# MPaL 2023 Program and Abstract Booklet

Wednesday 25th October - Friday 27th October 2023

Max Planck Institute for Psycholinguistics, Nijmegen, NL

# Contents

# Acknowledgements

The following people have provided invaluable help and advice. Thank you! We couldn't have done it without you.

MPaL Organising Committee: Caroline Junge, Caroline Rowland, Clara Kunst, Heike Behrens, Ilse van den Dobbelsteen, Jennifer Sander, Joyce van Zwet, Marisa Casillas, Melis Çetinçelik, Mieke Slim, Paula Fikkert, Rowena Garcia, Tineke Snijders, Yayun Zhang, Andriana Sabov

Ilse van den Dobbelsteen, in particular, for pulling it all together

Izabela Jordanoska, Jennifer Sander, Dirk van Gorp, Alvin Wei Ming Tan and Michael Frank for the pre-conference workshops

Jeroen Geerts for supporting our hybrid conferencing set up

Maurice van Deutekom for creating the website and our abstract submission and registration forms

Thea Schopman for the catering

The MPI facilities team for organising the space: Jan Achterberg, Pascal Zoetekouw, Remco Diever, Rober van Thiel

Overseas International for international sign interpretation

MPaL volunteers: Abdellah Elouatiq, Andriana Sabov, Ciske Jansen, Chih Yeh, Clara Kunst, Daan Konink, Dilys Eikelboom, Elea Thijssen, Eleni Zimianiti, Gabriela Garrido, Hanne van Uden, Iris Schmits, Izabela Jordanoska, Maaike Niewenhuizen, Jennifer Sander, Joyce van Zwet, Maaike Niewenhuizen, Marieke van den Akker, Marlijne Boumeester, Martin Teunissen, Melis Çetinçelik, Mieke Slim, Nienke Rulkens-Dijkstra, Patricia Manko, Robin Devillers, Sergio Miguel Pereira Soares, Stéphanie Kremer, Saishuang Wu, Yayun Zhang, Tomoko Tatsumi, Zara Harmon

# Program overview

## Wednesday, October 25th

| Start Time | Session | Title/Authors (presenter in bold)<br>O = online presentation (e.g. O1.1.) |
|---|---|---|
| 8.15 | Registration & coffee | |
| 8.45 | Welcome | |
| 9.00 | Session 1<br>(20 min talks) | O1.1. How caregivers' speech patterns enhance word segmentation: Insights from a computational modeling study on a Korean corpus. ***Jun Ho Chai***, *Seongmin Mun, Eon-Suk Ko*<br>1.2. Language development in bimodal bilingual children: A longitudinal study from infancy to school-age years. ***Evelyne Mercure***, *Victoria Mousley, Laura Goldberg, Mairead MacSweeney*<br>O1.3. Tongue root harmony acquisition and word segmentation in multilingual infant learners of languages with and without vowel harmony. ***Paul Okyere Omane***, *Natalie Boll-Avetisyan, Titia Benders*<br>1.4. Infant directed speech in UK and Ugandan mothers: An assessment of quantity and acoustic features across cultures and within Ugandan Languages. ***Ellie Donnelly***, *Ed Donnellan, Joanna Buryn-Weitzel, Kirsty Graham, Maggie Hoffman, Eve Holden, Michael Jurua, Charlotte Knapper, Sophie Marshall, Nicole Lahiff, Claudia Wilke, Katie Slocombe* |
| 10.20 | Coffee break | |
| 10.40 | Session 2<br>(20 min talks) | 2.1. Measuring mean length of utterance and lexical diversity among Mongolian-speaking rural and urban children. ***Dorjderem Byambasuren***, *Shanley Allen*<br>2.2. Uncovering cross-linguistic morphosyntactic transfer in second-language learning. *Zoey Liu, Emily Prud'hommeaux,* ***Joshua Hartshorne***<br>2.3. A large-scale study of how accent exposure affects vocabulary development. ***Helen Buckler***, *Priscilla Fung, Elizabeth K. Johnson*<br>2.4. Why do older children learn second languages faster than younger children? ***Wei Li***, *Heesu Yun, Joshua Hartshorne* |
| 12.00 | Lunch break | |
| 12.45 | Poster session 1: Timeslot A | |
| 14.00 | Session 3<br>(20 min talks) | 3.1. Parallel forms and over-generalisation in 5-year-olds: A cross-linguistic study of morphological acquisition in Croatian and Estonian. ***Virve Vihman***, *Gordana Hržica, Mari Aigro, Sara Košutar, Tomislava Bošnjak-Botica*<br>3.2. Morphological richness and cross-linguistic influence in bilingual acquisition. ***Adele Vaks,*** *Virve Vihman*<br>3.3. The influence of cognate status on bilingual infants' early receptive vocabulary: A cross-linguistic CDI study. *Salomé Schwob, Amandine Ballestraz, Letizia Volpin,* ***Katrin Skoruppa***<br>O3.4. The words from children to children: A study of the linguistic environment of children from diverse sociocultural groups in Argentina. ***Florencia Alam,*** *Celia Renata Rosemberg, Leandro Garber, Pablo Amdem* |
| 15.20 | Coffee break | |
| 15.40 | Symposium in honour of Anne Cutler | Chair: Caroline Junge<br><br>S.1. Understanding infants' preference for infant-directed speech through large scale collaborative science<br>*Melanie Soderstrom* (University of Manitoba)<br>S.2. At the interface of phonology and the lexicon: A crosslinguistic Cantonese/French comparison<br>*Thierry Nazzi* (CNRS - Université Paris Cité)<br>S.3. Pitch processing in Japanese and Dutch infants: Same or different?<br>*Claartje Levelt* (Leiden University) |
| 17.40 | Conference reception | |
| 18.40 | Poster session 1: Timeslot B, followed by closing remarks (end 20.00) | |

# Thursday, October 26th

| **Start Time** | **Session** | **Title/Authors (presenter in bold)**<br>O = online presentation (e.g. O1.1.) |
|---|---|---|
| 8.30 | Registration & coffee | |
| 9.05 | Invited talk | I.1. The neural basis of early speech perception in hearing and deaf/hard-of-hearing infants<br>*Judit Gervain* (Università degli Studi di Padova) |
| 10.20 | Coffee break | |
| 10.40 | Session 4<br>(20 min talks) | 4.1. Infants' neural tracking of rhythm in spoken nursery rhymes relates to their vocabulary size. ***Laura E. Hahn****, Tineke M. Snijders*<br>4.2. Attention towards speaker's visual cues during word learning in children with hearing loss: A pilot study. ***Beatriz de Diego-Lázaro****, Elisa Marrodan, Laura Bosch*<br>4.3. Do visual speech cues facilitate ten-month-old infants' neural tracking of speech? ***Melis Çetinçelik****, Antonia Jordan-Barros, Caroline F. Rowland, Tineke M. Snijders*<br>4.4. The role of pitch contour shape in expressing social purpose in infant babbling. ***Elanie van Niekerk,*** *Caroline Junge, Aoju Chen* |
| 12.00 | Lunch break | |
| 13.00 | Poster session 2: Timeslot A | |
| 14.15 | Session 5<br>(20 min talks) | 5.1. Stepping into the shoes of young children with Down syndrome: Understanding sensorimotor patterns of parent-child interaction during word learning. ***Hana D'Souza,*** *Kate Mee, Catalina Suarez-Rivera, Chen Yu*<br>5.2. Comparing language input in homes of blind and sighted children: Insights from daylong recordings. ***Erin Campbell****, Lillianna Righter, Eugenia Lukin, Elika Bergelson*<br>5.3. Recognition of dialectal word-forms in bivarietal children. ***Sarah Warchhold,*** *Anja Gampe, Katharina Zahner-Ritter, Bettina Braun* |
| 15.15 | Coffee break | |
| 15.40 | Session 6<br>(20 min talks) | O6.1. Vocal maturity predicts adult responsiveness in a Tseltal Mayan community. ***Yuchen Jin,*** *Juan Méndez Girón, Gilles Polian, Kennedy Casey, Marisa Casillas*<br>O6.2. Copula absence variation in adult and child corpus speech. ***Jordyn Martin,*** *Claire Bergey, Sharese King, Marisa Casillas*<br>O6.3. Multigenerational child-directed communication (CDC) in Mayan Tsotsil: Caregivers' interactional format-types in communicative events. ***Lourdes de León***<br>O6.4. Vocabulary growth and the early linguistic environment in rural Ghana. ***Joseph Coffey,*** *Jesse Snedeker, Elizabeth Spelke* |
| 17.00 | Short comfort break | |
| 17.10 | Poster session 2: Timeslot B, followed by closing remarks (end 18.20) | |

# Friday, October 27th

| **Start Time** | **Session** | **Title/Authors (presenter in bold)**<br>O = online presentation (e.g. O1.1.) |
|---|---|---|
| 8.30 | Registration and coffee | |
| 9.00 | Invited talk | I.2. Breaking into Language: Diversity, representations, and limits on generalizability<br>*Leher Singh* (National University of Singapore) |
| 10.15 | Coffee break | |
| 10.40 | Session 7<br>(20 min talks) | 7.1. Developing language in a developing body: A genetic perspective. ***Ellen Verhoef,*** *Lucía de Hoyos, Fenja Schlag, Philip S. Dale, Evan Kidd, Simon E. Fisher, Beate St Pourcain,*<br>7.2. The development of informativity: Multimodal referential communication in Spanish and Norwegian preschoolers. ***Paula Rubio-Fernandez,*** *Chigusa Kurumada*<br>7.3. How a white dog becomes a cloud: developmental and computational investigation of metaphor production skills in preschoolers. ***Chiara Pompei,*** *Serena Lecce, Paolo Canal, Paola Del Sette, Valentina Bambini* |
| 11.40 | Comfort break | |
| 11.45 | Session 8<br>(20 min talks) | O8.1. Rational inattention: A new theory of neurodivergent information seeking. ***Samuel Jones,*** *Manon Jones, Kami Koldewyn, Gert Westermann*<br>8.2. The role of language experience in the first cohort of an emerging sign language. ***Rachel Miles****, Rachel Mayberry* |
| 12.25 | Lunch break | |
| 13.25 | LangVIEW discussion | An introduction to the LangVIEW group, aims and achievements and a discussion about how to extend/modify LangVIEW.<br>See alecristia.github.io/LangVIEW/ |
| 14.25 | Conference closing discussion & feedback session (end 14.45) | |

# Notes

**Online audience should us this live stream link to attend the talks:**
https://videoportal.mpi.nl/Mediasite/Channel/mpal2023/

**Online oral/sign language presenters should use this zoom link to deliver their talk**
https://mpi-nl.zoom-x.de/j/64724505147?pwd=M0lweUlCbEp1K0FFVVVBVnN0RTlvQT09
Meeting ID: 647 2450 5147, Passcode: 328461

**In-person posters** should be placed on their boards at the start of each day and removed at the end of the day. Each board will have a number on it that corresponds to the number on your poster below. For online poster presenters, we will place your posters for you.

**Online poster presenters and online audience** should open the following zoom link and go to the relevant breakout room for each poster listed further down on the program.
https://mpi-nl.zoom-x.de/j/61561096671?pwd=OVExQ2JyUjBsS2xkTnFscHExZWt1UT09
Meeting ID: 615 6109 6671, Passcode: 156357

**All online presenters and audience:** Please make sure you know the time difference between your timezone and that of the Netherlands (Central European Summer Time, UTC+2) and adjust your attendance accordingly.

See attendee and presenter guide on the MPaL attendees website for more information:
https://www.mpi.nl/GXQ5BMZhnSVbqgpDFWtwhYTy

---

# Poster program

## Wednesday 25th October

### Timeslot A

#### In-person posters

On Wednesday, all in-person poster presenters will be available in Timeslot A (12.45)

| # | Authors (**presenter**) | Title |
|---|---|---|
| P1.01 | **Magdalena Krysztofiak,** Magdalena Łuniewska, Katarzyna Chyl, Pernille Hansen, Joanna Kołak, Karolina Muszyńska, Hanne Gram Simonsen, Zofia Wodniecka & Ewa Haman. | Searching for words: Picture naming errors in bilingual and monolingual preschoolers and contributing factors. |
| P1.02 | **Ali Langner** | Investigating infants' production of syllables following full cleft palate repair surgery: Syllable sequences at 13-14 months as a predictor of phonetic repertoire at 24 and 36 months. |
| P1.03 | **Vishakha Shukla**, Angela Xiaoxue He & Sudha Arunachalam | Attention to illustrations in autistic and non-autistic children following spontaneous parent narratives: An exploratory eye-tracking study. |
| P1.04 | **Anja Hahne**, Niki K. Vavatzanidis, Christina S. Wegewitz, Lena C.E. Heine & Anne Erler | Consequences of deprivation and adverse input conditions on language acquisition in the long run: Evidence from children with cochlear implants. |
| P1.05 | **Paul Ibbotson** & William Browne | The effects of family, culture, and sex on linguistic development across 11 languages. |
| P1.06 | **Elena Andonova** | The social & cultural context of early language development in Bulgarian. |
| P1.07 | **Hannah Sawyer**, Colin Bannard & Julian Pine | Testing the competing sources of input account on English-speaking children's verb-marking errors across development. |
| P1.08 | **Rebecca Woods & Johannes Heim** | What's a question to start with? |
| P1.09 | **Monica Barbir**, Yuka Tatsumi & Sho Tsuji | Learning from sparse input: How children learn morphosyntactic elements that are often omitted in speech. |
| P1.10 | **Elsa Viviana Oropeza Gracia** | The development of complement clauses in Spanish: The case of Reported Speech. |
| P1.11 | **Melvatha R. Chee** | Navigating the Navajo verb construction in child speech: A focus on verbal prefixes. |
| P1.12 | **Eugenia Lukin**, Erin Campbell, Lillianna Righter & Elika Bergelson | Comparing utterance composition and conversational content in everyday language input to blind and sighted toddlers. |

| | | |
|---|---|---|
| P1.13 | **Sarah Rajendra** & Leher Singh | Socio-economic Status predicts infant word recognition: Evidence from a socio-economically and linguistically diverse Singaporean sample. |
| P1.14 | **Jennifer Sander**, Melis Çetinçelik, Yayun Zhang & Caroline Rowland | Unraveling the granularity of different metrics in analyzing joint attention data. |
| P1.15 | **Anika van der Klis**, Caroline Junge, Frans Adriaans & René Kager | Caregiver reporting of Dutch children's vocabularies: Examining validity and predictors of variation from infancy to toddlerhood. |
| P1.16 | **Birsu Kandemirci,** F. Cansu Pala | An evidentiality task to accommodate cross-linguistic differences. |
| P1.17 | **Iris Leliveld**, Jorik Geutjes, Caroline Junge & Aoju Chen | Comparing the prosody of IDS and ADS: How do ADS and IDS differ in their marking of intonational phrase boundaries? |
| P1.18 | **Kirsty Green**, Marcus Perlman & Sotaro Kita | Iconic words are more common in early interactions because they are more engaging. |
| P1.19 | **Letizia Volpin**, Amandine Ballestraz, Salomé Schwob & Katrin Skoruppa | How gesture repertoire and early pragmatic abilities predict first vocabulary independently in young children exposed to one or more language. |
| P1.20 | **Monica Vanoncini**, Isabell Wartenburger & Birgit Elsner | Do action boundaries help to segment speech? |
| P1.21 | **Youtao Lu**, Megumi Ishikawa, Maria Gohlke, Emma de Araujo, Panagiotis Boutris, Sho Tsuji & Reiko Mazuka | Examining the concurrent effect of contingency on word learning in Japanese and French 13-month-olds. |
| P1.22 | **Dahliane Labertoniere** & Katrin Skoruppa | Composition of the early lexicon across languages: A systematic review. |
| P1.23 | **Sharon Unsworth** | Why some bilingual children actively use their heritage language more than others. |
| P1.24 | **Ingrida Balčiūnienė** & Aleksandr N. Kornev | Spontaneous bilingualism in a child with autism spectrum disorder: A case study. |
| P1.25 | **Anna Caunt** & Rana Abu-Zhaya | Evaluating measures of language input to multilingual infants. |
| P1.26 | **Wei Li**, Aidas Aglinskas & Joshua Hartshorne | Contrastive neural network reveals the structure of neuroanatomical variation within bilingualism. |
| P1.27 | **Rowena Garcia**, Youtao Lu & Natalie Boll-Avetisyan | Limits of variability in infant phonotactic acquisition: A study on the sonority sequencing principle. |
| P1.28 | **Iris van der Wulp**, Marijn Struiksma & Frank Wijnen | Rhythmic abilities and statistical learning in infancy. |
| P1.29 | Gilbert Ambrazaitis, **Nadja Althaus**, Charlotte Bertilsson, Simone Löhndorf, Anna Sara H. Romøren & **Susan Sayehli** | Do dialect-specific prosodic properties shape the path to contrastive focus? - Production and comprehension data from 3-5 year-old children acquiring Stockholm or Scania Swedish. |
| P1.30 | **Martina Dvořáková**, Kateřina Chládková & Jan Kremláček | Neural preparedness for spoken language: Neural speech tracking in newborns of Czech-speaking, Russian-speaking, and signing mothers. |

# Timeslot A

## Online posters

On Wednesday, all online poster presenters will be available to talk to in Timeslot A (12.45 CEST). They will be present via zoom.

| # | Zoom breakout room | Authors (**presenter**) | Title |
|---|---|---|---|
| OP1.01 | 1 | **William N. Havard**, Loann Peurey, Alejandrina Cristia & Kasia Hitczenko | Speech maturity dataset. |
| OP1.02 | 2 | **Sarah Dolscheid** & Martina Penke | Exploring links between visual attention and language production in children. |
| OP1.03 | 3 | **Athina Ntalli,** Jelena Mirković, Adhvika Shetty, Pooja Pandith, M. N. Usha, Sanjana Nagendra, B. Kala, S. Chandara, Rinkle Crasta, Deeksha Prabhu, Gideon Arulmani, & Sonali Nag | Improving children's spoken language via implicit learning of syntactic and narrative structures. |
| OP1.04 | 4 | **Xiaowei Gong**, Asli Aktan-Erciyes, Basak Sahin-Acar & Dilay Z. Karadöller | Neither bilingual experience nor home language environment relate to cognitive control of bilingual children. |
| OP1.05 | 5 | **Samuel David Jones**, Hannah Stewart & Gert Westermann | A maturational frequency discrimination deficit may explain developmental language disorder. |

# Timeslot B

No poster presenters are currently scheduled to present their posters in Timeslot B on Wednesday but you will be able to browse the posters during this timeslot and leave a note for the presenter if you have questions.

# Thursday 26th October

## Timeslot A

### In-person posters

On Thursday, all **in-person** poster presenters will be available in Timeslot A (13.00 CEST). (Please note there is no poster P2.02)

| # | Authors (**presenter**) | Title |
|---|---|---|
| P2.01 | **Serene Siow** & Nick Huang | Believe what you see: Children's interpretations of perception verbs used for beliefs. |
| P2.03 | **Vrinda Bhatia**, Vishakha Shukla, Anwesha Mahapatra, Madeleine Long & Paula Rubio-Fernandez | Multimodal referential communication in newly-sighted children: A test of adaptive pragmatics |
| P2.04 | **Gaia Lucarini**, Caroline Nallet, Davide Brotto, Alessandro Martini, Patrizia Trevisi & Judit Gervain | Rhythmic discrimination of languages in infants with hearing loss. |
| P2.05 | **Benedetta Colavolpe**, Lara Burgato, Gaia Lucarini & Judit Gervain | The development of Italian vocabulary, morphology and syntax: An observational study. |
| P2.06 | **Júlia Florit-Pons**, Mariia Pronina, Alfonso Igualada, Pilar Prieto & Courtenay Norbury | Multimodal skills, but not motor skills, predict narrative and pragmatic skills in typically and non-typically developing preschoolers. |
| P2.07 | **Sita ter Haar**, Yang Zheng & Gabriel Beckers | The relation between sleep and vocal learning in songbirds, a model for speech acquisition. |
| P2.08 | **Iris Nomikou** & Emily Hofstetter | Exploring the sociality of infant strain sounds in naturalistic interaction. |
| P2.09 | **Dinah Baer-Henney** & Ulrike Domahs | German number cues and their variability of strengths within and across time. |
| P2.10 | **Tomoko Tatsumi** & Julian Pine | What I say matters: Longitudinal changes in children's response and interaction in Japanese question sequences. |
| P2.11 | **Angelika Golegos** & Theodoros Marinis | Is "he" the tiger or the hedgehog? Individual differences in children's processing of pronoun ambiguity in German. |
| P2.12 | **Naz Deniz Atik**, Gregory Ward & Sandra R. Waxman | Evidence for a morphosyntactic marker of genericity in Turkish: -dır. |
| P2.13 | **Adeline Braverman**, Lili Correa & Naja Ferjan Ramírez | Language input from mother-mother dyads: An exploratory study of gender/sex-related variability in the use of parentese. |
| P2.14 | **Cecilia Rojas-Nieto** | Child-caregiver conversational sequences that look for the communicative encounter: A look through Mexican families. |
| P2.15 | **Giovanna Morini**, Mels Ayala & Stephanie Stollar | What did you say? The role of audio-visual cues on speech perception in noise by monolingual and bilingual |

| | | |
|---|---|---|
| | | toddlers. |
| P2.16 | **Daniil Kocharov** & Okko Räsänen | Analyzing age-dependent lexical and syntactic changes in child-directed speech using CHILDES. |
| P2.17 | **Sura Ertaş**, Sümeyye Koşkulu-Sancar, Ebru Ger, Ulf Liszkowski & Aylin C. Küntay | Relation of infants' and mothers' pointing to infants' vocabulary development measured directly and with parental report. |
| P2.18 | Melanie Soderstrom, **Caroline Junge**, Natalia Kartushina, Gaye Soley, Julien Mayor, Virginie Durier, Stephanie Barbu, Zuzana Ocel Kov,<br>Katerina Chladkova,<br>Filip Smolík & Paula Fikkert | Preference for Infant-Directed Speech in 6-9-month-old infants: A cross-linguistic, cross-laboratory approach. |
| P2.19 | **Agnieszka Dynak**, Katarzyna Bajkowska, Jolanta Kalinowska, Joanna Kołak, Magdalena Krysztofiak, Magdalena Łuniewska, Karolina Muszyńska, Nina Gram Garmann, Ewa Haman | Will you benefit from taking part in parental intervention? Factors influencing the rate of increase in the knowledge after taking part in an intervention about early bilingual development. |
| P2.20 | **Laura Cristina Villalobos Pedroza** | Exploring the role of prosody on prompted repair sequences in child-adult interaction: A case study on first language acquisition of Spanish. |
| P2.21 | Ming Yean Sia, **Rajalakshmi Madhavan**, Xiaoyun Chen & Nivedita Mani | The effect of labelling and sustained attention during parent-child interaction on novel-word retention. |
| P2.22 | **Jessica N. Steil**, Ulrike Schild & Claudia K. Friedrich | Word frequency imbalance does not guide noun comprehension of 6- to 14-month-old German-learning infants within the looking-while-listening paradigm. |
| P2.23 | **Solène Belogi** & Katrin Skoruppa | Fast mapping abilities and their predictive effect on receptive vocabulary in 3 to 5 year-old monolingual and bilingual children. |
| P2.24 | **Martin Teunisse**, Roy Hessels & Caroline Junge | Building on the Looking While Listening paradigm: What are the individual differences in the performance on the LWL for 2-5-year-olds? |
| P2.25 | **Julia Egger**, Caroline F. Rowland & Christina Bergmann | Examining the relationship between lexical speed of processing and novel word learning. |
| P2.26 | **Allison Fitch** & Amy Lieberman | The use of mutual exclusivity in monolingual and bimodal bilingual children acquiring American Sign Language. |
| P2.27 | **Clara Kunst**, Diarmuid Johnson, Evan Kidd & Sharon Unsworth | Cross-Linguistic Influence and intergenerational language change in Irish Gaelic. |
| P2.28 | **Jérémy Genette**, Steven Gillis & Jo Verhoeven | Exploring individual differences in dual pathways to the vowel height contrast: the f0 and F1 routes. |
| P2.29 | Joanna Kołak, Gemma Taylor & Padraic Monaghan | The potential of digital media to support monolingual and bilingual children's language development. |

# Timeslot A

## Online posters

On Thursday, some online poster presenters will be available in Timeslot A and some in Timeslot B. The online poster presenters listed below will be available to talk to in Timeslot A (13.00 CEST). They will be present via zoom.

| # | Zoom breakout room | Authors (**presenter**) | Title |
|---|---|---|---|
| OP2.01 | 1 | **Sebastian Holt** & David Barner | Learning the meanings of numbers from the syntax of nouns. |
| OP2.02 | 2 | **Sneh Jhaveri**, Abbie Heidenreich & Sarah Kucker | Predicting child language outcomes using narrow and broad socioeconomic factors. |
| OP2.03 | 3 | **Hannah Sarvasy** | Verbatim narrative prompting to Nungon-speaking children. |
| OP2.04 | 4 | **Jongmin Jung**, Jun Ho Chai & Eon-Suk Ko | Socioeconomic status, parental play and book-reading, maternal work status and vocabulary development in young Korean children. |
| OP2.05 | 5 | Eon-Suk Ko, **Jun Ho Chai** & Jongmin Jung | The initiator effect in conversational interactions and its association with children's language outcome. |
| OP2.06 | 6 | **Shannon P. Kong**, Olivia Afonso & Nayeli Gonzalez-Gomez | Exploring bilingual and monolingual children's ability to combine mutual exclusivity and eye gaze across different contexts. |

# Timeslot B

No in-person posters are scheduled for Timeslot B on Thursday.

## Online posters

The online poster presenters listed below will be available to talk to in Timeslot B (17.10 CEST). They will be present via zoom.

| # | Zoom breakout room | Authors (**presenter**) | Title |
|---|---|---|---|
| OP2.07 | 1 | **Kennedy Casey** & Marisa Casillas | Multimodal predictors of early object noun recognition in Tseltal. |
| OP2.08 | 2 | **Jessica Kosie** & Casey Lew-Williams | Characterizing infant-directed communication and links to caregiver-infant synchrony. |
| OP2.09 | 3 | **Federica Bulgarelli** | Characterizing input from older children in North-American daylong recordings. |
| OP2.10 | 4 (presenters for OP2.10 and OP2.11 are in the same zoom breakout room) | **Urška Fekonja,** Naja Ferjan Ramirez, Ljubica Marjanovič-Umek & | Language environment and early language skills in Slovenian toddlers: A pilot study using daylong recordings. |
| OP2.11 | 4 (presenters for OP2.10 and OP2.11 are in the same zoom breakout room) | **Naja Ferjan Ramirez** | Estimating children's language exposure: A comparison of random and volume sampling from daylong recordings collected in a bilingual community. |
| OP2.12 | 5 | **Lillianna Righter**, Erin Campbell, Eugenia Lukin & Elika Bergelson | The interdependence of vocabulary and morphosyntax development in blind and sighted children. |
| OP2.13 | 6 | **Kayla McComb** & Caitlin Fausey | Harnessing learning theory to achieve robust manual annotation: Insights into training native listeners to identify infant vocalizations in everyday audio. |
| OP2.14 | 7 | **Erika Exton** & Rochelle Newman | Properties of infant-directed speech in unilingual and mixed-language contexts. |
| OP2.15 | 8 | **Mariam El Amin &** Jennifer Brown | An examination of maternal linguistic input of bilingual mothers. |

# Abstract booklet

# Oral/signed presentations abstracts

## Day 1

## Session 1

### O1.1. How caregivers' speech patterns enhance word segmentation: Insights from a computational modeling study on a Korean corpus

Online presentation

Jun Ho Chai, Chosun University
Seongmin Mun, Ajou University
Eon-Suk Ko, Chosun University

Contact: junhoc94@gmail.com

Children learn to segment words from the speech of their caregiver by using metrical and phonotactic regularities (e.g., Jusczyk & Aslin, 1995), among others. Behavioral studies suggest that infants segment words more easily in child-directed speech (CDS) than adult-directed speech (ADS; Soderstrom, 2007; Thiessen et al., 2005). However, the underlying mechanisms behind this advantage are not well understood. This paper examines whether the benefits of CDS observed in controlled lab settings extend to the noisy yet ecologically valid language environment. We employ statistical modeling of word segmentation using data from spontaneous interactions of 35 Korean mother-infant pairs.

The research questions were as follows: First, is CDS more advantageous than ADS in the computational segmentation of words? Second, provided that speech registers differ in their segmentability of words, which properties of the linguistic input contribute to such a difference? To investigate these questions, we conducted simulations using thirteen different word segmentation algorithms on both speech types (i.e., CDS vs ADS).

We utilized the Ko corpus from the CHILDES dataset (Ko et al., 2020, Table 1 for corpus properties statistics) for both CDS and ADS speech types as the linguistic input. We included an additional ADS corpus, the Call Friend Korean corpus (Ko et al., 2003), which is of similar corpus length with the CDS. The orthographic form of the corpus was transformed into phonetic form using the Python-based KoG2P package (Cho, 2017), to approximate a child's actual linguistic environment. We employed baseline algorithms, two sub-lexical algorithms (transitional probabilities & diphone-based segmenter), and two lexical algorithms

(phonotactics from utterances determine distributional lexical elements & adaptor grammar) utilizing Python-based WordSeg (Bernard et al., 2018). To evaluate model performance, we compared the word boundaries detected by each model with the original word boundaries in the input sentences and computed F-score based on recall and precision rate.

We report the following results: (i) Korean CDS demonstrated distinct corpus properties, including shorter utterance and word lengths, a higher proportion of one-word utterances, a lower proportion of hapaxes and more word repetitions compared to ADS, (ii) CDS demonstrated better segmentability, showing 12% improvement over ADS, (iii) when controlled for register type and corpus size, corpus properties such as shorter utterance and word lengths, more word repetitions, and a higher proportion of one-word utterances are associated with better word segmentation. These results provide evidence of how caregiver's speech patterns facilitate word segmentation, a crucial step in language development.

In summary, our study contributes to a better understanding of the benefits and nuances of CDS in word segmentation. Our study is one of the first attempts to algorithm statistical word segmentation with Korean, which turned out to be quite different from the algorithms reported in European languages (Cristia et. al., 2019; Loukatou et. al., 2019). The difference could be attributed to typological variations in the language, as well as methodological distinctions such as the data used and the derivation of phonetic input based on phonological rules. Nonetheless, our findings demonstrate the advantages of CDS segmentation based on ecologically valid and spontaneous data.

## 1.2. Language development in bimodal bilingual children: A longitudinal study from infancy to school-age years

In-person presentation

Evelyne Mercure, Goldsmiths, University of London
Victoria Mousley, Birkbeck, University of London
Laura Goldberg, University College London
Mairead MacSweeney, University College London

Contact: e.mercure@gold.ac.uk

Hearing children of deaf parents (also known as CODAs) are likely to be exposed to both a signed and a spoken language early in life. Research into language development in bimodal bilingual children is scarce, often based on small samples, often presents contradictory results, and rarely addresses the earliest phases of language development (Hofmann & Chilla, 2015; Petitto et al., 2001). Despite this lack of data, it is often believed that bimodal bilingualism is likely to result in language learning difficulties (Chen Pichler, Lee & Lillo-Martin, 2014). The present study aimed to fill this gap in the literature by examining language acquisition in bimodal bilinguals from infancy to school-age years in comparison to children acquiring two spoken languages from birth (unimodal bilinguals) and children acquiring a single language (monolinguals).

Data is presented from 31 bimodal bilinguals (BSL/ English) between 5 and 8 months, with longitudinal data at 15 months (n= 22), 24 months (n=19) and 6-8 years (n = 10). It is compared to 28 unimodal bilinguals (English/another spoken language; n = 12 at 15-months, n =16 at 24-months and n = 12 at 6-8 years) and 34 monolinguals (English; n = 22 at 15-months, n = 22 at 24-months and n = 13 at 6-8 years). At 5-to-8-months, the Mullen Scales of Early Learning (MSEL) was administered as well as questionnaires of language exposure. At 15 and 24 months, language preferences questionnaires were completed by parents as well as the Communicative Development Inventory (CDI) in English for all infants and in BSL for bimodal bilinguals. At 6-8 years, a battery of assessments was conducted online via the Pearson Clinical Q-Global platform. These included the Expressive Vocabulary Test Third Edition (EVT-3) and Clinical Evaluation of Language Fundamentals – Fifth Edition (CELF-5 UK).

In infancy, MSEL revealed that bimodal bilinguals significantly outperformed unimodal bilinguals in their receptive language skills [$F(2, 93) = 3.258$; $p = 0.043$]. At 15-month-old, the CDI suggested no significant group differences in English receptive and expressive vocabulary. In bimodal bilinguals, a significant positive correlation was observed between their estimated vocabulary in English and in BSL for both receptive [$r(17) = 0.817$ ; $p < 0.001$] and expressive vocabulary [$r(17) = 0.535$ ; $p = 0.018$]. This suggests that bimodal bilingual infants who learned vocabulary more successfully tended to do so in both of their languages (English and BSL). At 24-months, group differences were observed on the CDI [$F(2, 54) = 3.983$; $p = 0.025$; $\eta2 = 0.135$], with bimodal bilinguals tending to outperform unimodal bilinguals in English receptive vocabulary ($p = 0.089$).

In school-age years, bimodal bilinguals were found to have similar English vocabulary to monolinguals and unimodal bilinguals, but increased multilingual conceptual vocabulary compared to unimodal bilinguals [$F(2, 34) = 3.358$ ; $p = 0.048$; $\eta2 = 0.178$]. CELF-5 revealed similar performances between bimodal bilinguals and children of hearing parents on most language tasks, except for the ‘word class’ task in which bimodal bilinguals scored lower than monolinguals [$F(2, 34) = 3.89$ ; $p = 0.031$; $\eta2 = 0.195$].

These results globally suggest successful early language acquisition in bimodal bilinguals compared to both monolinguals and unimodal bilinguals. A positive relationship was observed between estimated vocabulary in English and BSL in the second year of life. Moreover, positive effects of bimodal bilingualism were found on communicative skills in infancy as well as some aspects of vocabulary across toddlerhood and childhood. These data are important to combat still prevalent prejudice suggesting that bimodal bilingualism is likely to result in difficulties in spoken language acquisition.

# O1.3. Tongue root harmony acquisition and word segmentation in multilingual infant learners of languages with and without vowel harmony

Online presentation

Paul Okyere Omane, University of Potsdam, Macquarie University, International Doctorate for Experimental Approaches to Language And Brain (IDEALAB)
Natalie Boll-Avetisyan, University of Potsdam
Titia Benders, University of Amsterdam

Contact: omaneokyere@hotmail.com

Many infants worldwide are exposed to multiple languages, yet very little is known about how multilingual experience affects infants' ambient language(s) processing. Our study looked at vowel harmony (VH, a phonotactic constraint requiring vowels in adjacent syllables to be similar) processing in multilingual infants. Monolingual infants learning a VH language show a listening preference for VH patterns, while infants learning a non-VH language do not (e.g., Altan et al., 2016; Gonzalez-Gomez et al., 2019). Moreover, infants use VH cues for word segmentation (Van Kampen et al., 2008; Mintz et al., 2018).

Multilingual experience can affect infants' ambient language(s) processing (for a review; Höhle et al., 2020). In Ghana, as in many other African countries, exposure to diverse languages is the norm, and many of the languages, e.g., Akan, have VH, while others do not. We asked whether Ghanaian infants with simultaneous experience with VH and non-VH languages prefer VH patterns and use VH for speech segmentation. In two experiments, we investigated the acquisition and perceptual preferences for Advanced Tongue Root harmony (ATR) and the ability to use ATR harmony cues for speech segmentation in multilingual infants in Ghana (an understudied population), learning between 2 and 5 languages, with minimally one showing ATR harmony. Infants' language exposure was assessed with a questionnaire and a logbook diary, and the central fixation procedure for the experiment, in our mobile lab in Accra.

In experiment 1, we investigated infants' acquisition and preferences for ATR harmonic or disharmonic syllable sequences and the degree to which exposure to both VH and non-VH languages modulates infants' preferences. We hypothesized that (1) infants learning an ATR harmony language (e.g., Akan) and other non-vowel harmony languages will prefer harmonic syllable sequences over non-harmonic ones, (2) exposure to an ATR harmony language (Akan) might or might not modulate preferences. Forty 6-month-old multilingual infants heard bisyllabic CVCV nonwords that were either harmonic (e.g., bidu) or non-harmonic (e.g., bɔde) based on the ATR feature of Akan. As a result, infants showed a familiarity preference by listening longer to ATR harmonic over non-harmonic syllable sequences ($p < .01$). This preference was not modulated by exposure ($p = .79$). The results show that exposure to minimally one VH language independent of the amount of exposure is sufficient for infants to show a preference.

In experiment 2, forty 9-11-month-old infants' ability to segment words from continuous

speech using ATR harmony cues was investigated. We hypothesized that (1) Multilingually raised infants exposed to minimally one ATR harmony language will rely on ATR harmony cues for segmentation. (2) Exposure to an ATR harmony language might modulate the use of harmony cues for segmentation. Infants were first familiarized with text passages embedded with target bisyllabic words (e.g., tupi) that either disharmonized with an attached CV suffix (tupi-kɛ: providing a word boundary cue) or harmonized with the attached CV suffix (tupi-ke: providing no cue). Infants were then tested on their recognition of the familiarized target words and novel words. Results revealed a familiarity preference: infants' average LTs to familiarized words in disharmonic context was longer than those in the harmonic context ($p = .05$) and novel words ($p < .05$). These results suggest 9-11 months old multilingual infants learning VH and non-VH languages use ATR cues to identify word boundaries. No effect of language exposure was found ($p = .47$), suggesting that minimal exposure to ATR harmony language could be enough for young multilingual infants to use ATR cues in language processing.

Together, these experiments provide the first evidence of ATR acquisition in infants and VH preference in infants learning both VH and non-VH languages simultaneously.

## 1.4. Infant directed speech in UK and Ugandan mothers: An assessment of quantity and acoustic features across cultures and within Ugandan Languages

In-person presentation

Ellie Donnelly, Durham University and University of York
Ed Donnellan, University College London
Joanna Buryn-Weitzel, University of York
Kirsty Graham, University of York and University of St Andrews
Maggie Hoffman, Arizona State University
Eve Holden, University of St Andrews
Michael Jurua, Budongo Conservation Field Station, Uganda
Charlotte Knapper, University of York
Sophie Marshall, University of York
Nicole Lahiff, University of York
Claudia Wilke, University of York
Katie Slocombe, University of York

Contact: drelliedonnelly@gmail.com

When speaking to infants, caregivers tend to use a special speech register called Infant-directed speech (IDS), which is typically slower paced, higher-pitched and with greater pitch modulation and larger vowel space than adult-directed speech (ADS) (Saint-Georges et al., 2013). Through such acoustic modifications, IDS may play a critical role in the development of infant attention (Senju & Csibra, 2008), language (Golinkoff et al., 2015) and emotion (Fernald, 1992). However, IDS quantity (Cristia et al., 2019) and acoustic features vary across languages and cultures (Hilton et al., 2022). One driver of this variation may be the

time infants are in body contact with caregivers as IDS may have evolved to sooth infants in the absence of body contact (Falk, 2004). However, previous research has focused overwhelmingly on WEIRD populations with small sample sizes, so cultural variability of both IDS quantity and acoustic features, and mother-infant body contact are poorly estimated. We are currently analysing a large dataset from 96 Ugandan and 129 UK mother-infant dyads. We used videos of free play when infants were 3-9 months old to measure the amount of time mothers (i) produced IDS and (ii) were in body contact with their infants. For acoustic features of IDS and ADS we asked mothers to interact and talk to their infants and an adult experimenter, and to name and show them objects containing corner vowels /i/,/u/,/a/. Preliminary analysis of a subset of the data revealed interesting patterns. In contrast to the body-contact hypothesis, mothers in Uganda (N=29) and the UK (N=29) produced comparable amounts of IDS, despite Ugandan mothers spending significantly more time in infant body contact. IDS and ADS acoustic measurements show that IDS was higher in mean pitch and pitch modulation than ADS in both Uganda (N=18) and the UK (N=29), but this difference was significantly more pronounced in the UK. Speech rate for IDS was significantly slower than ADS in Uganda (N=19), but not the UK (N=29). We found no evidence of group level vowel-hyperarticulation in either population (N=17 for Uganda; N=24 for UK). Results from the full dataset will be discussed in the presentation and we will discuss possible drivers of any cultural variation in IDS and ADS acoustic features confirmed by analysis of the full data set. Variation in IDS acoustic features as a function of language within non-WEIRD cultures has been so far overlooked in the literature. Therefore, we aim to also conduct a within-culture analysis of the acoustic differences between IDS and ADS within the three Ugandan languages included in the study (Kiswahili, Lugbara, Alur).

References


- Cristia, A., Dupoux, E., Gurven, M., & Stieglitz, J. (2019). Child-Directed Speech Is Infrequent in a Forager-Farmer Population: A Time Allocation Study. Child Development, 90(3), 759–773.
- Falk, D. (2004). Prelinguistic evolution in early hominins: Whence motherese? Behavioral and Brain Sciences, 27(4), 491–503.
- Fernald, A. (1992). Human maternal vocalizations to infants as biologically relevant signals: An evolutionary perspective. The Adapted Mind, 391–428.
- Golinkoff, R. M., Can, D. D., Soderstrom, M., & Hirsh-Pasek, K. (2015). (Baby)Talk to Me: The Social Context of Infant-Directed Speech and Its Effects on Early Language Acquisition. Current Directions in Psychological Science, 24(5), 339–344.
- Hilton, C. B., Moser, C. J., Bertolo, M., Lee-Rubin, H., Dorsa, A., Bainbridge, C. M., Simson, J.,. … Mehr, S. A. (2020). Acoustic regularities in infant directed speech and song across cultures. Nature Human Behaviour 6, 1545-1556 .
- Saint-Georges, C., Chetouani, M., Cassel, R., Apicella, F., Mahdhaoui, A., Muratori, F., Laznik, M. C., & Cohen, D. (2013). Motherese in Interaction: At the Cross-Road of Emotion and Cognition? (A Systematic Review). PLoS ONE, 8(10).
- Senju, A., & Csibra, G. (2008). Gaze Following in Human Infants Depends on Communicative Signals. Current Biology, 18(9), 668–671.

# Session 2

## 2.1. Measuring mean length of utterance and lexical diversity among Mongolian-speaking rural and urban children

In-person presentation

Dorjderem Byambasuren, University of Kaiserslautern-Landau (RPTU)
Shanley Allen, University of Kaiserslautern-Landau (RPTU)

Contact: dorjoo@rptu.de

Scientifically, it is well documented that the early years of childhood play a crucial role in children's overall well-being and development. Language development is also critical to children's development and learning processes. Since no previous studies have investigated the first language acquisition of Mongolian, it is an important field of study not only for increasing diversity in language acquisition but also increasing the diversity of sociocultural environments in our knowledge of language acquisition. A recent systematic review indicated that the field of language acquisition needs to be more diverse and there is a crucial need for empirical evidence from lesser-studied languages and cultures to develop a comprehensive theory of child language acquisition (Kidd & Garcia, 2022).

Mongolian, like other languages in the Altaic language family, is typologically agglutinative in structure and employs a vast array of inflections on the word, meaning that morphemes are easily identifiable and that a given morpheme has only one meaning. Mongolian allows up to 10 morphemes per word, and the average word length is around 4-5 morphemes (Unurbayan et al., 2022). The typical word order is SOV, and a modifier usually precedes the head it modifies. Moreover, Mongolian has the following features: vowel harmony, lack of tone, absence of genders, no definite articles, a nominative-accusative case system, and a very limited plural system. This study focuses on the Khalkha dialect of Mongolian which is spoken by the majority of the population (about 3 million native speakers) in outer Mongolia.

Although virtually all children in Mongolia learn Mongolian as their first language, there is a critical lack of tools to determine their level of language ability. The current study investigates how Mean Length of Utterance (MLU) and Moving-Average Type-Token Ratio (MATTR), two widely-used assessment measures in English and other languages, can be applied in Mongolian and how these measures differ in Mongolian-speaking rural and urban children aged 4;0-6;9. Particularly, we examined how MLU and MATTR in both words and morphemes for Mongolian child language samples, asking whether these tools are viable when calculated for both words and morphemes, and how MLU and MATTR measurements correlate with age within each community group.

Fifty-six (n=56) typically developing monolingual children participated in this study (36 rural and 20 urban). To facilitate comparison across the children, elicited narrative data was

collected using the “frog story” (Meyer, 1969), which has been used extensively in cross-linguistic research and across different populations to identify different linguistic strategies (Berman & Slobin, 1994). We found that the MLU and MATTR measures were strongly correlated with children’s age in the urban group, but not significantly correlated in the rural group. Further, rural children outperformed urban children on measures of MLU-w and MATTR-w. Finally, our results demonstrated that results calculated by words vs. morphemes are strongly correlated for both MLU and MATTR, as we hypothesized.

These findings imply that both utterance length and lexical diversity in Mongolian can be reliably measured in either words or morphemes and that the language development trajectory for Mongolian children may vary depending on their immediate socio-cultural context. These results contribute to expanding the diversity of the field of language acquisition, provide further evidence that MLU and MATTR can be used effectively in agglutinative and morphologically complex languages, and underline the importance of studying language development in varied social contexts. They are also valuable as a strong foundation for further studies in Mongolian acquisition for other populations and age ranges.

## 2.2. Uncovering cross-linguistic morphosyntactic transfer in second-language learning

In-person presentation (by Hartshorne)

Zoey Liu, University of Florida
Emily Prud'hommeaux, Boston College
Joshua Hartshorne, Boston College

Contact: joshua.hartshorne@bc.edu

Many learners find that the morphosyntax of their first language (L1) affects how they learn a second (L2). The reasons, mechanisms, and extent of such influence are debated. Prior studies indeed show complex patterns of both positive (facilitatory) and negative (inhibitory) transfer, varying by morphosyntactic phenomenon and language pair tested (MacWhinney, 1992). Unfortunately, such studies tend to focus on narrowly-defined phenomena in a handful of language pairs (cf. Mitchell et al., 2019), making it difficult to draw a clear picture regarding whether and which morphosyntactic features are consistently transferred independent of L1-L2 pair. The few larger-scale experiments mostly focus on character/lexical co-occurrence specific to the language pairs of interest (Malmasi & Dras, 2014).

This study addresses these limitations by using machine learning to identify consistent patterns of transfer (if any) in L2 morphosyntax across 13 L2s and 275 L1-L2 pairs. Transfer effects should allow one to distinguish L2 morphosyntax produced by speakers with different L1 backgrounds (Malmasi et al., 2017). Possible outcomes include: no linguistic feature consistently transfers (positively or negatively) across L1-L2 pairs; all linguistic features transfer in many/most cases; or only some aspects of morphosyntax transfer, such as early-learned or UG-implicated phenomena (Mitchell et al., 2019). We note that our focus on common patterns across languages means that we will necessarily miss unusual

interactions between specific L1-L2 pairs, which are better assessed in more targeted studies. Additionally, our method assesses transfer holistically and does not cleanly distinguish positive from negative transfer.

Data consisted of 117,163 essays written in L2s, compiled from published learner corpora. While demographics about the writers are minimal – limiting some kinds of analyses – the data set is rich in L1s and L2s. To determine whether we can detect consistent morphosyntactic transfer across L1-L2 language pairs, we used an automatic parser to identify part-of-speech (POS) tags and dependency relations, which are largely theory-neutral and can be automatically annotated (Berzak et al., 2014; De Marneffe et al., 2021; van der Goot et al., 2021). We then trained a ridge classifier to identify L1s from the patterns of 3-grams of POS tags and 3-grams of dependency relations in the combined data set. The model achieved much better performance than several different baselines (Tab. 1).

To study what morphosyntactic features are transferred from L1 to L2, we designed a rich set of hand-curated features at the raw text (e.g., the number of words), morphological (e.g., aspect of the verb), and syntactic (e.g., distribution of subordinate clauses) levels. These features were used for L1 classification, where the contribution of each feature was measured as the increase or decrease in classification performance (permutation-adjusted F1 score). The results demonstrated strong transfer effects for certain auxiliary/lexical verb morphological features; in contrast, the relative order of main and subordinate clauses and the average clausal length show little transfer.

We discuss the implications of our results for theories of L2 learning (Mitchell et al., 2019). We also discuss future directions, including potential methods for disentangling positive and negative transfer.

Table 1. Classification results for the ridge classifier, compared to three different “chance” baselines (majority, random, and stratified).

| Model | Precision | Recall | F1 |
|---|---|---|---|
| Majority | 0.01 | 0004 | 0.01 |
| Random | 0.08 | 0.01 | 0.02 |
| Stratified | 0.10 | 0.04 | 0.04 |
| Ridge | 0.41 | 0.41 | 0.41 |

# 2.3. A large-scale study of how accent exposure affects vocabulary development

In-person presentation

Helen Buckler, University of Nottingham
Priscilla Fung, University of Toronto
Elizabeth K. Johnson, University of Toronto

Contact: helen.buckler@nottingham.ac.uk

Lexical development in bilingual infants has been a hot topic of study in recent years (e.g., Costa & Sebastián-Gallés, 2014); much less attention, however, has been paid to acquisition in children routinely exposed to multiple varieties of their native language (see Johnson, 2018). Despite growing evidence that multi-accent exposure affects speech processing (e.g. Buckler et al., 2017), no large-scale study has examined the role of accent exposure in vocabulary development. The primary goal of this study is to investigate whether vocabulary development in monolingual children with exposure to multiple varieties of their native language look more like monolinguals with exposure to only one variety or bilinguals learning multiple languages.

Previous research indicates that quantity and quality of language input correlate positively with vocabulary development. Children who hear more words tend to have larger vocabularies (e.g., Song et al., 2014), as do children who hear a greater variety of words (e.g., Huttenlocher et al., 2010). There is also evidence that initially, bilingual infants and toddlers have smaller vocabularies in their respective languages than their monolingual peers (e.g., Hoff et al., 2012). This is unsurprising, given that the bilingual child's input is split between two languages.

It is possible that routine exposure to multiple accents may similarly slow vocabulary learning. Research has shown that infants routinely exposed to multiple accents process speech differently to those exposed to a single variant (e.g. Buckler et al., 2017) and this difficulty could extend to vocabulary learning. If a child learns the word "tomato" from their American mother, when their British father says "tomahto" the child may treat this as a new word. Failing to connect word forms in different accents would disrupt early vocabulary learning. Additional evidence for the potential effect of multi-accent exposure on vocabulary development comes from studies showing that children struggle to recognize word forms across accents until they near their second birthday (Best et al., 2009).

Here, we report the first large-scale study to examine the role of accent exposure in early vocabulary development in monolingual multi-accented children (N=824) between 11 and 34 months of age, comparing this to both monolingual mono-accented children (N=1353) and bilingual children (N=704). Accent and language exposure were assessed with a detailed questionnaire. Expressive vocabulary scores were assessed using age-appropriate MacArthur-Bates Communicative Development Inventory (CDI) forms (Words & Gestures: 11 to 18 months; Words & Sentences: 19 to 29 months; CDI-III: 30 months and above; Fenson et al., 1994). Because there is no single standardized test for our entire age range

and including three different tests in a single model was not possible, we performed separate analyses for the three CDI forms.

Taking all monolingual children together, as expected, monolingual children had higher vocabulary scores than bilingual children in both W&S ($\beta = 10.07$, SE = 1.09, $t = 9.27$, $p < .001$) and CDI-III ($\beta = 12.47$, SE = 2.11, $t = 5.92$, $p < .001$) indicating that bilingual toddlers had smaller English vocabulary size than their monolingual peers. However, this result is only found in older children (W&G $\beta = 0.02$, SE = 0.12, $t = 0.16$, $p = .87$) which could be due to a floor effect in the infants' small vocabularies. With regard to accent exposure, vocabulary scores of mono-accent and multi-accent monolingual children did not differ at any age, demonstrating that routine exposure to multiple accents did not affect monolingual children's vocabulary development.

This is the first study to demonstrate that routine exposure to multiple accents has no negative impact on children's early vocabulary development. When it comes to vocabulary development, monolingual children with exposure to multiple accents look more like mono-accented monolinguals than bilinguals.

## 2.4. Why do older children learn second languages faster than younger children?

In-person presentation

Wei Li, Boston College
Heesu Yun, Boston College,
Joshua Hartshorne, Boston College

Contact: liacz@bc.edu

As the number of bilinguals all over the world is increasing, understanding the impact of an individual's first language (L1) on acquiring a second language (L2) is crucial. Previous research indicates that the L1 can both facilitate and hinder L2 learning (Mitchell et al., 2019). Surprisingly, while adults are generally less successful at acquiring an L2, studies suggest that older children with more L1 knowledge actually learn L2s more quickly (Chan & Hartshorne, 2022; Mayberry & Kluender, 2018; Snow & Hoefnagel-Höhle, 1978). This may be because L1 proficiency supports L2 acquisition (Cummins, 1979) or due to positive transfer outweighing negative transfer.

In the most comprehensive study to date, Chan & Hartshorne (2022) investigated L2 English learning in international schools (as measured by standardized test scores), finding that older L2 learners did learn faster, but that this was specific to children whose L1 was more closely related to English. This suggests that the age effect is driven by positive transfer. However, the statistical results were weak and the measure of linguistic similarity, imprecise. Here, we double the size of the dataset, increase the diversity of L1s, and use more precise metrics of linguistic similarity (separate measures of phylogenetic, phonological, and morphosyntactic similarity; Littell et al., 2017).

Building on Chan & Hartshorne (2022), we investigated English standardized test scores of students at international English schools (1,071 students, 2,608 observations, 30 distinct L1s), with age of acquisition (AoA), English experience, and linguistic similarity as dependent variables. Replicating Chan & Hartshorne (2022), when controlling for duration of English study, students with a later AoA tend to have a higher proficiency score than the students with early AoA ($b = 9.45$, $p<.0001$), an effect that held for both oral skills ($b = 6.63$, $p<.0001$) and literacy skills ($b = 9.53$, $p <.0001$). Critically, there was an effect of linguistic similarity: the closer the phylogenetic relationship between their L1 and English, children with later AoAs learned more quickly ($b = -7.04$, $p<.05$). However, phonological similarity did not predict the age effect for oral scores ($b = 3.29$, $p=.46$), nor did morphosyntactic similarity predict the age effect for literacy scores ($b = -0.65$, $p=.067$).

To increase statistical power, we ran a secondary analysis that additionally considered students for whom we lacked AoA information, resulting in a total of 1,864 students, 4,758 observations, and 39 distinct L1s. The dependent variable is learning rate and we controlled for proficiency at test rather than AoA. Consistent with the above results, older children learned faster than younger children of the same proficiency level ($b=0.062$, $p<.0001$), an effect that held for oral and literacy subscores ($b = 0.048$, $b = 0.072$, respectively, $ps<.0001$). Again, this effect was larger when the L1 was phylogenetically closer to English ($b = -0.017$, $p<.001$). This time, we found that the age effect on oral scores increased with phonological similarity ($b = -0.021$, $p<.0001$) and the age effect on literacy scores increased with morphosyntactic similarity ($b = -0.018$, $p<.0001$). This suggests the lack of significance above was due to insufficient power.

This is the strongest confirmation to date that greater L1 proficiency leads to faster L2 acquisition, and that this is driven by positive transfer. The results also extend previous research: the positive transfer is not restricted to Mandarin (Pasquarella et al., 2011), Spanish (Anthony et al., 2009), or French (Sohail et al., 2022) native speakers, but rather extends across many L1s in proportion to the similarity between the L1 and English. We discuss potential limitations, such as the focus on L2 English and the lack of a precise measure of morphosyntactic knowledge. We also discuss how these findings could be reconciled with critical period effects.

# Session 3

## 3.1. Parallel forms and over-generalisation in 5-year-olds: A cross-linguistic study of morphological acquisition in Croatian and Estonian

In-person presentation

Virve Vihman, University of Tartu
Gordana Hržica, University of Zagreb
Mari Aigro, University of Tartu
Sara Košutar, University of Zagreb
Tomislava Bošnjak-Botica, Institute of Croatian Language and Linguistics

Contact: virve.vihman@ut.ee

In the course of language development, children are known to produce variable forms for a single target. These may be considered erroneous (e.g., omission of morphological marking) or overgeneralized (e.g. 'goed' pro 'went'), but the target language may also contain parallel acceptable forms. This phenomenon is known as overabundance (Thornton 2019): morphological paradigm cells which can be realised by more than a single lexical form, e.g. the word 'puddle' has parallel forms, which are both used by adults, in Croatian (lokva-nom.sg, lokava ~ lokva ~ lokvi for genitive.pl, Bošnjak Botica & Hržica, 2016) and in Estonian (e.g., loik-nom.sg, loikusid ~ loike for partitive.pl; Kaalep, 2010). To our knowledge, no studies have investigated how children acquire this sort of overabundance which is present in the system.

We report on an elicitation study which aimed to investigate how children navigate the parallel forms and whether overgeneralisations show similar patterns, directly comparing acquisition of this phenomenon in both Croatian and Estonian. Five-year-old children acquiring either language, both of which exhibit much overabundance, were tested on noun forms with and without overabundance in the target language. We used an identical design in both languages, with 60 test items (30 overabundant, 30 non-overabundant) and 60 fillers. The overabundant items are all attested with at least two different forms for plural in the target case (Croatian: genitive plural, Estonian: partitive plural) in the respective corpora for the target language.

We expected 5-year-old children, as a group, to produce two (or three, for Croatian) forms for overabundant nouns, i.e. to reproduce the variability attested in the adult language. We also expected children to produce multiple forms for non-overabundant nouns: i.e. that they would produce target-like forms as well as overgeneralized forms, leading to lower accuracy in non-overabundant lexemes.

We found effects of age, differences between item type (with significantly lower accuracy for overabundant than non-overabundant nouns in both languages, contrary to expectations) and language (with lower accuracy in Croatian than Estonian). We also found positive

effects of lexical cell frequency (in Estonian, but not Croatian) and class size (in both languages), and a negative effect of the presence of stem change in Estonian. We thus found effects of both the structure of the system and properties of the input, but not all effects were found across both languages. We will discuss the findings and their implications both methodologically and theoretically.

## 3.2. Morphological richness and cross-linguistic influence in bilingual acquisition

In-person presentation

Adele Vaks, University of Tartu
Virve Vihman, University of Tartu

Contact: adele.vaks@ut.ee

Studies investigating bilingual development often include language pairs in which one language is inflectionally impoverished, such as English, meaning that it may be difficult to assess whether errors of omission in morphological production arise from cross-linguistic influence or from gaps in the less developed system during bilingual acquisition (e.g. in heritage language acquisition or at early points of development; see, e.g. Van Dijk et al. 2022). To address this, it is necessary to include the acquisition of pairs of languages where rich morphology is attested in both target systems. Moreover, morphological errors are reported to be rare among monolingual children learning languages with rich morphology (Slobin 1985, Dressler 2010, Xanthos et al. 2011), yet errors are found, nevertheless, in elicitation studies, particularly with less frequent forms and less frequent lexemes (e.g. Räsänen et al. 2015, Granlund et al. 2019).

In this study we compare results from a sentence-repetition task (SRT) in Estonian conducted with bilingual children aged 5 to 7, acquiring Estonian and either Norwegian or Russian. The SRT was developed as part of a diagnostic tool for identifying developmental language disorder among bilingual pre-schoolers. In addition to a general SRT, we included items representing three constructions which differ across the three languages, in order to determine (a) whether the SRT is an appropriate tool for investigating cross-linguistic influence in bilingual development, and (b) whether the two groups differ significantly in their responses in Estonian, according to differences in their other language. The structures included for investigating cross-linguistic influence were dative experiencer constructions (which are similar in Estonian and Russian), copula constructions (similar in Estonian and Norwegian) and irrealis conditional constructions (in which both Russian and Norwegian differ from Estonian, as neither of them marks conditionals with distinct morphology, as Estonian does).

We tested 19 Estonian-Norwegian children aged 5;0-7;11 (mean 78 months) and 20 Russian-Estonian children aged 5;5-6;11 (mean 73 months). The groups were matched for language dominance according to a parental survey. Quantitative analysis of the results indicates that the two groups did not differ significantly in accuracy according to our hypotheses based on cross-linguistic influence. However, the Norwegian group performed

somewhat better on the conditional constructions, in which we expected both groups to perform similarly, as neither language shares the conditional construction with Estonian. Qualitative error analysis reveals some differences in how the two groups manage this challenging construction, which may stem from cross-linguistic influence. We provide an analysis of the results, as well as reasons for why this task may not be appropriate for eliciting the cross-linguistic influence we expected to find.

## 3.3. The influence of cognate status on bilingual infants' early receptive vocabulary: A cross-linguistic CDI study

In-person presentation (by Skoruppa)

Salomé Schwob, Université de Neuchâtel
Amandine Ballestraz, Université de Neuchâtel,
Letizia Volpin, Université de Neuchâtel
Katrin Skoruppa, Université de Neuchâtel

Contact: salome.schwob@unine.ch

Over the last decades, research has shown that simultaneous bilingual children's early vocabulary does not develop independently nor complementarily, 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). Furthermore, "cognates", phonologically similar forms denoting such mutual concepts, are known to facilitate bilinguals' lexical access from toddlerhood (Van Holzen et al. 2019). Recent work suggests that cognate status also boosts lexical learning very early on: Toddlers learning phonologically very similar languages which contain 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 from age 16 months (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 their knowledge of word form pairs, while tracing the acquisition of translation equivalents in bilinguals exposed to different languages. We hypothesize that we will find a stronger association between the knowledge of word forms in both languages for pairs that are phonologically similar in the particular two languages an individual child is learning, yielding potentially strong evidence for a specific cognate effect.

As part of a larger study, we designed a web-based vocabulary development questionnaire in French, English, (Swiss) German, Italian, Portuguese and Spanish, collecting 463 translation equivalents (e.g. box-boîte-Dose-scatola-caixa-caja) from individual language CDI forms, using Wordbank (Frank et al. 2021). So far, parents/ caregivers of 20 twelve-month-olds exposed to French and one other of the other languages filled in two language versions of this questionnaire independently, indicating if their child understood each word. In order to test for the influence of phonological similarity, we assigned each word pair a phonological overlap score in each language, using Kohnert et al.s (2004) Cross-Linguistic

Overlap Scale for Phonology (scale from 1-10, rating overlap in initial sounds, number of syllables, individual consonants and vowels).

Descriptive analyses (on all word pairs across participants, n=8778) confirm that translation equivalents are present in early receptive vocabulary: While most word pairs were still unknown (82,1%), 5,5% were understood in both languages, compared to 12,4 % in one language only.

We then ran a mixed logistic regression model with random effects for participants and items, aiming to predict understanding of each word in French from the fixed effects a) understanding of the word in the child's other language and b) phonological overlap between the word forms, as well as their interaction. We found a significant effect of understanding in the other language ($p < .001$) and a significant interaction with phonological similarity ($p < .001$), whilst the main effect of phonological overlap was not significant ($p = .10$). These results show that there is indeed a specific cognate boost on the item level in comprehension, that is, that bilingual children's understanding of a particular word form in one language is influenced by their knowledge of a phonological similar word form in the other language.

We are currently computing interrater reliability for the phonological overlap score and collecting data from the same children at 18 months (receptive and productive vocabulary). This will enable us to evaluate the influence of phonological similarity on lexical growth. In our larger longitudinal model, we will also assess the role of 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.

## O3.4. The words from children to children: A study of the linguistic environment of children from diverse sociocultural groups in Argentina

Online presentation

Florencia Alam, National Council of Scientific and Technical Research (CIIPME-CONICET)
Celia Renata Rosemberg, CIIPME-CONICET
Leandro Garber, CIIPME-CONICET
Pablo Amdem, CIIPME-CONICET

Contact: florenciaalam@gmail.com

A series of studies from the last few decades has shown that during the first years of life the characteristics of the at-home linguistic environment have a significant impact on young children's language acquisition (Fernald, Marchman & Weisleder, 2013). Despite the fact that different studies have indicated that children from different social groups and cultures tend to spend several hours a day with their siblings (Oshima-Takane, Goodz & Derevensky, 1996), most studies analyzing the linguistic environment of children under 2 years of age have focused on the mother's speech production in dyadic interactions (Hoff, 2003; Rowe,

2012). In particular, research conducted with indigenous and rural populations has shown that older children perform caregiving and socialization tasks for young children (Maynard, 2002) and that young children's interactions are in fact not dyadic but involve multiple participants of various ages (Ochs & Schieffelin 1984; De León 1998). Only a few recent works have addressed the extent to which the language produced by children of different ages contributes to shaping the at-home linguistic environment of young children. Results showed that children from rural and indigenous communities hear more speech from other children than their peers of urban residential families (Loukatou et al., 2022; Scheinedman & Goldin-Meadow, 2012). However these studies were carried out between extreme groups (urban-middle income vs indigenous rural communities) from different countries. This work aims to analyze the linguistic environment in the households of a socioeconomically and socioculturally diverse sample of Argentinian children (up to 4 years old), considering the proportion of speech they heard from other children (until 12 years old), and its quantitative and some qualitative characteristics (the quantity and diversity of words and the amount of questions addressed to the child and overheard). The corpus (Rosemberg et al., 2015, 2018, 2022) comprises audio recordings of spontaneous speech from 46 children living in residential urban areas, 16 children from urban marginalized areas, 21 children from indigenous marginalized communities in semi urban areas. Three recordings of 4 hours of each child's linguistic environment were carried out over the course of one year (984 total hours of recordings) starting at 14 months. The 2 middle hours of the recordings of 43 children (9 from indigenous marginalized communities in semi urban areas, 12 from urban marginalized areas, and 22 from urban residential households) were transcribed in CHAT, and analysis of quantity and diversity of words and amount of questions addressed to the child and overheard were carried out with CLAN program (MacWhinney, 2000). Transcriptions were only made for 28% of the corpus as they demand a great amount of human and economic resources, so in order to analyze the proportion of speech children hear from other children in the 984 hours of recordings we employ a pre-trained diarization model that, given an audio recording, classifies each frame into the type of speaker (adult male, adult female and child) (Lavechin et al., 2020). Beta regressions were used to test differences between the groups. Results show that children from impoverished indigenous communities in semi rural areas hear more amount of speech (automatic diarization analysis), quantity and diversity of words, and more amount of questions (manual analysis over the transcriptions), both addressed to them and overheard from other children than their peers from the other socio-cultural groups. Preliminary findings on longitudinal variations show a similar pattern. These findings contribute to the description of the linguistic characteristics to which children of different socio-cultural groups are exposed.

# Symposium in honour of Anne Cutler

## S.1. Understanding infants' preference for infant-directed speech through large scale collaborative science

Melanie Soderstrom, University of Manitoba

Contact: M.Soderstrom@umanitoba.ca

A robust literature supports the importance of infant-directed speech (IDS) in infant language development (e.g. Soderstrom 2007; Golinkoff et al., 2015; Cristia, 2013 for reviews). However, like most areas of language development, research on IDS has historically been limited by small sample sizes (Frank et al., 2017) and samples biased in terms of geography and language (Kidd & Garcia, 2022). In this talk I will discuss ManyBabies 1, a first attempt to study infant preference for IDS using a large scale, globally diverse sample of infants, and its various follow-on studies. While the overall findings confirm the presence of a preference for IDS, factors such as language experience and infant age influence this preference. Moreover, studies of test-retest reliability and later vocabulary measures raise questions about the predictive value of this preference as measured in the laboratory. I will explore the implications of these findings, and end with a brief discussion of the need for further diversification of samples.

## S.2. At the interface of phonology and the lexicon: A crosslinguistic Cantonese/French comparison

Thierry Nazzi, CNRS - Université Paris Cité

Contact: thierry.nazzi@parisdescartes.fr

Since the seminal work by Stager and Werker (1997), many studies have explored the use of phonological detail during word learning in infants and toddlers. In this crosslinguistic project, we compared Cantonese- and French-learning toddlers on their sensitivity to consonant, vowel and tone information while learning new words in Cantonese. In a first experiment, we presented infants with pairs of wordS differing only by a consonant, a vowel or a tone. Cantonese-learning 30-month-olds (but not 24-month-olds) only learned in the vowel condition, establishing a vowel bias. French-learning infants failed in all conditions. In a second experiment, we presented infants with pairs of word differing in both consonants and vowels. In the learning phase, each word was either presented with a single tone (control condition), or with three different tones (interference condition). Overall, toddlers could learn the words, although the effect was only significant in the control condition. These results establish word learning even in an unknown language, highlighting powerful word learning abilities. Regarding tone sensitivity, we argue that it is comes from different levels in the two populations, the phonological level for Cantonese-learning toddlers, the acoustic level in French-learning toddlers, bringing new data on the complex link between sound processing and lexical learning.

# S.3. Pitch processing in Japanese and Dutch infants: Same or different?

Claartje Levelt, Leiden University

Contact: C.C.Levelt@hum.leidenuniv.nl

In a vintage *Native Listening* study, Sato, Sogabe and Mazuka (2010) showed that in Japanese 10-month-olds, hemispheric specialization had taken place for the processing of pitch accent; the bilateral processing that had been found in 4-month-olds had changed to a left-hemisphere dominance in the 10-month-olds. Pitch accent is typical for Japanese and the idea was that Japanese infants, at some point between 4- and 10-months old, had discovered that tone was being used lexically (i.e. linguistically) in their L1, triggering the lateralization to the left hemisphere when lexical tones, but not pure tones, were processed. This raises the question whether this hemispheric specialization would, then, not take place in infants with linguistic input lacking lexical tone, like Dutch. In a Japanese-Dutch collaboration, 4- and 10-months-old Japanese and Dutch infants were tested on novel stimuli to try and answer this question.

# Day 2

## Invited talk 1: The neural basis of early speech perception in hearing and deaf/hard-of-hearing infants

Judit Gervain, Università degli Studi di Padova

Contact: judit.gervain@unipd.it

This talk will give an overview of several lines of research investigating the neural mechanisms underlying basic auditory and speech perception in typically developing infants as well as in deaf / hard-of-hearing and cochlear implanted infants. In particular, a NIRS-EEG co-recording studies will be presented testing how typical newborn infants process stimuli simulating those produced by a cochlear implant. Further, NIRS studies will be discussed assessing how 0-10-month-old hearing impaired infants and 12-24-month-old cochlear implanted infants recognize the human voice or discriminate their native language from a rhythmically different unfamiliar language, two foundational abilities for acquiring spoken language. Some of the studies are still ongoing, but preliminary results suggest that residual hearing in these groups of infants may be sufficient to successfully perform these basic auditory tasks, and may thus serve as a foundation for further language development, rehabilitation and speech therapy.

# Session 4

## 4.1. Infants' neural tracking of rhythm in spoken nursery rhymes relates to their vocabulary size

In-person presentation

Laura E. Hahn, Charité – Universitätsmedizin Berlin and Radboud University
Tineke M. Snijders, Tilburg University, Max Planck Institute for Psycholinguistics and Radboud University

Contact: laura.hahn@charite.de

Neural tracking of the low frequency amplitude envelope of speech is hypothesised to be crucial for language processing and development. This study explored to what extent infants' rhyme perception and neural tracking of spoken nursery rhymes is modulated by top-down and bottom-up processing factors, namely vocabulary size and regular speech rhythm. Dutch 10.5-month-old infants listened to naturalistic rhyming and non-rhyming nursery

rhymes that either had a salient 1.5 Hz stress rhythm (rhythmic nursery rhymes) or deviated in one syllable to disrupt the rhythmic pattern (non-rhythmic nursery rhymes). Neural tracking was defined as the coherence between the speech amplitude envelope and the EEG signal (speech-brain coherence), assessing both stress (1.5 Hz) and syllable (3 Hz) rates. In addition, infants' ERPs for rhyming and non-rhyming pseudowords at the end of each nursery rhyme line were compared for more versus less rhythmic nursery rhymes. Neural tracking was found for the stress rate as well as for the syllable rate of the nursery rhymes, for both rhythm conditions. At the syllable rate, neural tracking was higher for non-rhythmic nursery rhymes. Improved syllable tracking of non-rhythmic nursery rhymes might reflect infants' maturing auditory processing abilities in dealing with non-isochronous everyday speech. Syllable rate tracking was negatively correlated with concurrent vocabulary, but positively correlated with future vocabulary, suggesting a developmental change in infants' auditory processing focus as their lexicons increase. ERPs for rhyming line-final pseudowords in the nursery rhymes resembled previous research for rhyming songs (Hahn et al., 2021). Yet their relationship with speech rhythm, neural tracking and lexical development raise questions for further research. These results indicate interactive effects of bottom-up acoustic stimulus features (here speech rhythm) and top-down linguistic processing abilities (here vocabulary size) on infants' neural tracking of speech, furthering our understanding on low frequency speech tracking during the development of lexical and phonological representations.

**References**

Hahn, L. E., Benders, T., Fikkert, P., & Snijders, T. M. (2021). Infants' implicit rhyme perception in child songs and its relationship with vocabulary. *Frontiers in Psychology*, *12*(680882), 1–8.

## 4.2. Attention towards speaker's visual cues during word learning in children with hearing loss: A pilot study

In-person presentation

Beatriz de Diego-Lázaro, University of Barcelona
Elisa Marrodan, University of Barcelona
Laura Bosch, University of Barcelona

Contact: bdediego@ub.edu

Children with hearing loss (HL) show great variability in speech and language outcomes. While some children achieve age-appropriate speech and language outcomes after receiving early intervention, about 30% of children do not (Bruijnzeel et al., 2016; Manrique, et al., 2019). A possible factor to explain this variability in addition to demographic factors might be children's ability to integrate multisensory (auditory and visual) information during language learning. The purpose of this study was to examine the attention towards a speaker's visual information (eye gaze to eyes and mouth) by children with and without HL during a word-learning experiment, and whether visual patterns during this task correlate with vocabulary measures. We hypothesised that if focusing on visual cues facilitates speech processing, then children would learn more words under conditions where visual

cues are accessible. We expected that children would look longer at the speaker's mouth and eyes when learning words in noisy conditions, especially children with HL.

Participants were 11 children with normal hearing (NH; M=5.6 years, SD=1) 4 deaf children (M=6.5 years, SD=1.3), cochlear implant users, and 4 hard of hearing (HH) children (M=6 years, SD=1,3), hearing aid users. All participants were growing up in a bilingual Catalan-Spanish environment and received amplification before 12 months. Children completed a hearing screening, expressive vocabulary tests, and an eye-tracking word-learning experimental task where 8 words were presented in four conditions: audiovisual quiet, audiovisual noise, audio quiet, and audio noise. During the audio conditions, the speaker's mouth was covered with a black square.

We ran linear mixed models with random intercepts to examine differences in word-learning accuracy and eye fixation time by hearing status (NH, HH, and deaf) and learning condition (audiovisual quiet, audiovisual noise, audio quiet, and audio noise). For fixation time, we added area of interest (eyes, mouth, and object) as a fixed-effect factor to our model. Our preliminary results for accuracy showed no differences by hearing status, but a significant effect of learning condition, ($F(3, 48) = 3.26$, $p = .02$), indicating that children learned more words in the audiovisual quiet than in the audiovisual noise condition. Interestingly, our results for fixation time showed a significant interaction between hearing status, learning condition, and area of interest ($F(12, 857) = 2.17$, $p = .01$). Follow-up pairwise analyses revealed children with HL (HH and deaf) looked longer at the mouth in audiovisual conditions than NH children, especially in noise. No differences were observed in object fixation time except in the audiovisual noise condition, probably because children with HL devoted more time to look at the speaker's mouth. No differences were observed between HH and deaf children in fixation time in any of the conditions. Finally, correlation analyses revealed significant negative correlations between fixation time to the mouth, word-learning accuracy, and vocabulary measures, indicating that children who looked longer to the mouth showed lower word-learning and vocabulary scores.

These results suggest that, despite not observing significant differences in static vocabulary measures, children with HL might pay attention to visual cues differently from NH children during dynamic word-learning tasks. Their visual patterns, particularly fixation time to the speaker's mouth, seems to be related to vocabulary learning skills. One interpretation of this result is that children with HL might rely more on lip reading to complement their auditory degraded input, especially in noisy conditions. Ongoing research with a larger sample might confirm current results. Future studies could investigate visual patterns during language learning in conjunction with brain processing measures to provide a more complete view of how HL might impact learning.

# 4.3. Do visual speech cues facilitate ten-month-old infants' neural tracking of speech?

In-person presentation

Melis Çetinçelik, Max Planck Institute for Psycholinguistics
Antonia Jordan-Barros, Max Planck Institute for Psycholinguistics and University College London
Caroline F. Rowland, Max Planck Institute for Psycholinguistics and Radboud University
Tineke M. Snijders, Max Planck Institute for Psycholinguistics, Radboud University and Tilburg University

Contact: melis.cetincelik@mpi.nl

In face-to-face interactions with their caregivers, infants receive multimodal language input from both the auditory speech signal as well as the speaker's face, which provides visual speech cues through the rhythmic articulatory movement of the lips, mouth and jaw. Previous research has shown that visual speech cues may facilitate speech perception in adult listeners, especially in noisy or challenging conditions (Bernstein et al, 2004; Crosse et al., 2015; Grant & Seitz, 2000). Visual speech cues also modify infants' speech perception and word segmentation from continuous speech (Tan et al., 2022; Teinonen et al., 2008), and infants between 6-12 months may be especially sensitive to these cues as they attend more to the mouth of a speaker's face than the eyes (Lewkowicz & Hansen-Tift, 2012). One mechanism that is argued to play a key role in speech processing in both adult and infant listeners is neural tracking of speech, that is, the phase-locking of cortical oscillations to the amplitude envelope of the speech at multiple frequencies corresponding to the stress, syllable and phrasal units in speech. Neural tracking of speech may be a neural mechanism underlying early language development, such that infants use the temporal regularities in speech such as stress patterns and syllables for effective speech processing and word segmentation. Importantly, during audiovisual speech perception, visual speech cues provide information about the amplitude envelope of the speech signal, especially at the syllable rate, given the close temporal correspondence between the opening and closing of the lips and the acoustic envelope at the syllable frequency range (Chandrasekaran et al., 2009). Thus, exposure to the visual and auditory input simultaneously during speech perception may aid speech processing by enhancing neural tracking of speech, particularly at the syllable rate (Peelle & Sommers, 2015). The current study investigated whether visual speech cues facilitate infants' speech processing, indexed by their neural tracking of speech. 32-channel EEG data was recorded from 10-month-old Dutch-learning infants while they watched videos of a native Dutch speaker reciting passages in infant-directed speech. Half of the videos displayed the full face of the speaker (Audiovisual [AV] condition), while in the other half, the speaker's mouth and jaw were masked with a static block, obstructing the visual speech cues (Block condition). We analysed infants' neural tracking of speech, measured by speech-brain coherence (SBC), focusing in particular at the stress and syllable rates (1-1.75 and 2.5-3.5 Hz respectively in our stimuli), as amplitude modulations are especially marked in these frequencies in infant-directed speech (Leong & Goswami, 2015), and therefore they may serve as important cues for neural tracking. To investigate whether infants show neural tracking of speech, we ran cluster-based permutation analyses at the stress and syllable rates by comparing real SBC to surrogate data, created by randomly

pairing the speech envelope with the EEG data. Then, we tested for differences in infants' SBC in the AV and Block conditions with cluster-based permutation at the frequencies of interest. Our preliminary results (N = 34) indicate that infants tracked the speech signal at both the stress and syllable rates at all electrode sites (cluster p's = .002). However, we identified no differences between the audiovisual vs. blocked conditions (p's > .05), meaning that infants likely tracked the speech signal equally well when speech cues were present or masked. Our results have important and timely implications for our understanding of both speech processing and language development, as they suggest that infants' speech perception is not necessarily impaired when visual speech cues are occluded, such as when they are listening to a speaker wearing a facemask.

## 4.4. The role of pitch contour shape in expressing social purpose in infant babbling

In-person presentation

Elanie van Niekerk, Utrecht University
Caroline Junge, Utrecht University
Aoju Chen, Utrecht University

Contact: e.a.vanniekerk@uu.nl

Evidence suggests that preverbal infants systematically vary the intonation patterns of their vocalisations dependent on its social purpose. For example, English-acquiring and Catalan-acquiring infants aged 7-11 months produced vocalisations directed at a communicative partner ('communicative purpose') with a broader pitch span and shorter duration, compared to vocalisations not aimed at a communicative partner ('non-communicative purpose'). This was demonstrated by analysing pitch as scalar and static values (e.g., mean pitch). Since pitch is a dynamic and continuous variable, the current study extends previous analyses by asking whether infants also modulate pitch contour shape to express communicative versus non-communicative purposes in babbling.

We hypothesised that the shape of pitch contours differs between vocalisations serving communicative versus non-communicative purposes, in line with Flax et al. (1991) and D'Odorico & Franco (1991) on the systematic use of contour shapes in social contexts. We predicted that communicative vocalisations would entail steeper and more convex slopes that tend to rise, whereas non-communicative vocalisations will entail flatter and more concave slopes that tend to fall. Furthermore, we expected a developmental trend such that as infants mature and develop the ability to signal more varied social purposes, there would be increased differentiation within this broad trend.

A pre-existing, longitudinal corpus from four Catalan-acquiring infants (Esteve-Gibert & Prieto, 2012) was used to address our research question. The corpus was collected during weekly 30-minute free-play caregiver-infant interactions at their homes between ages 0;7 and 0;11. Vocalisations were annotated for social purpose using the codes 'communicative', 'non-communicative' and 'not clear'. From this corpus, 500 vocalisations that equally represent two age groups (0;7, 0;9), three participants (two male, one female), and two social purposes (communicative, non-communicative) were semi-randomly selected for the

current purpose. A functional principal component analysis (Gubian et al., (2015), which captures pitch variation as contours that are represented by continuous functions, was done using the 'Automatic Annotation of Speech Prosody' tool (Hu et al., 2020). Two Functional Principal Components (FPC) were analysed, with FPC1 altering the slope of the contour by making it more/less steep and FPC2 altering the contour to be more convex/concave. Separate linear mixed-effects models were constructed for two outcome variables (FPC1, FPC2) using the 'lme4' package in R. The models were built in a forward stepwise fashion and the ANOVA function was used to compare models. The best-fitting models for both PC1 and PC2 contained age (0;7, 0;9) and social purpose (communicative, non-communicative) as fixed factors,  and speaker as a random factor with a random slope for social purpose.

The FPCA revealed that PC1 explains μ =76% of the variance in pitch contour shape with positive values causing a terminal fall and negative values, a terminal rise. PC2 explains μ=17,2% of the variance with positive values making the terminal contour more concave, and negative values making the terminal contour more convex. Statistical analysis revealed no main effect of social purpose on PC1 ($p=0.25$) or PC2 ($p=0.32$). A highly significant main effect of age on PC1 ($p<0.001$) and PC2 ($p<0.001$) was however found. No interaction effect between social purpose and age was found.

Our study did not yield evidence for a role of pitch contour shape in expression of social purpose in babbling. But we have found that infants tend to produce a more rising-like contour in general at an older age, suggesting better control of pitch production. In future research, we will expand this analysis to the age of 11 months to shed further light on possible developmental changes.

# Session 5

## 5.1. Stepping into the shoes of young children with Down syndrome: Understanding sensorimotor patterns of parent-child interaction during word learning

In-person presentation

Hana D'Souza, Cardiff University
Kate Mee, Cardiff University
Catalina Suarez-Rivera, New York University and University College London
Chen Yu, The University of Texas at Austin

Contact: dsouzah@cardiff.ac.uk

A lot of our knowledge about how young neurodiverse children develop language currently comes from screen-based tasks, standardized tests, or parental reports. Less is known about children's everyday learning experiences, where parent-child interaction is at the core. During this free-flowing activity, parents direct or react to their child, while their child—who is

often surrounded by interesting objects and in pursuit of their own goals—directs, reacts to, or ignores the activity of their parent. What sensorimotor patterns (e.g., looking, object handling, speech) define this rich context? In order to understand this, we need to step into children's shoes and experience the world as they do. Recent technological advancements allow us to do this by enabling us to transition from traditional screen-based eye-trackers to head-mounted eye-trackers/cameras. This technology has already provided us with insights into the dynamic interplay between various components of parent-child interaction in typically developing children, challenging fundamental assumptions about the sensorimotor properties of language development (e.g., how much the child looks at faces). However, much less is known about neurodiverse children. This is the first study to use the same technology with young children with Down syndrome and their parents. Down syndrome is the most common known genetic cause of neurodevelopmental disorder, with an incidence of approximately 1 in 1000 live births. As a group, young children with Down syndrome show persistent weaknesses and atypicalities in attentional and motor abilities as well as language outcomes, yet this is accompanied by large variability. This variability provides an opportunity to tease apart the effects of different domains on everyday learning opportunities.

Fifteen children with Down syndrome aged 3-5 years, and 15 typically developing children matched on ability level, took part in this head-mounted eye-tracking study of parent-child interaction with novel objects and their labels. The children were then tested on their learning of the labels after the interaction. Their parents reported on the children's receptive and expressive vocabularies (Communicative Development Inventory [CDI]). Furthermore, an experimenter-led standardized developmental assessment (Mullen Scales of Early Learning [MSEL]) was administered to the children to test their ability level across five domains: gross motor, fine motor, visual reception, receptive language, and expressive language.
The interaction data was coded frame-by-frame and analysed for looking behaviours, object handling, and parental speech. The sensorimotor properties of these interactions will be discussed in the context of the strengths and difficulties young children with Down syndrome experience, as well as large individual differences we observe. We hope that this research will inform our theories of language development in both typical and neurodiverse children as well as provide insights for parents and practitioners into how to better support young children with Down syndrome.

## 5.2. Comparing language input in homes of blind and sighted children: Insights from daylong recordings

In-person presentation

Erin Campbell, Duke University & Boston University
Lillianna Righter, Duke University & Harvard University
Eugenia Lukin, Duke University & Harvard University
Elika Bergelson, Duke University & Harvard University

Contact: eecamp@bu.edu

Early word learning is often described as tracking perceptually-grounded word–referent co-occurrences, i.e. seeing referents while hearing labels (Yu & Smith, 2012). Given that blind language learners cannot see words' referents but ultimately attain comparable language fluency to sighted adults (Loiotile et al., 2020; Roder et al., 2003), we asked whether their parents adapt their language input to (potentially) support this process. Might they provide more speech or interaction to supplement verbal descriptions in the absence of vision, or simplify their utterances like other caregivers of disabled children (Dirks et al., 2020; Lorang et al., 2020)?

We analyzed language environments of 15 blind children and 15 demographically- and age-matched sighted children (6–30mo.; M:16mo.) using daylong audio recordings. We derived nine language input measures across four categories: quantity, interactiveness, linguistic complexity, and conceptual features, which we compared across our blind and sighted groups (accounting for data distribution and multiple comparisons). Two measures were from automated LENA output, based on entire daylong recordings (~28000min. total): adult word count (quantity) and conversational turn count (interactiveness). The other seven were derived from 40min. of human annotation per daylong recording (1200min. total): manual word count (quantity), proportion of child-directed speech (interactiveness); type-token ratio and mean length of utterance (linguistic complexity); and proportion of temporally-displaced verbs (past/future/hypothetical), Child Body-Object Interaction ratings, and proportion of words that are highly visual (conceptual features).

We found three key results. First, blind and sighted children heard statistically indistinguishable input for all measures of quantity and interactiveness (all corrected p-values>.05). Second, in contrast, input differed significantly for both linguistic complexity measures and 2/3 conceptual measures: blind children were exposed to longer utterances ($t(15)=2.51$, $p=.039$), higher type-token ratios ($t(15)=2.25$, $p=.039$), more temporally-displaced verbs ($W=36.50$, $p=.022$), and more words rated lower on Child Body-Object Interaction ($D=0.98$, $p<.001$). Finally, for the 3rd conceptual measure, we found that blind and sighted children heard statistically indistinguishable quantities of highly visual words (10% of both groups' input; $t(25.11)=0.32$, $p=.632$); notably, for blind children, these words' referents are imperceptible.

These results suggest that overall, parents of blind and sighted children talk and interact just as much in their everyday home language environments. However, rather than simplified input, we found that language input to blind children was characterized by more complex speech and less focus on children's here-and-now: longer utterances, more utterances about past/future/hypothetical events, more words with non-interactive referents (i.e. lower Child-Body-Object interaction ratings), similar rates of 'highly visual' words whose referents they cannot see). As well-established by prior work (Gleitman & Gleitman, 1992; Gleitman et al 2005), young children (sighted or blind) leverage language to learn language. By providing more complex input, parents of blind children may be (deliberately or not) helping their children on their path to language.

# 5.3. Recognition of dialectal word-forms in bivarietal children

In-person presentation

Sarah Warchhold, University of Konstanz
Anja Gampe, University of Duisburg-Essen
Katharina Zahner-Ritter, University of Trier
Bettina Braun, University of Konstanz

Contact: sarah.warchhold@uni-konstanz.de

Diverse linguistic environments not only include multiple languages but also multiple varieties of a language. Germany is characterised by a range of different dialects that differ in syntax, lexicon, morphology and phonology (e.g., Kehrein, Lameli & Rabanus 2015). In many rural parts of Germany, dialects are used for daily communication, along with Standard German which is present in the media and through reading. Bivarietal children, who grow up with more than one variety of German, encounter different but phonologically closely related word forms (e.g., Standard German [fuːs] foot vs. Alemannic [fu͡əs]). We assess the nature of the lexical representations in bivarietal children for which different options have been discussed: Using the intermodal preferential looking paradigm, Floccia, Delle Luche, Durrant, Butler & Goslin (2012) showed that 20-month-old Welsh bivarietal children only recognized words spoken with a rhotic accent (independent of their parents' variety), suggesting storage of (or access to) one form only. Durrant, Delle Luche, Cattani & Floccia (2015) showed that 20-month old English bivarietal children recognized words despite mispronunciations, suggesting underspecified representations. Van der Feest & Johnson (2016) showed that 24-month-old Dutch bivarietal children flexibly adapted to the speaker. Using the familiar word paradigm, Kartushina & Mayor (2023) found no evidence of recognition of word forms in Norwegian bivarietal 12-month-olds although children in this age range typically show a familiarity preference (Carbajal, Peperkamp & Tsuji 2021).

Previous research replicated the familiar-word preference for monovarietal 12-18-month-olds (growing up with Standard German) when listening to Standard German stimuli in an experiment-controlled visual fixation procedure implemented in an App (Braun, Czeke, Rimpler, Zinn, Probst, Goldlücke, Kretschmer & Zahner-Ritter 2021). Bivarietal German children of the same age range (growing up with a dialect in addition to Standard German) also recognized the Standard German word forms, but exhibited a novelty preference. Since both groups show a looking-time difference, there is no evidence of a developmental delay in bivarietal German 12-18-month-olds relative to their monovarietal peers. The novelty preference in bivarietal children was instead interpreted as resulting from mature linguistic processing and/or more robust lexical representations (cf. DePaolis, Keren-Portnoy & Vihman 2016), a hypothesis that was strengthened by a novelty preference in an older group of 18-24-month-old monovarietal children.

In the present study, we tested whether German bivarietal children also recognize dialectal word forms and predicted that they would also exhibit a novelty preference. We recorded the stimuli of Braun et al. (2021) anew with a Swabian speaker (matching recordings for pitch range and perceived speaker affect). So far, we tested twenty 12-19-month-olds in rural Alemannic areas (based on zip codes). A linear regression model with wordtype, block, and

age as fixed effects revealed a significant effect of wordtype only (ß=-1253.38, SE=475.16, t=-2.64, p<0.01, Hedge's g = -0.27). Children looked on average 1.3 s longer to the nonce-word lists than to the word lists. The replication of the novelty preference further strengthens the hypothesis that bivarietal children have developed more robust lexical representations, probably owing to frequent exposure to related word forms for the same concept. The effect size is slightly smaller than for Standard German stimuli (Hedge's g -0.34), which may be caused by variable distances between the variety spoken at home and the dialect of the speaker of the experiment. In the future, we will (a) include a control group of age-matched monovarietal Standard children and (b) test mispronunciations (e.g. [foːs] instead of [fuːs] (Standard) and [fu͡əs] (Alemannic) to determine the specificity of these lexical representations.

# Session 6

## O6.1. Vocal maturity predicts adult responsiveness in a Tseltal Mayan community

Online presentation

Yuchen Jin, University of Chicago
Juan Méndez Girón, Centro de Investigación y Estudios Superiores en Antropología Social Sureste
Gilles Polian, Centro de Investigación y Estudios Superiores en Antropología Social Sureste
Kennedy Casey, University of Chicago
Marisa Casillas, University of Chicago

Contact: yuchenjin@uchicago.edu

US caregivers are more responsive to infants' language-like vocalizations than non-language-like vocalizations (e.g., canonical babble and words > non-canonical babble) (Albert, Schwade & Goldstein, 2018; Snow, 1977). These contingent responses draw children in as active conversational contributors, even before they begin to speak, and reflect culturally marked modes of caregiver-infant interaction that are unlikely to be universal (Gaskins, 2006; Ochs & Kremer-Sadlik, 2020). For example, under ethnographic accounts of Mayan language socialization, children are brought into the adult social world first as side participants before gaining rights as ratified interlocutors—a status achieved once they become recognizable as competent speakers (de Leon, 2011; Brown, 2014). Here, we ask: what features of Tseltal children's early speech drive their recognizability as potential interlocutors? Based on prior ethnographic work (de Leon, 2011; Brown, 2014), we hypothesized that Tseltal caregivers would respond most frequently to children's lexical speech, relative to canonical and non-canonical vocalizations, and that this effect would grow stronger between birth and age two.

Method. We randomly sampled 9 five-minute clips from 32 daylong audio recordings of Tseltal children (mean=10 months; median=8; range=2–24), which were transcribed by a

native Tseltal speaker. Transcription included all target-child-produced and target-child-directed linguistic vocalizations (i.e., words and babble; not cries, laughs, or vegetative sounds). Each child vocalization was classified into a vocal maturity category: non-canonical (and non-lexical), canonical (and non-lexical), or lexical (Casillas et al., 2017).

Results. A quality control check promisingly revealed that children's vocal maturity trajectories match those from a comprehensively-checked subset of this corpus (Casillas, Brown & Levinson, 2020) and coarsely-defined language development milestones from middle-class Western children (Fig.1A) (Kuhl, 2004). Per minute, we observed an average of 2.1 target-child-produced (range=0–24) and 0.5 target-child-directed vocalizations (range=0–8.6). Contingent adult responses were rare (10% of all child vocalizations received responses) but often immediate (gap<2s) when present (49.3% of all child-directed vocalizations).

We used a logistic regression to predict whether a child's vocalization received a response, given vocalization maturity (non-canonical/canonical/lexical), child age (months), and their interaction, with by-child random intercepts. We controlled for whether the conversational turn sequence was initiated by the child or an adult, considering the latter more reliably elicits adult response (Hoff-Ginsberg, 1987; Warlaumont et al., 2014).

Adults were more likely to respond to children's canonical ($\beta$=0.53, SE=0.17, p=0.002) and lexical ($\beta$=0.57, SE=0.19, p=0.003) vocalizations, relative to non-canonical vocalizations. Age interacted with lexicality ($\beta$=0.52, SE=0.18, p=0.004) such that responsiveness to lexical speech increased over age. These effects persisted in both child-initiated and adult-initiated conversational turn sequences (Fig.1B).

Discussion. Tseltal adults responded more to children's canonical and lexical vocalizations, relative to non-canonical vocalizations, and became increasingly selective for lexicality over age. These results align with findings from US caregivers (Albert et al., 2018; Snow, 1977), suggesting that, even across diverse childrearing contexts, canonicality and lexicality can serve as key cues to children's readiness to be interlocutors. Our results also suggest that Tseltal adults begin the process of drawing children in as interlocutors somewhat earlier than previously observed (de Leon, 2011; Brown, 2014)—in response to canonical babble. Altogether, our findings support the idea that these early shifts in Tseltal children's speech make important contributions to their treatment by interlocutors, and ultimate development as linguistically- and socially-engaged language users in their home environments.

# O6.2. Copula absence variation in adult and child corpus speech

Online presentation

Jordyn Martin, University of Chicago
Claire Bergey, University of Wisconsin-Madison
Sharese King, University of Chicago
Marisa Casillas, University of Chicago

Contact: jordynmartin@uchicago.edu

Copula absence (e.g., “this ∅ yours”; “he ∅ going”) is a systematic feature of African American English (AAE). But how children gain mastery over the appropriate environments for omission is still unknown, in part because, while this feature is present in AAE, it is also an attested developmental pattern for children learning other English varieties as well. Green’s (2011) study of spontaneous and elicited speech of AAE-acquiring 3–5-year-olds in Louisiana finds that syntactic environment matters: copula absence in child AAE occurs in non-past environments, and does not occur utterance finally, or when contracted with “it”, “that”, and “what”. Van Hofwegen and Wolfram’s (2010) longitudinal study of 32 AAE speakers between 4 and 17 years in North Carolina show that general English acquisition patterns and AAE-specific dialectic features interact nonlinearly with age: copula omission declines and then rises again before grade 5. Pulling these two accounts of AAE copula omission together requires an in-depth look at longitudinal AAE acquisition with an eye toward the specific environments appropriate for omission. Moreover, to understand why children demonstrate the omission patterns they do, it is imperative to examine their linguistic input from AAE-speaking parents. We bring together longitudinal data, child production and child input data, and analyze syntactic environments to understand (a) how copula omission is modeled for AAE-learning children in their home environments; (b) how children themselves use omission across development; and (c) what aspects of their usage reflect more general patterns in the acquisition of the English copula.

Method: We examine copula omission in spontaneous speech produced by five Black parents and their children from the Language Development Project longitudinal corpus of Chicagoland families. Our preliminary findings are based on two 90-minute home video recordings for each child, made at 4;6 and 4;10. Utterances were coded based on Washington and Craig’s (2002) analysis of AAE features. To examine syntactic environment we then also coded all pre- and post-copula omission words.

Results: Parents omitted copulas in a more selective set of syntactic environments compared to their children, but the most frequent environments for omission (phrase-initially, preceding a pronoun, “NA - pro”, and between interrogative adverbs and participles, “adv:int - part”; Figure 1) were common among both children and parents. However, in other environments (e.g., between a demonstrative and a possessive pronoun “pro:dem - pro:poss”) parents and children differed greatly.

Discussion: These data do not (yet) afford a wide developmental view, but it is clear that before age 5, AAE-acquiring children demonstrate both (1) copula omission patterns that

reflect the most frequent omission environments in their input while also (2) experimenting with omission in a variety of other environments, reflecting general patterns of English acquisition. To distinguish systematic copula absence in AAE from developmentally appropriate omission in learning English, our first priority is to code more data from these same children at younger ages. This work also confirms previous evidence and provides new evidence of the linguistic constraints on copula omission in AAE.

## O6.3. Multigenerational child-directed communication (CDC) in Mayan Tsotsil: Caregivers' interactional format-types in communicative events

Online presentation

Lourdes de León, Center for Advanced Studies in Social Anthropology (CIESAS)-México

Contact: lourdesdeleonp@gmail.com

Recent studies of input in nonindustrial communities have shown the value of studying CDC on two scales: (i) longitudinal qualitative analysis based on case studies of a small set of children (Brown 1998), and (ii) large scale quantitative analysis of day-long in-home recordings with a larger set of children (Casillas et al. 2019). Both scales of analysis have shown that CDC is generally infrequent in nonindustrial communities and generally produced by different socializers. The large-scale statistical analysis has also revealed some patterns of infants' and adults' verbal behaviours associated with the temporal structure and the different activities during the day (Casillas et al. 2019). The relevance of activity-type and CDC has been attested for urban families of different SES (Rosemberg et al. 2022, Tamis-LeMonda et al. 2019), however it has not been systematically studied in any non-industrialized community. This kind of research requires qualitative methods based on ethnography and video-analysis in order to identify communicative events in routine activities with children. The study argues that the analysis of CDC in routine activities of a non child-centred society with multigenerational caregivers presents a different picture. It requires taking interactional formats (IF's) as units of analysis in specific communicative events rather than routine activities. The present study explores the associations between IF's, caregiver, and communicative events in Mayan Tsotsil multigenerational families.

The analysis is based on a total of 2,500 utterances (with 343 IF's) directed in situations of high interactional activity to four monolingual Tsotsil children (two boys and two girls) ages from 11 to 17 months (M: 15 months) by different caregivers of the extended families of the investigation. The study is rooted in nearly four decades of linguistic and anthropological research among the Tsotsil in Southeast Mexico (de León 2012).

# O6.4. Vocabulary growth and the early linguistic environment in rural Ghana

Online presentation

Joseph Coffey, Harvard University
Jesse Snedeker, Harvard University
Elizabeth Spelke, Harvard University

Contact: jrcoffey@g.harvard.edu

What is the role of child-directed speech in early language development? On the one hand, children only learn the language they hear, and they must perceive a word to learn it: a child who hears English will learn drum, while a child who hears German will learn trommel. We also know that child-directed speech predicts individual differences in language acquisition. Children who are spoken to more often and with richer language will learn their language more quickly than their peers. On the other hand, we know that this is a rather simple view of verbal interaction. Language is a social device, learned across a wide range of circumstances. In many societies (particularly in rural, non-Western societies), children's verbal interactions with caregivers are relatively short and focused on actions rather than on words and their meanings. Rather than participating in adult interactions, children are socialized to silently observe interactions going on around them (Ochs & Schieffelin, 1994; Shneidman & Goldin-Meadow, 2012; Lancy, 2015). In these societies, children hear much less speech than in the average child in the U.S., where most studies on individual differences have been conducted (Cristia, 2022). Despite this, most children from these communities learn language within a healthy timeframe. This discrepancy reveals a gap in our understanding of what is required for healthy language development that can only be closed by cross-cultural research.

The present study is a part of a larger randomized controlled trial of 2064 high school students that began in Ghana in 2008 (Duflo et al., 2021). These students (who are now the parents of our child participants) were drawn from low-income households in rural areas of the southern and central regions of the country. We measured the vocabulary growth of 192 children of the original participants between 12 to 29 months of age (mean=18.5 months) using a version of the CDI adapted for Twi. After the survey was administered, caregivers were given LENA recording devices to leave in their children's clothing throughout the day to track their exposure to child-directed speech, producing estimated counts for Adult Words, Conversational Turns, and Child Vocalizations over roughly 12 hours. We focused on three major questions: 1) How do LENA measures in Ghana compare to similar measures collected in the U.S.? 2) How does the pace of vocabulary acquisition in Ghana compare to the U.S. and other African countries? 3) Are LENA input measures predictive of children's vocabulary? Our LENA comparison was drawn from a longitudinal study of U.S. children comprised of nearly 40,000 hours of LENA audio (Gilkerson et al., 2017). Our CDI comparison was taken from the American English CDI shortform norming study (Fenson et al., 2000).

We found that children in rural Ghana heard fewer adult words and engaged in fewer conversational turns with their caregivers than has been previously found in the U.S., which

is broadly consistent with studies of rural, non-Western households (Cristia, 2022). Despite this, we found children's average vocabulary sizes between 14 and 32 months to be comparable to children in the U.S. (Fenson et al., 2000). Looking more broadly at CDI data collected across several different African countries, vocabulary growth our in sample is more comparable to children growing up in urban African settings than to children growing up in other rural African settings. We did not find a significant relationship between any of our LENA input measures and vocabulary measures, despite many studies finding reliable correlations between these values (Wang, Williams, Dilley, & Houston, 2020), although previous studies of African countries have also failed to find these relationships (e.g., Weber, Fernald, & Diop, 2017). 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.

# Day 3

## Invited talk 2: Breaking into Language: Diversity, representations, and limits on generalizability

Leher Singh, National University of Singapore

Contact: leher.singh.nus@gmail.com

Theories of early language development incorporate a developmental mechanism by which infants can break into language: perceptual narrowing. This account is grounded in the notion that infants statistically sample distributional variation of sounds in language input, allowing them to converge on native phonetic categories that align with these distributions. This process is then in turn presumed to scaffold word learning. Often characterized as a universal process, the methodological and demographic foundation of studies of perceptual narrowing remains decidedly narrow. In this talk, I will discuss recent data that examine i) diversity and representation in studies of perceptual narrowing, ii) constraints on generalizability on prior studies, and iii) recent evidence from under-represented populations that suggest alternative pathways to phonetic category acquisition.

# Session 7

## 7.1. Developing language in a developing body: A genetic perspective

In-person presentation

Ellen Verhoef, Max Planck Institute for Psycholinguistics
Lucía de Hoyos, Max Planck Institute for Psycholinguistics
Fenja Schlag, Max Planck Institute for Psycholinguistics
Philip S. Dale, University of New Mexico
Evan Kidd, Australian National University
Simon E. Fisher, Max Planck Institute for Psycholinguistics and Radboud University
Beate St Pourcain, Max Planck Institute for Psycholinguistics, Radboud University and University of Bristol

Contact: ellen.verhoef@mpi.nl

Mastering word production and understanding in young children is often preceded by mastering motor and social developmental milestones. Individual differences in these abilities are partially attributable to genetic factors, although the underlying mechanisms linking motor, social and language development are little understood. Here, we investigate whether genetic influences contributing to infant motor and personal-social behaviour can

account for variation in infant and later toddler language performance.

We studied gross motor (6 months), personal-social (15 months) and ten language phenotypes (15-38 months) in children from the Avon Longitudinal Study of Parents and Children with genome-wide information (N≤6,460). First, we constructed language factors with exploratory and confirmatory factor analyses, thereby reducing the computational burden of downstream genetic analyses. Second, we estimated whether individual differences in motor, personal-social, and language abilities can be attributed to common genetic variation (Single-Nucleotide Polymorphism-heritability, SNP-$h^2$) using genome-based restricted maximum likelihood (GREML). Finally, we carried out genetic-relationship-matrix structural equation modelling (GRM-SEM) to study longitudinal multivariate genetic relationships (Cholesky decompositions).

Variation in the ten language measures could be captured by three interrelated language factors: $F_{15m\_lang}$, $F_{24m\_lang}$ and $F_{38m\_lang}$. $F_{15m\_lang}$ explained primarily variation in infant measures, with the largest factor loading (λ) for receptive vocabulary at 15 months ($\lambda_{F15m\_lang}$=0.85(SE=0.05)). $F_{24m\_lang}$ captured mainly variation in early toddlerhood, with the largest loading for expressive vocabulary at 24 months ($\lambda_{F24m\_lang}$=0.87(SE=0.02)). $F_{38m\_lang}$ explained variation in late toddlerhood, with the largest loading for expressive vocabulary at 38 months ($\lambda_{F38m\_lang}$=0.89(SE=0.01)). Individual differences in language factor scores were modestly heritable ($F_{15m\_lang}$: SNP-$h^2$=0.12(SE=0.05), $F_{24m\_lang}$: SNP-$h^2$=0.21(SE=0.06), $F_{38m\_lang}$: SNP-$h^2$=0.17(SE=0.05)). Similar SNP-$h^2$ estimates were obtained for infant gross motor (0.18(SE=0.06)) and personal-social skills (0.19(SE=0.05)). To assess evidence for shared genetic influences across phenotypes and developmental periods, we fitted a Cholesky GRM-SEM model, studying infant gross motor and personal-social skills followed by the three language factors in developmental order. Genetic influences (represented by genetic factor loadings γ) underlying personal-social, but not gross motor skills, accounted for variation across the three language factors ($F_{15m\_lang}$: $\gamma_{pers\_soc}$=0.26(SE=0.09), $F_{24m\_lang}$: $\gamma_{pers\_soc}$=0.28(SE=0.10), $F_{38m\_lang}$: $\gamma_{pers\_soc}$=0.30(SE=0.10)). Subsequent GRM-SEM analyses, modelling variation in individual language measures, confirmed contributions of infant personal-social skills to most concurrent and later language skills. These analyses, however, also identified links between infant gross motor and several language abilities at 38 months of age. Specifically, genetic influences underlying infant gross motor skills were associated with morphology ($\gamma_{motor}$=0.29(SE=0.10)) and word form production abilities ($\gamma_{motor}$=0.21(SE=0.10)), while genetic influences underlying personal-social abilities were associated with expressive ($\gamma_{pers\_soc}$=0.26(SE=0.09)) and receptive vocabulary size, ($\gamma_{pers\_soc}$=0.19(SE=0.09)) as well as word combination use ($\gamma_{pers\_soc}$=0.21(SE=0.09)) .

Our findings indicate that infant motor and personal-social abilities co-develop with infant and toddler language skills, as captured by common genetic variation. While genetic influences related to infant personal-social abilities were shared with both, lexical and lower-level grammar abilities in infancy and toddlerhood, infant gross motor abilities were genetically associated with advanced rule-based grammatical skills in toddlers only.

# 7.2. The development of informativity: Multimodal referential communication in Spanish and Norwegian preschoolers

In-person presentation

Paula Rubio-Fernandez, Max Planck Institute for Psycholinguistics
Chigusa Kurumada, Rochester University

Contact: Paula.Rubiofernandez@mpi.nl

Providing sufficient information to make oneself understood is a hallmark of pragmatic development, which hinges on both linguistic and socio-cognitive development. Young children often produce ambiguous referential expressions, but by 3 years of age, they can provide sufficient information across multiple conversational turns. Here, we investigated the development of informativity from a cross-linguistic and multimodal perspective by studying Spanish and Norwegian preschoolers' use of pointing and modification in a simple referential communication task. While we expect pragmatic development to be generally comparable in the two language groups, we sought to explore whether differences in NP morphology between Norwegian and Spanish might affect children's production of referential expressions. In Spanish, both indefinite and definite articles are full words, but the Norwegian definite article is a suffix (e.g., Spanish: 'un perro' / 'el perro' = Norwegian: 'en hund' / 'hunden'). This cross-linguistic comparison is interesting also because Norwegian has double definiteness: Ns following a demonstrative take a definite form (e.g., 'Den hunden', That dog-the), resulting in a complex NP that takes longer to acquire than corresponding forms in other languages.

We tested Spanish preschoolers (M = 3, 4 and 5 years) and adult controls (N=23 per age group), and Norwegian preschoolers (tested longitudinally at 3 and 4:6 years; N=24). Data collection has been completed, but coding for the older Norwegian group is still ongoing. We will therefore report the results of the Spanish age groups here, and be ready to present the cross-linguistic analyses of the younger groups at the conference.

We simplified the task design by Matthews et al. (2007) in order to reduce attentional and cognitive demands. Participants were presented with six pairs of animals and asked which one they preferred, in exchange for stickers. In the first three trials (Unique condition), they had to choose between two animals of different kinds, so an unmodified description (e.g., 'The fish') was sufficient. In the next three trials (Ambiguous condition), the two animals were of the same kind, hence requiring color or size modification (e.g., 'The {small/red} bird'). The Experimenter was sitting across the table, but behind the laptop, so pointing was inefficient. The Experimenter provided up to four prompts for clarification (e.g., 'Which one? There are two birds!').

Data from the Spanish-speaking children revealed the following results: INFORMATIVITY: As predicted, 3yos needed more prompts than the older children in order to produce informative descriptions, even in the Unique condition. After two prompts, 3yos still provided insufficient information 50% of the time (e.g., 'Ese' / That one), while 4 and 5yos performed significantly better. RELIANCE ON POINTING AND DEMONSTRATIVES: Overall, 3yos produced more pointing gestures than the older age groups in both conditions. They also

showed a tendency to rely on pointing for disambiguation, despite the Experimenter's reminders that she could not see the animals from where she was sitting. Alongside the production of pointing gestures, 3yos used more demonstratives. This tendency was particularly strong in the Ambiguous condition, suggesting an early sensitivity to the higher informativity demands of that condition. REFERENTIAL STRATEGIES: With increasing age, children preferred to use pronominalized adjectives in the Ambiguous condition (e.g., 'El rojo' / The red one), while the adults (tested online) used full NPs. Younger children used color and size adjectives at comparable rates, whereas older children showed a preference for color over size.

Our initial results suggest that, although 3yos have difficulty producing sufficiently informative referential expressions, they show rudimentary understanding of the need for ambiguity resolution. Their referential skills seem to develop steadily in subsequent years, with 5yos being already at ceiling.

## 7.3. How a white dog becomes a cloud: Developmental and computational investigation of metaphor production skills in preschoolers

In-person presentation

Chiara Pompei, Istituto Universitario di Studi Superiori, IUSS, Pavia
Serena Lecce, University of Pavia
Paolo Canal, Istituto Universitario di Studi Superiori, IUSS, Pavia
Paola Del Sette, Istituto Giannina Gaslini, Genova
Valentina Bambini, Istituto Universitario di Studi Superiori, IUSS, Pavia

Contact chiara.pompei@iusspavia.it

Metaphor comprehension teems in the literature on figurative language acquisition. Conversely, few studies have examined Metaphor Production (MP) in children. These studies either measured spontaneous ("A red balloon" for an apple) or task-elicited metaphors (i.e., "zebra-shell" for the picture of a shell with white and black stripes) and support the idea of an early development of this ability. However, the existing literature poorly considered the role of other cognitive skills and supports the idea of an early development of this ability.

This cross-sectional study aimed to investigate MP and its cognitive correlates in preschoolers, combining behavioral and computational methods.

The study involved 171 typically developing children aged 4 to 6 years (Age, M=5.40, SD=0.78), divided by age into three groups (4,5 and 6 years), all native speakers of Italian. MP abilities were assessed using an elicitation task asking to produce metaphors given literal prompts: for instance, children were asked to describe a dog as being white without using the word 'white' and were prompted to think of other white things. Metaphor accuracy was coded on a three-points scale: salient metaphors (e.g., 'The dog is a cloud') were scored 2, similes and non-salient metaphors were scored 1 and literal/no answers 0.

Following previous approaches, we computed semantic distance (SD) measures between the produced metaphors and their relative literal prompts using pre-trained word embeddings. To investigate the inner structure of produced metaphors, in line with, we further calculated the SD between topics and produced vehicles. We also assessed ToM, vocabulary, and Executive Functions. Accuracy in the MP task was analyzed in a LM with age group as categorical predictor (Forward Differences Contrasts) and cognitive variables as continuous predictors. SD measures were analyzed in two models with age group as categorical predictor.

The model on Accuracy showed an effect of age group, with 6-years-old children performing better than 5-years-old ones ($p = .002$). Main effects of vocabulary ($p = .003$) and ToM ($p = .007$) were found, with the contribution of ToM emerging particularly in the 5- to 6-years-old comparison ($p = .040$). SD between metaphors and literal prompts correlated with MP accuracy ($r(165) = -.32$, $p < .001$). Moreover, as age increases, the SD both between the produced metaphor and the literal prompt ($p = .002$) and between the topic and the vehicle increases ($p = .053$).

Our findings indicate that MP skills develop throughout the preschool period, with a marked improvement at the age of 6 years. Furthermore, our data suggest that MP develop side-by-side with other skills. Receptive vocabulary promotes MP across ages, suggesting that vocabulary offers the language platform for generating metaphors. ToM skills seem to play a role particularly between the ages of 5 and 6 years, which is also the developmental phase in which children improved in MP, suggesting that ToM might play as a springboard for producing metaphors, allowing children to consider others' mental states and the context shared with the interlocutor, dropping egocentric answers.

SD analysis provides a further window into MP development. As age and accuracy increase, children tend to choose words that are progressively more semantically distant from the prompt and vehicles more distant from the topic. The increase in SD resonates with evidence of greater SD for creative, rather than non-creative, metaphors, suggesting that children become more accurate by exploring the semantic network broadly.

Overall, our findings highlight the multiplicity of factors, from Theory of Mind to vocabulary, and specifically the use of more distant words, that support children in the process of learning how to turn a white dog into a cloud.

# Session 8

## O8.1. Rational inattention: A new theory of neurodivergent information seeking

Online presentation

Samuel Jones, Bangor University and Lancaster University
Manon Jones, Bangor University
Kami Koldewyn, Bangor University
Gert Westermann, Lancaster University

Contact: samuel.jones@bangor.ac.uk

This project presents rational inattention as a new, transdiagnostic theory of information seeking in children with neurodevelopmental conditions including developmental language disorder (DLD) and dyslexia. Rational inattention holds that the optimal solution to minimizing epistemic uncertainty is to avoid imprecise information sources. The key theoretical contribution of the rational inattention framework is to endogenize imprecision, making it a function of the neurocognitive deficits that have been invoked to explain neurodivergent phenotypes, including deficits in auditory perception, working memory, and procedural learning. We argue that disengagement with information sources with low endogenous precision (e.g., speech in DLD or orthography-phonology mappings in dyslexia) constitutes resource-rational behaviour. We demonstrate the strength of this account in a series of computational simulations. In experiment one, we simulate information seeking in artificial agents mimicking an array of neurodivergent phenotypes, which optimally explore a complex learning environment containing speech, text, numeric stimuli, and social cues. In experiment two, we simulate optimal information seeking in a cross-modal dual-task paradigm, and qualitatively replicate empirical data from children with and without DLD. Across experiments, simulated agents' only aim was to maximally reduce epistemic uncertainty, with no difference in reward across information sources. We show that rational inattention emerges naturally in specific neurodivergent phenotypes as a function of low endogenous precision. For instance, an agent mimicking the DLD phenotype disengages with speech (and preferentially engages with alternative precise information sources) because endogenous imprecision renders speech not conducive to information gain. Because engagement is necessary for learning, simulation demonstrates how optimal information seeking may paradoxically contribute negatively to an already delayed learning trajectory in neurodivergent children.

# 8.2. The role of language experience in the first cohort of an emerging sign language

In-person presentation

Rachel Miles, University of California, San Diego
Rachel Mayberry, University of California, San Diego

Contact: rmiles@ucsd.edu

Studies of emerging sign languages have shown that linguistic structures emerge over time as successive cohorts or generations regularize input and create linguistic organization. One commonality observed across the first generation or cohort in both village and deaf community sign languages is a lack of convergence on a common word order and a tendency to produce only one argument per verb.

The present study examines argument ordering among the first cohort of signers in a new signing community in Vanuatu. Prior to 2019, there was no reported community of deaf people in the country because deaf children were often denied access to school and many deaf adults were the only deaf person in their village. In 2019 & 2020 a total of 6 individuals from Vanuatu attended or worked at the school for the deaf in Suva, Fiji and were exposed to Fijian Sign Language (FJSL). Beginning in 2021 these six individuals returned to Vanuatu and formed a signing community centered in a large hearing school in the capital Port Vila. Since that time, three more deaf children have enrolled in the school and many hearing members of the school have begun to interact in sign language with the various students.

Participants for the current study include eight members of the signing community. Two hearing signers who were exposed to FJSL (at ages 6 and 29) spoke English and Bislama before going to Fiji. Of the six deaf participants, four were exposed to FJSL. None of the six deaf participants had accessible exposure to an established language prior to joining the signing community. Mean age of exposure to sign language was 8.9 years (sd =2.75).

Descriptions of simple events were elicited using a communicative task. Stimuli included three event types: intransitive (14 items), transitive irreversible (24 items), and transitive reversible (8 items). Pictures for the comprehension array included (when applicable) alternative subject, alternative object, alternative action, and reversal of semantic roles. We labelled each sign produced as referring to the subject, object, or verb from the picture and determined word order, excluding any signs referring to location or modifying any of the arguments.

For intransitive events, both hearing and deaf participants predominantly produced SV word order (68.75% and 65.85% respectively). For all transitive events, hearing participants predominantly produced SVO word order (reversible events 68.56%, irreversible events 65.63%). However, like first cohort signers of other emerging sign languages, deaf participants produced a high percentage of single argument structures in transitive sentences. For irreversible events, 36.8% of productions were SV. For reversible events, 30% of productions were split events where both animate arguments were expressed with

an action (e.g. boy pull, girl is-pulled). Additionally, the deaf participants did not show a preference between SVO or SOV word orders for either event type. Both orders were produced at a rate of 12.64% for irreversible events and 22.5% for reversible events.

In addition, deaf participants were more sensitive to effects of animacy of the object. While both hearing and deaf participants were more likely to omit inanimate objects than subjects and animate objects, the deaf participants were twice as likely to omit them (50% omission as compared to 23% omission).

The heterogenous background of participants proved essential in analyzing the argument ordering used in the task. While the deaf participants' language closely mirrored the patterns seen in other emerging sign languages, the hearing participants used SVO order in the majority of their descriptions across event types, which matches the word order of their spoken languages. Our results demonstrate that in creating linguistic structure in a new language, the age of the language is not the sole factor. The language experience of individuals in the community is also significant.

# LangVIEW discussion

An introduction to the LangVIEW group, aims and achievements and a discussion about how to extend/modify LangVIEW. See alecristia.github.io/LangVIEW/

# Poster abstracts

## Day 1 in-person posters

### P1.01. Searching for words: Picture naming errors in bilingual and monolingual preschoolers and contributing factors

In-person presentation

Magdalena Krysztofiak, University of Warsaw
Magdalena Łuniewska, University of Warsaw
Katarzyna Chyl, Educational Research Institute
Pernille Hansen, Inland Norway University of Applied Sciences
Hanne Gram Simonsen, University of Oslo
Joanna Kołak, University College London
Karolina Muszyńska, University of Warsaw
Zofia Wodniecka, Jagiellonian University
Ewa Haman, University of Warsaw

Contact: magdalena.krysztofiak@psych.uw.edu.pl

How do children learn and organize words in their memory and what happens when they have to organize vocabularies of two (or more) acquired languages? To answer this question we can look at the errors children make when they cannot retrieve a target word in a picture naming task. Selected responses may inform us about available connections between word meanings in their mental lexicon and strategies used to overcome difficulties in word retrieval. This type of analysis may be especially interesting in bilingual children since two languages may interact with each other and language dominance may influence the pattern of errors children make in a given language. However, this field has not been sufficiently explored in bilinguals' L1. The aim of the study is to investigate the types of errors made by bilingual and monolingual preschoolers focusing on bilinguals' L1 (Polish), using a picture naming task.

The study includes data from 119 monolingual Polish children and 142 bilingual Polish children aged 3 to 7 years. Children were assessed with a picture naming task (a part of Cross-Linguistic Lexical Tasks, CLTs) in which they named actions and objects in their L1 (Polish). We categorized children's naming errors into four categories: semantic errors, non-semantic errors, omissions, and language-switch errors. We then compared the proportion of these categories between groups and investigated the impact of parental input in L1 and L2, the child's age, and naming accuracy on the proportion of each error category in the bilingual group.

Results indicated that bilingual and monolingual children did not differ in the proportion of semantic errors. However, bilingual children had lower naming accuracy and made significantly more omissions than their monolingual peers. Furthermore, regression analyses indicated that younger bilingual children with more input in L2 made more omissions in their L1.

The results suggest that bilingual and monolingual children do not differ in the ability to retrieve semantically related responses from the mental lexicon, when not being able to provide the target word in L1. However, in general, bilinguals may have lower lexical skills than their monolingual peers in L1 and retrieve fewer words in L1 if they are younger and have more input in L2. This study extends our knowledge of the organization of mental lexicon in bilingual preschoolers and demonstrates possible factors contributing to word retrieval in L1.

## P1.02. Investigating infants' production of syllables following full cleft palate repair surgery: Syllable sequences at 13-14 months as a predictor of phonetic repertoire at 24 and 36 months.

In-person presentation

Ali Langner, Cardiff University

Contact: LangnerA@cardiff.ac.uk

A wealth of research on typical development illustrates that prelinguistic vocalisation supports the progression to first words and later speech development (Oller, 2000, among others). The tendency for infants to babble appears universal; by existing knowledge, we know for example, that infants born profoundly deaf do attempt to vocalise, and go on to produce physical, rhythmic movements as a production mechanism. We also know that infants born with cleft palate vocalise as frequently their typically-developing peers (Chapman et al., 2001). However, this undeniable desire to babble, as illustrated in such atypical development, is not robust enough in these clinical populations to avoid difficulties and divergences in the speech trajectory.

In the UK, 1 in 600 babies are born with cleft lip and/or palate (Shaw et al., 2019) and almost all these infants undergo full palatal repair by 12 months (Fell et al., 2022). However, despite successful surgery, up to half of infants with a cleft palate (CP) encounter persistent speech difficulties that hold through childhood and into adulthood, impacting speech intelligibility, e.g., misarticulations, nasalisation, absent/weakened pressure consonants (Bunton & Hoit, 2018; Kaiser et al., 2017; Sainsbury et al., 2019; Sell et al., 2015). What remains an open question, is whether any of these long-lasting difficulties are identifiable within prelinguistic vocal patterns, and whether babble patterns at 14 months could indicate production features that hold longer term. One possibility about why infants with CP divert from the typical trajectory is within the composition of their canonical vocalisations. A few studies reveal no significant difference in the frequency of syllables produced (Stout et al., 2011 and Willadsen & Albrechtsen, 2005), capturing that the components of syllable composition requires more research. The only known study to consider this in depth is of Korean-acquiring infants with

CP (Ha & Oller, 2022), who exhibited fewer true canonical productions (e.g., vocalisations excluding glottals and glides), insight we do not yet have about English-speaking infants.

The current study examines early vocalisations from 20 English-acquiring 14-month-old infants after CP repair, analysed once between 3-7 months after surgery. Hour-long segments of audio data were extracted from when each infant was most vocal across day-long LENA recordings and then phonetically transcribed. The transcription process captures consonant-like (closure) categories; broad (front, centre, back) vowel categories; and vocalic positioning within syllables. I compare vocal patterns relating to syllable composition, and consonant-vowel sequences in terms of their frequency, stability, and articulatory range against phonetic inventories from clinical assessments at 24 and 36 months.

The central aim of the analysis is to statistically explore the relationship between the phonetic sequences vocalised at 14 months (i.e., pre-, inter-, and postvocalic consonant patterning with vowel categories). Regression models serve to compare the sequential patterns transcribed from vocalisation data with phonetic inventories at 24 and 36 months on initial and final consonant inventory data at 36 months. Data coding is currently in progress, and the data analysis will be completed in the next three months. The findings from the analysis will elucidate whether the sequential features of vocalised syllables may relate to production outcomes at 24 and 36 months, and may indicate whether these patterns could give explanation to why infants with a CP diverge from the typical trajectory in up to half of cases.

## P1.03. Attention to illustrations in autistic and non-autistic children following spontaneous parent narratives: An exploratory eye-tracking study

In-person presentation

Vishakha Shukla, New York University
Angela Xiaoxue He, Hong Kong Baptist University
Sudha Arunachalam, New York University

Contact: vshukla@nyu.edu

Background and Objectives: Studies document poorer narrative comprehension skills in autistic children than non-autistic children; however, they focus on higher-level comprehension skills such as inference making [1-2]. In this exploratory eye-tracking study, we investigated young autistic and non-autistic children's performance on lower-level narrative comprehension skills such as identifying the topic, resolving referential expressions and attending to contextually relevant elements in the scene. We chose these skills because they can be effortful for autistic children [3-5]. Given that parents' input is often tuned to their children's language abilities [6-7], we additionally asked if parent narratives are tuned to support comprehension differently for autistic vs. non-autistic children.

Methods: Parents narrated stories to their children (autistic: n = 25 ; mean age = 5;2 ; range = 3;1-6;10, non-autistic: n = 35 ; mean age = 3;9 ; range = 3;0-5;8) based on a wordless 4-page story-book displayed on an eyetracker monitor. Each page displayed one animal in each quadrant. To establish one animal as the topic, we asked parents to narrate the story of the pig; however, they could talk about other characters too. The pig appeared in a different quadrant on each page. Narratives were coded for i) length, ii) frequency of reference to the elements in the pig quadrant and other quadrants, and iii) referential expression used for the pig (noun vs. pronoun).

Results: Parent narratives did not differ in story length (autistic = 28.35 ; non-autistic = 30.18; $t(41.5) = 1.21$; $p = 0.73$) or the choice of referential expressions (Fisher's exact $p = 0.26$). However, parents of autistic children referred to the topic of the story proportionally more than parents of non-autistic children (Fisher's exact $p < 0.001$). Next, we investigated how children followed along with narratives in real-time. Both autistic and non-autistic children looked at the topic above chance (autistic = 0.37, $t(24) = 3.7$, $p = 0.001$; non-autistic = 0.32, $t(34) = 3.4$, $p = 0.002$). A linear mixed-effects model with the mean proportion of looking to the target as the dependent variable revealed no main effect of group ($\beta = 0.27$ $p = 0.21$). Proportion of reference to the topic was correlated with the proportion of looks at the topic in both groups (autistic: $r(16) = 0.41$, $p = 0.04$; non-autistic: $r(32) = 0.77$, $p < 0.0001$); however, the correlation was weaker in the autistic group (Fisher's exact test $p = 0.015$). Finally, comparison of latencies of looks to the topic following nominal vs. pronominal reference revealed no group difference ($p = 0.35$).

Conclusions: Parents of autistic children did not produce shorter stories or avoid using pronouns to support their children's processing challenges. They did however refer to the topic of the story proportionally more than parents of non-autistic children. This suggests that their narratives are tuned to support their children's potential difficulty with identifying and maintaining the topic. Autistic children's ability to maintain focus on the topic and resolve pronominal references was comparable to the non-autistic children. However, as compared to the non-autistic group, the correlation between their attention to the topic and their parent's proportion of reference to the topic was weaker. Future research should explore the cause and impact of this on language development.

References

[1] Norbury & Bishop, 2002. International Journal of Language & Communication Disorders. [2] Nuske & Bavin 2011. International Journal of Language & Communication Disorders. [3] Losh & Capps, 2003. Journal of Autism and Developmental Disorders. [4] Bavin et al., 2014. Autism Research. [5] Nagano et al., 2014. Journal of Autism and Developmental Disorders. [6] Bernstein Ratner, 1984. Journal of Child Language. [7] Huttenlocher et al., 2010. Cognitive Psychology.

# P1.04. Consequences of deprivation and adverse input conditions on language acquisition in the long run: Evidence from children with cochlear implants

In-person presentation

Anja Hahne, Technische Universität Dresden, Ear Research Center Dresden
Niki K. Vavatzanidis, Technische Universität Dresden, Ear Research Center Dresden
Christina S. Wegewitz, Technische Universität Dresden, Ear Research Center Dresden
Lena C.E. Heine, Technische Universität Dresden, Ear Research Center Dresden
Anne Erler, Technische Universität Dresden, Ear Research Center Dresden

Contact: anja.hahne@ukdd.de

Children with severe hearing loss or deafness are nowadays regularly fitted with cochlear implants (CIs) to enable them to hear and thus get access to spoken language. Although CIs are the most successful neuroprosthesis to date, technical limitations remain, such as reduced frequency resolution. Another important point concerns the auditory deprivation that these children suffer. The newborn hearing screening now identifies children at an early age with the goal to fit them within their first year of life. However, this still means several months of auditory deprivation pass at a very important stage of language development processes. Furthermore, many children are not implanted in the first year of life, so the phase with little or no acoustic input is even longer.

The study of children with cochlear implants therefore represents a model of language acquisition under restricted conditions. Is brain plasticity sufficient to compensate for deprivation and reduced input? Which aspects of language acquisition do these parameters affect and how?

Most CI children have reached a reasonable vocabulary at school age, but many of these children that are otherwise successful in mainstream schools still struggle with (morpho-) syntactic elements in language. Therefore, we wanted to investigate the processes underlying language comprehension of school-aged children in more detail.

In an EEG experiment, we examined semantic, syntactic and prosodic aspects of sentence processing in children and adolescents with bilateral cochlear implant supply and compared the data to typically-hearing (TH) peers.

The data show that the unfavorable conditions (deprivation and physically adverse input) have a long-lasting effect on language acquisition. The prosodic structuring of complex sentences shows clear deficits. Since temporal information is well transmitted by the CI, it can be assumed that the reason lies primarily in the long deprivation phase. Interestingly, however, CI children were guided in their syntactic analysis by sentence prosody at the beginning of these sentences. All prosodic effects were much weaker and observed later then in TH peers, demonstrating that complex sentence processing is a major challenge for the hearing impaired children.

## P1.05. The effects of family, culture, and sex on linguistic development across 11 languages.

In-person presentation

Paul Ibbotson, The Open University
William Browne, The University of Bristol

Contact: paul.ibbotson@open.ac.uk

Languages vary in their complexity; caregivers vary in the way they structure their communicative interactions with children; and boys and girls differ in their language, cognitive and social skills. Using a multilevel modelling approach, we explored how these factors influence the path of language acquisition for different children growing up around the world. Data consisted of naturalistic speech recordings of 80 mother-child pairs, totalling 2,093,078 utterances, 8,779,131 morphemes, divided across 11 different languages: Cantonese, English, Farsi, French, German, Hebrew, Italian, Japanese, Portuguese, Spanish and Turkish. Using Mean Length of Utterance (MLU) as a measure of language complexity and developmental skill, we found that variation in children's MLU was significantly explained by (a) between-language differences; namely children who spoke the same language shared similar trajectories, and (b) between-mother differences; namely mothers who used higher MLUs tended to have children with higher MLUs, regardless of which language they are learning and especially in the very young (<3 years-old). Controlling for family and language environment, girls' speech typically had a higher MLU than boys of the same age, and overall, children developed morphosyntactic skills incrementally at about the rate of 1 MLU unit per year. Results demonstrate the relative importance of culture, family, and sex in shaping the path of language acquisition for different children. By modelling language as multilevel structure with cross-cultural variation, we were able to disentangle those factors that make children's pathway to language different and those that make it alike.

## P1.06. The social & cultural context of early language development in Bulgarian

In-person presentation

Elena Andonova, New Bulgarian University

Contact: eandonova@nbu.bg

Until recently, research on early language development in Bulgarian has been limited to a handful of authors who focused predominantly on corpus analyses of a small sample of children (e.g., Stoyanova, 2009). The adaptation of the MBCDI to the Bulgarian language and cultural context (Andonova, 2015) has allowed for tracking the developmental trajectory of a large sample of children via parent report. Unpublished data offer support for sufficiently high levels of reliability and external validity of the Bulgarian CDI Words & Sentences.

Here I present the findings of recent analyses of Bulgarian CDI Words & Sentences (VERBA-2) data on an initial sample of 709 children.

The Bulgarian adaptation of CDI Words & Sentences (VERBA-2) followed closely the structure and format of the original instrument but faced considerable challenges to the development of the grammatical components of the inventory due to the specific characteristics of the language with its rich morphosyntax. Several indices of grammar acquisition were used all of which were positively and moderately correlated. The rise of grammar was shown to be interdependent with vocabulary scores.

Lexical and grammatical development were examined as a function of age, gender, birth order, and several indices of socio-economic family status, including education levels. Against the background of considerable individual variation an ascending trajectory of both lexical and grammatical development reflects the impact of monthly age. Birth order had no effect on any of the measures. In line with findings from a smaller and more age-restricted sample of 153 children (Andonova, 2015), child gender's influence was minimal on vocabulary measures to non-existent on grammar. In this respect, the Bulgarian CDI data appears to differ from those in most other adaptations.

Maternal education emerged as the most significant predictor of children's developmental achievements among five factors (maternal education, paternal education, parents' highest education level, self-rated financial situation, and place of residence). Children whose mothers had education levels up to high school graduate showed weaker vocabulary scores than children whose mothers had education experience beyond high school diploma. The gap between the two groups grew significantly with age and was most pronounced in the 25-to-30-month child age bracket. On the other hand, differences in parental education were not associated with variability in grammar development.

The significant influence of family education and the absence of child gender differences are discussed with a view to the specific cultural and social factors that surround early child development in this country including historically deep-rooted attitudes towards education, generally high child poverty levels, gender expectations and the fact that Bulgaria is one of the countries with the longest paid maternity/caregiver leave in the world - 410 calendar days - which may play a role in caregivers' awareness of individual children's rate of development.

References

Andonova, E. (2015). Parental report evidence for toddlers' grammar and vocabulary in Bulgarian. First Language, 35(2), 126-136.

Stoyanova, Y. (2009). Индивидуални вариации във вербалното развитие. [Individualni variatsii vuv verbalnoto razvitie]. Sofia University Publishers

# P1.07. Testing the competing sources of input account on English-speaking children's verb-marking errors across development

In-person presentation

Hannah Sawyer, University of Liverpool
Colin Bannard, University of Manchester
Julian Pine, University of Liverpool

Contact: hshsawy3@liverpool.ac.uk

The Competing Sources of Input (CSI) account proposes that verb-marking errors (e.g., 'She play') reflect the extraction of unmarked subject+verb sequences from longer structures in the input (e.g., 'Does she play?'). However, apparent support for the CSI account (e.g., Leonard et al. 2015) could be explained by effects of unmarked verbs alone rather than of unmarked sequences. In Study 1, we use a pre-registered corpus analysis to investigate whether there are sequence effects on English-speaking children's errors and whether these effects occur over and above more general effects of verb bias, which are already well established in the literature (Räsänen et al., 2014, Kueser et al., 2018). The CSI account also predicts that verb-bias and sequence-bias effects will diminish at different rates, with verb-bias effects dropping out earlier than sequence-bias effects as children become more sensitive to the preceding context. In Study 2, we test this prediction in a second pre-registered corpus analysis which explores how the influence of different input predictors changes over development.

Study 1

Data from 12 2- to 3-year-olds from the Manchester corpus (Theakston et al. 2001) were analysed. Child-produced third-person singular (3sg) utterances were extracted and coded for verb-marking errors (e.g., baby go there=error, baby goes there=correct). Child-directed speech statistics were calculated from the adult speech of all the UK- and US-English corpora available on CHILDES (MacWhinney, 2003) including: subject+verb-sequence (SV) bias (i.e., the proportion of occurrences of each specific subject+verb sequence in the bare rather than the inflected form, e.g., 'she play' vs. 'she plays'), verb-in-3sg-contexts bias (i.e., the proportion of occurrences with a 3sg subject of each verb in the bare rather than the inflected form, e.g., 'any 3sg subject + play' vs. 'any 3sg subject + plays') and verb-in-any-context bias (i.e., the proportion of all occurrences of each verb in the bare rather than the 3sg form, e.g., 'play' vs. 'plays').

We built mixed-effects logistic regression models predicting error, with random effects of child on all terms and of verb on the intercept. We found that all three bias measures significantly predicted verb-marking errors in separate Bonferroni-corrected models. The best predictor was SV bias ($\beta$=0.88, p<.001), which also accounted for significant unique variance, indicating that sequence effects occurred over and above the established verb-bias effect (p<.001). These results provide strong evidence for input effects on children's verb-marking errors, as well as evidence for sequence-specific effects, which directly

supports the CSI account. Sequence-specific effects are likely to be particularly important in English because of the relatively high frequency of 3sg+unmarked verb sequences in questions (e.g., Does Dolly want a biscuit?). However, they may also result in verb-marking errors in other languages, including agreement errors in Spanish (e.g., 'Mama y Papa quiere' on the basis of 3sg sequences such as 'Papa quiere') and optional infinitive errors in Dutch (e.g., 'Dolly dansen'= 'Dolly to dance' on the basis of modal questions such as ''Kan Dolly dansen?').

Study 2

Data from 12 3- to 4-year-olds from the Post-Manchester corpus (Theakston & Rowland, 2009; Rowland & Theakston, 2009) were combined with the data from Study 1, and analysed using the same method. The only consistent effect across both age groups was SV bias, which remained but grew weaker over time. Verb bias was not predictive in the Post-Manchester corpus (p=.704). These findings are also consistent with the CSI account, which argues that children recover from making errors by becoming progressively more sensitive to context, at first just immediately preceding lexical contexts (e.g., 'she') and eventually more distant lexical contexts (e.g., 'does').

## P1.08. What's a question to start with?

In-person presentation (Woods, Heim)

Rebecca Woods, Newcastle University
Johannes Heim, University of Aberdeen

Contact: johannes.heim@abdn.ac.uk

Introduction: In response to a renewed interest in the acquisition of clause typing and speech acts across different approaches to language acquisition (e.g., Ambridge et al 2023; Hacquard 2022), we introduce novel longitudinal corpus and diary data that demonstrate so far undocumented variation in the acquisition of auxiliary verbs. This variation sheds light on the emergence of conventionalised mappings of clausal form and function in the third year of life. Two neurotypical British English-acquiring early talkers aged 2;2-2;7 use auxiliary-initial constructions (AuxSubj) in both questioning and non-questioning contexts before they settle on adult-like mappings. This is shown in (1), where the arrows mark final intonational tunes.

a. A bee! I can see a bee! ↘ AuxSubj used as description (Teddy, 2;4)

b. Can't I see a bee. ↘ AuxSubj used as assertion (Teddy 2;4)

c. I made a sandwich. Can you eat it?↗ AuxSubj used as question (Teddy, 2;7)

We will show that caregivers' use of questions impacts children's hypotheses about initial mappings between clause types and speech acts. Incorporating data from different linguistic domains provides a new perspective on how interactional language is acquired, with a particular focus on canonical and non-canonical questions.

Background: Computational modelling suggests that both pragmatic knowledge and morphosyntactic awareness are used by 18-month-olds in distinguishing major clause types (Yang 2022). Evidence from a preferential looking study (Goodhue et al 2023) further demonstrates that 18-month-olds monitor interlocutor knowledge when they discriminate AuxSubj constructions with rising intonation from auxiliary-medial (SubjAux) constructions with falling intonation. This aligns with observation that intonation is a reliable cue for discriminating speech acts in child-directed view (Geffen & Mintz 2017). However, previous accounts on speech act mapping regularly conflate pragmatic knowledge with prosodic, gestural and morphosyntactic information. To our knowledge, no comprehensive, non-automatized study has been conducted on the naturalistic use of interrogatives in caregiver English since Shatz (1979), and in children's English since Snow et al (1996). We therefore provide evidence for a complex interplay of prosody, pragmatics, and morphosyntax in mapping clause types onto speech acts based on longitudinal data that is carefully separates different forms and functions.

Method and findings: We coded our empirical data for morphosyntactic structure, prosodic contour, prominence, and pragmatic use (using a modified version of Shatz's 1979 typology of questions and the INCA-A coding system of Ninio and Wheeler 1984). Our analysis shows that AuxSubj in caregiver speech (n=265) occurs in suggestions more often (28% of 265) than information-seeking questions (14%), with "test" questions (10%) close behind. Our early talkers use AuxSubj (n=60) most frequently to assert (>30%), though one child also uses SubjAux (n=50) for this purpose (82%). Wh-questions (adult n=223, child n=49) are principally used for seeking information by both child (55%) and caregiver (40%), though also to "test" (child=20%, adult=35%). This suggests that "test" questions are not only prompted by lab situations (cf. Shatz 1979) but may be an integral part of child-directed speech in some communities (cf. Zaitsu et al 2021). Children seem to adopt this type as conventional ingredients of interaction. Intonation is primarily used for focus marking rather than speech act distinction at that age. Most auxiliary constructions occurred with either a fall (73%) or a rise-fall (16%); the attested rises mainly marked focus. This distribution of contours is analogous to the many falling contours across wh-questions, test questions, and suggestions in their auxiliary input. Our paper will provide detailed comparisons of speech act types, constructions, and prosodic variation in child and caregiver data.

## P1.09. Learning from sparse input: How children learn morphosyntactic elements that are often omitted in speech

In-person presentation

Monica Barbir, The University of Tokyo
Yuka Tatsumi, The Pennsylvania State University
Sho Tsuji, The University of Tokyo

Contact: monica.barbir@ircn.jp

The morphosyntax of languages is highly complex, and yet children learn it readily from a wide range of linguistic environments. In some languages, such as Japanese, certain morphosyntactic elements can be omitted, and what is more, are often omitted in infant-

directed speech (e.g., Ikeda et al. 2016; Matsuo et al. 2012). How children learn often-omitted morphosyntactic elements is unclear. Omission results in two potential obstacles for learning: reduced frequency and increased variability in the input (e.g., Ambridge et al, 2015). In this study, we address this question by investigating the developmental trajectory of often-omitted morphosyntactic elements during toddlerhood, in three languages: Japanese, Mandarin Chinese, and Korean.

All three languages rely on grammatical particles for a variety of functions, like case marking, but differ in their frequency of use and degree of omission (Ikeda et al. 2016; Kim, 2022; Chang, 1992). Particle drop is common for certain particles in Japanese and Korean, but the overall frequency of each particle is higher in Japanese. In general, Japanese has one particle for each morphosyntactic marking, but Korean has multiple particles for the same marking (e.g., depending on the preceding sound, animacy, honorifics; Ikeda et al. 2016; Kim, 2022). Mandarin Chinese, on the other hand, has little particle drop (Chang, 1992). Comparing Japanese (high-frequency/high-omission), Korean (low-frequency/high-omission), and Mandarin Chinese (high-frequency/low-omission) will enable us to quantify the roles of frequency and omission on the development of morphosyntax.

We first conducted a systematic literature review on particle input and acquisition following PRISMA guidelines (Page et al, 2021), complementing our English literature search with one in Japanese and Mandarin Chinese. There was little data on the topic: 33 studies across all languages (roughly half published in English), with many based on small sample sizes (e.g., 4 children: Otomo, Miyata, & Shirai, 2015; 4 children: Zhang, Xu, & Elliott, 2019). The results of our systematic literature review demonstrate a need to focus on non-WEIRD (White, Educated, Industrialized, Rich, and Democratic) populations to fully understand the full diversity of grammar acquisition across the world's languages.

Our review evidenced two trends in particle acquisition: frequency may determine age-of-production and omission may determine error rates. Highly frequent particles in the input have an earlier age-of-production for Japanese learning and Korean learning children (though not for Mandarin Chinese learning children; De Villiers & De Villiers, 1973; Kim, 2022; Zhang et al., 2019). Particles with low omission rates are produced with fewer errors in Japanese and Mandarin Chinese (no data on Korean; Yano, 2016; Yokoyama, 1992; Chang, 1992). Together, the literature suggests that frequency and omission may pose a different challenge for learning, but there is too little data to draw conclusions.

We thus plan to next quantify the developmental trajectory of particle production between 16 months and 36 months of age from parental reports on the MacArthur Communicative Development Inventory, for Japanese (n=400; collected in our laboratory, none available on WordBank; Frank et al, 2017), Korean (n=1498; from WordBank), and Mandarin Chinese (Mandarin-Beijing: n=1749 and Mandarin-Taiwanese: n=1987; from WordBank). To determine the role each plays on the development of particles, we will compare models with and without our key independent variables: frequency and omission rate. This study will provide big-data insight into the effect of omission of morphosyntactic elements on learning.

# P1.10. The development of complement clauses in Spanish: The case of Reported Speech

In-person presentation

Elsa Viviana Oropeza Gracia, Universidad Nacional Autónoma de México

Contact: viviana.oropeza@enallt.unam.mx

This paper examines the development of complement clauses within the production of Reported Speech (RS) utterances in three longitudinal corpora from Spanish-speaking children aged 2;00-to 4;00. Samples of ecological interactions between infants and caregivers, taken from the CHILDES database, were analysed (BeCaCeSNo, w/d; Diez-Itza et al., 1999; MacWhinney, 2000; Vila, 1990).

Producing Reported Speech constructions involves several tasks that may impose pragmatic and syntactic challenges to children. In order to report a previously expressed utterance, children must identify its illocutionary force and then make the necessary adjustments to present as it was once uttered (Coulmas 1986). Previous studies have suggested that this type of constructions is infrequent and found rather late in the developmental process (Diessel, 2004; Ely & McCabe, 1993; Norqvist, 2001; Shiro, 2012, 2014). However, results from this study suggest that, when using a *dicendi* verb to report an utterance in a complex construction, infants are able to make important syntactic adjustments that account for early acquisition of complex sentences. This study documented that by the early age of 2;08 years old, one of the children, Emilio, started producing subordinate clauses in RS constructions. First, by successfully using the conjunction “que” (that) (1), children show that they know how to subordinate two utterances in a reported speech construction. Second, children are also able to make the syntactic adjustments required to produce a RS construction (2). They are able to make (2a) personal, and temporal, (2b) limited modal shifts, that will, ultimately, show that children can report utterances with different illocutionary forces from their own perspective.

(1) Ha dicho la profesora **que** ha cerrado el tren.
The teacher said that the train is closed.

(BeCaCeSNo 3;04.28)

(2) Syntactic adjustments

a) Personal and temporal shifts (2s > 3s; PRES > PRET)

Adult > Niñ: ¿Qué te ha dicho el médico?
What did the doctor say?

Niñ > Adult: Que **estaba** muy mal, mucho, de la garganta.

That I was very, very sick, (I had a) sore throat.

(DiezItza 3;09.22)

b) Temporal and modal shifts (IMP > PRET SUBJ)

Adult > Niñ: ¿Qué te dijo David?
What did David say?

Niñ > Adult: Que la **pusiéramos**
That we turn on (the radio)

(DiezItza 3;09.22)

# P1.11. Navigating the Navajo verb construction in child speech: A focus on verbal prefixes

In-person presentation

Melvatha R. Chee, University of New Mexico

Contact: mchee@unm.edu

In Navajo child speech, the un-prefixed verb stem is produced prior to the verbal prefixes in the acquisition of Navajo verb constructions (Saville-Troike, 1996). This robust syllable is highly salient due to its position (right edge), the core semantic content, and the phonotactic structure. The core meaning of the verb stem is essential because it serves as the base upon which to build expressions, utilising a large variety of verbal prefixes. TAM (tense, aspect, mood) is also represented in the stem as a single unit, resulting in different phonological forms. A combination of prefixes, or even a single prefix, may be attached to express events, states, motion, cognition, etc. The verb stem and the prefix string constitute the minimal obligatory morphosyntactic specification for a well-formed verbal expression. Navajo has a verb-based lexicon that is morphologically rich and complex. Verbal semantics, agreement, argument structure, and adverbial information are all encompassed in the verb. The Navajo verb construction comprises a concatenation of lexical and inflectional morphemes, all of which are bound. The individual meanings of these prefixes are dependent on the verb construction as a whole. Identifying specific morphemes in the Navajo verb is particularly difficult due to morphophonological interactions that blur morpheme boundaries. This talk addresses the learnability of polysynthetic morphology. Working from a canonical example of polysynthetic verbal morphology, it is suggested that the prominence of sound-meaning pairings drives the acquisition of Navajo verbal morphology. I specifically focus on the learnability of agreement and mode marking prefixes to answer the question: how do children learn the pieces that compose the base verbal prefix string? This analysis of child-produced Navajo verbal morphology shows that children first focus their attention on producing semantically salient verbal prefixes. Although all verbal prefixes have semantic content, children pay more attention to those that have a one-to-one form-meaning pair. In Navajo, agreement is learned before mode because there is less homophony. Verbal prefixes that children pay less attention to and produce much less are homophonous prefixes such as mode marking. Homophonous prefixes present a challenge in the learnability of verbal morphology as their meanings are not easily distinguished. The meaning of homophonous prefixes is noticeable when they are used with neighbouring prefixes. As more prefixes (located to the left of the mode marker) are

accessed, homophony significantly increases. Navajo children must learn to navigate this verbal prefix system in order to produce adult-like verb constructions. By learning to produce the Navajo mode marker and the agreement marker, Navajo-speaking children learn to navigate homophonous prefixes and those prefixes with a one-to-one form-meaning pair assist in piecing the verb complex. 1600 child-produced verb tokens were coded for this work. Data for this study was collected from four Navajo-speaking children in the form of audio recorded child-caretaker conversations of four children ages 4;0, 6;0, 9;0 and 11;0. These findings will contribute to the diversity of the study of child language development and to the revitalization of Navajo, where a shift to English is prevalent.

## P1.12. Comparing utterance composition and conversational content in everyday language input to blind and sighted toddlers

In-person presentation

Eugenia Lukin, Duke University & Harvard University
Erin Campbell, Duke University & Boston University
Lillianna Righter, Duke University & Harvard University
Elika Bergelson, Duke University & Harvard University

Contact: genia.lukin@duke.edu

During language acquisition, children integrate sensory and linguistic input, e.g. by looking at named referents. And yet, without visual input, congenitally blind adults generally attain equivalent language outcomes to sighted adults (Perez-Pereira & Conti-Ramsden, 1999). We consider whether parents of blind infants tailor speech to their children as a compensatory mechanism for missing visual input, as parents do in other contexts (e.g. Vigil et al, 2005). Specifically, we investigate whether blind vs. sighted infants hear more speech that is high in linguistic informativity (i.e. features more information-adding utterance types and content). Linguistic informativity in the input has been linked to better language outcomes (e.g. conversational skills and expressive language) in research with sighted children (Romeo et al., 2022; Wong et al., 2012). However, the limited small-n studies with blind children suggest their input contains more directives and imperatives, and fewer descriptions than sighted children's input (Andersen et al., 1993; Moore & McConachie, 1994), countering the notion that blind children's parents boost informativity.

We seek to (1) replicate prior results concerning blind children's input and (2) expand them by considering conversational content as a proxy for descriptiveness (wherein extensions and expansions are more informative than repetitions and affirmations; Clark, 2014; Cleave et al., 2015). To account for other prevalent content categories we also consider initiations and reading/singing. Differences in utterance types or content would suggest parents of blind vs. sighted children adapt the input to alter informativity; a lack of differences would suggest blind children adapt their learning to compensate for missing visual information from otherwise informationally-comparable speech.

We tested this in a corpus of daylong LENA recordings of blind and sighted children, matched for gender, age, number of siblings, and maternal education (n=11/group) aged 6.4-30.3mo. (mean = 14.4mo.) We annotated 20 2-minute segments from each daylong recording (880min. total) using the ACLEW scheme (Casillas et al., 2017). Child-directed utterances (Sighted=2,972, Blind=2,854) from all non-target-child speakers were categorized for type (Imperatives, Directives, Interrogatives, Declaratives) and content (Expansions, Extensions, Repetitions, Affirmations, Initiation, Reading/Singing, Other). 4.8% of utterances received two content tags. 1044 total utterances (577 sighted, 467 blind) were tagged as Other and had no conversational content. One outlier (>3SD above mean) was removed from the Reading/Singing category. We tested for group differences in the proportion of each utterance type and content category. We found that in both the input type and in the input content, blind and sighted children heard essentially the same proportions of utterances (all multiple-comparison-corrected ps>.05 by Wilcoxon or T-Test, as appropriate). Both groups of infants heard the greatest proportion of Declaratives (1756 sighted, 1896 blind) and Extensions (888 sighted, 721 blind). Analyses over raw Ns mirrored those over proportions.

Broadly put, we found that both in raw quantities and relative proportions, the linguistic informativity of blind and sighted children's input was highly similar. Thus, in our larger-n language samples from everyday interactions we failed to replicate prior results suggesting blind children hear more imperatives and directives than their sighted peers. Nor did we find that they heard more potentially "helpful" utterance types or content categories that facilitate description (e.g. extensions; Clark, 2014). This in turn suggests that boosted linguistic informativity of the input (as operationalized here) is likely not a central compensatory mechanism for blind children's language acquisition.

## P1.13. Socio-economic Status predicts infant word recognition: Evidence from a socio-economically and linguistically diverse Singaporean sample.

In-person presentation

Sarah Rajendra, National University of Singapore
Leher Singh, National University of Singapore

Contact: psyls@nus.edu.sg

Language learning begins early in infancy, even before infants are capable of uttering their first words. By 6 months of age, infants can recognize common words (Tincoff & Jusczyk, 2012; Bergelson & Aslin, 2017), even without leading contextual cues (Bergelson & Swingley, 2012). However, there is significant variation across children in how they acquire language with specific environmental factors playing a crucial role in determining the pace or trajectory of language development. In particular, socioeconomic factors are influential in determining the trajectory of language development in young children (Hoff, 2003; Hoff & Tian, 2005; Hoff-Ginsberg, 1998; Fernald et al., 2013). Most famously illustrated by Hart & Risley (1995), the '30-million word gap' between children of high and low socioeconomic status (SES) families, demonstrated significant disparities in linguistic input and

consequently vocabulary size among families from high and low socioeconomic strata. The influence of SES manifests itself in infants' early speech processing abilities (Gonzalez-Gomez et al., 2020; Singh et al., 2021), suggesting that even young infants are vulnerable to the effects of socioeconomic hardship. Past research on the effects of SES on language development (e.g., Singh et al., 2022; Pace et al., 2017) point to disparities in the language skills of advantaged and disadvantaged SES groups. However, there have been few studies investigating effects of SES on word recognition in infancy.

The present study recruited a sample of socio-economically diverse, multilingual Singaporean infants who were tested on their ability to recognize common nouns. The study, adapted from Bergelson & Swingley (2012), used paired-picture trials presented to 83 5-12 month-old English-learning typically-developing Singaporean infants. Infants were tested using a preferential-looking paradigm during which they were presented with visual images of familiar nouns from two categories: body parts and food. Each object appeared four times; two times each as a target and distractor, and two times each on either side of the screen. A trial consisted of a pre-naming (0-3500ms) and a post-naming phase (3500-7000ms). Each target object was labelled by an unfamiliar native female English speaker, using four unique pre-naming phrases. Two tokens of each phrase were produced, and each token was used 3 times. A total of 24 trials were presented with an attention-getter appearing after every 4 trials, and the order of presentation of the trials was randomized across participants using the E-Prime 2.0 software. Children's language background was measured using the language exposure questionnaire (LEQ; Bosch & Sebastian-Galles, 1997), while socioeconomic status was determined using parental education and occupation to derive a composite measure, the Hollingshead Index of Social Status. Infants' looks towards target and distractor objects were hand-coded using the ELAN 3.0 software at 33 frames per second.

Word recognition scores were computed by subtracting fixation time to the target for post-naming phases from pre-naming phases: a positive value represents a target preference. We then regressed infants' word recognition scores to variation in English, chronological age, gender and socio-economic variables. The amount of exposure to English, chronological age, and gender did not predict word recognition scores (all p-values >. 43). However, above variation in socio-economic status, as measured by the Hollingshead Index, uniquely predicted word recognition scores, ($F(1, 84) = 6.96$, $p = .01$, accounting for 7.7% of the variance. When socio-economic factors were disaggregated into maternal/paternal education and occupation, only maternal occupation was a significant predictor of infant word recognition scores, accounting for 3.9% of the variance in infants' word recognition scores. The findings above demonstrate that before infants begin to speak, their abilities to understand familiar words is related to their family SES. This is a much earlier time point than identified in previous studies pointing to early-emergent disparities in word recognition based on socio-economic factors.

# P1.14. Unraveling the granularity of different metrics in analyzing joint attention data

In-person presentation

Jennifer Sander, Max Planck Institute for Psycholinguistics
Melis Çetinçelik, Max Planck Institute for Psycholinguistics
Yayun Zhang, Max Planck Institute for Psycholinguistics
Caroline Rowland, Max Planck Institute for Psycholinguistics

Contact: jennifer.sander@mpi.nl

Joint attention (JA) describes the active coordinated shared attention of a caregiver and the child learner on an object or action of interest (Gabouer & Bortfeld, 2021). This rich multimodal interaction has repeatedly been shown to be associated with a child's later language abilities (e.g., Yu, Suanda & Smith, 2019). While the importance of JA for language acquisition has been widely agreed on, much less agreement exists over the relevant metric to assess the quality of JA and which qualities of JA are most critical for language acquisition. In our study, we applied two established JA metrics that focuses on very different aspects of JA to the same set of data. Our aim was to compare: 1) whether the measures of JA derived from the two different metrics correlate; 2) which JA measure is a better predictor of language ability.

Method: 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 naming events (NE) where caregivers labeled a toy object, using the following two metrics categorized by Gabouer and Bortfeld (2021), namely the associative accounts and the social-interactional accounts.

The associative accounts focus on the shared visual attention of two partners onto the object or action of shared interest. In our study, we followed one such metric developed by Yu and colleagues (2019) in which if both dyad partners look at the object or action of interest for a minimum time, both partners are considered to be in a JA state. The socio-interactional account of JA focuses more on the interactional and intentional aspect of JA (e.g. Tomasello & Todd, 1983). In addition to shared visual attention acquired through gaze, the social account of JA requires awareness of the shared attention and can include bids for attention and intention confirming acts of the interaction partners. In the current study, we used the coding scheme developed by Gabouer and Bortfeld (2021). With both metrics, we derived a series of measures such as frequency and duration of JA events.

Results: While most measures of JA in the two approaches were measuring different characteristics of JA, measures involving NE were highly correlated. The frequency of JA episodes surrounding NE stemming from the Gabouer coding scheme was correlated with the interaction terms of SA and JA and NE in the Yu et al. approach. While both approaches identify JA differently, both capture JA around NE similarly.

Regarding our aim to investigate which JA measure is a better predictor of language ability, we did not find an effect of JA or SA on later language abilities using an associative account,

which contradicts earlier work showing that especially SA within JA in 9-month old infants predicted later language abilities at 12 and 15 months (Yu et al., 2019). However, using the metric from the social interaction account, our results suggest that some aspects of JA predict later vocabulary size (at 15 and 18 months), replicating results from our previous study (Sander et al., 2023), in which the main characteristics of JA (JA duration and JA success rate) did not predict vocabulary size, while measures related more to the timing of NE (e.g. at which point in time of the JA episode they occur) within JA events were a significant predictor of later vocabulary size.

Our study is the first to apply both metrics to the same dataset to investigate the relationship between their measures and ability to investigate the relationship between JA in interactions and later language abilities. We conclude that the coding schemes differ from each other to a large extent, especially in the way and granularity they filter the naturalistic data. Further, both the methodological comparison as well as the analysis of the JA components in our dataset following the Gabouer coding scheme suggest that NE within JA episodes play a particularly relevant role in JA's later language outcomes.

## P1.15. Caregiver reporting of Dutch children's vocabularies: Examining validity and predictors of variation from infancy to toddlerhood

In-person presentation

Anika van der Klis, Utrecht University
Caroline Junge, Utrecht University
Frans Adriaans, Utrecht University
René Kager, Utrecht University

Contact: a.vanderklis@uu.nl

Caregiver reports are reliable, valid, cheap, and fast tools for measuring early vocabulary across a wide range of participants and languages (Feldman et al., 2005; Fenson et al., 2007; Frank et al., 2021). In the Netherlands, the YOUth cohort study follows thousands of children whose caregivers fill out adapted versions of the N-CDIs (Zink & Lejaegere, 2002, 2003) hereafter NYOUth-CDIs. We must confirm the reliability and validity of the adapted checklists before we continue to use them to study Dutch children's vocabularies. First, we set out to examine the reliability and validity of the NYOUth-CDIs for children around 10 months and 3 years of age. Then, we aimed to examine whether key predictors that explain variation in children's early vocabularies are time-specific and task-specific in this large, longitudinal sample of Dutch children.

The data are derived from YOUth which involves repeated measurements at regular intervals (Onland-Moret et al., 2020). From the cohort, 444 Dutch infants around 10 months of age (230 girls, M = 10.6 months, SD = 0.9) were included in Wave 1. All children also participated in Wave 2 when they were on average 3.4 years of age (SD = 0.8). During Wave 1, caregivers filled out the NYOUth-CDI 1 measuring word production, word

comprehension, and gestures. During Wave 2, caregivers filled out the NYOUth-CDI 2 measuring word production. During this wave, children also participated in the Peabody Picture Vocabulary Task (PPVT-III-NL) measuring receptive vocabulary.

All components of the NYOUth-CDI 1 are significantly correlated with each other ($r = .47$ - $.65$). We also found a strong concurrent correlation between the NYOUth-CDI 2 and PPVT-III-NL ($r = .65$). For predictive validity, we found that all components of the NYOUth-CDI 1 are weakly correlated with later NYOUth-CDI 2 production scores ($r = .15$ - $.31$). Only gestures were significantly correlated with the PPVT-III-NL years later ($r = .15$). Then, we fitted robust linear models to examine the effects of children's age, gender, gestational age, birthweight, maternal education, and language status on all vocabulary measures. Apart from a consistent positive effect of age, we found inconsistent effects of maternal education, children's gender, and language status. Maternal education was a negative predictor of caregiver-reported word production ($\beta = -0.37$, $p < .05$) and comprehension ($\beta = -4.32$, $p < .01$) for infants, but it was a positive predictor of the PPVT ($\beta = 1.70$, $p < .01$) for toddlers. Then, we found a negative effect for males on NYOUth-CDI 1 gestures ($\beta = -2.60$, $p < .01$) for infants and NYOUth-CDI 2 production ($\beta = -5.65$, $p = 0.03$) for toddlers, but none of the other outcomes. Lastly, we found that multilingual language input only negatively affected the PPVT ($\beta = -5.23$, $p = 0.04$) but none of the caregiver-reported measures.

Several findings emerged. First, caregiver reports of gestures are a particularly relevant measure of infants' vocabularies. Gestures show a good amount of variability without a floor effect, unlike word production or word comprehension at this age. Gestures are not negatively influenced by maternal education, reveal an early advantage for girls, and are not influenced by multilingual language input. This was also the only caregiver-reported measure of infants that correlated with the PPVT, providing strong support for its predictive validity. It could be possible that the other scales on the NYOUth-CDI 1 gain more predictive validity as children grow older. The second finding is that the effects of well-known predictors of variation varied across time points and outcome measures. This could explain some of the contradictory findings reported in the literature regarding the effects of SES, children's gender, and multilingualism on vocabulary outcomes. Examining vocabulary development in large longitudinal samples cross-linguistically is an important step in validating the generalisability and stability of effects.

# P1.16. An evidentiality task to accommodate cross-linguistic differences

In-person presentation

Birsu Kandemirci, University of Manchester
F. Cansu Pala, Ege University

Contact: birsu.kandemirci@manchester.ac.uk

Languages vary in multiple ways which makes cross-linguistic research both exciting and challenging. Comparing children's performances in different languages provides researchers with a better understanding of how language acquisition can have an impact on various socio-cognitive skills. While doing this comparison, it is crucial to not only understand the differences between the languages, but also account for these differences to achieve a fair comparison. One of the structural differences between languages is how the sources of one's information is communicated, namely evidentiality production. Evidentiality use is obligatory in one quarter of all the languages, and optional to varying degrees in the rest of the languages. In our research, we focused on children's evidentiality production in Turkish, a language with obligatory evidentiality when referring to past events; and English, a language with optional evidentiality. In an earlier study (Kandemirci et al., 2023) we compared Turkish- and English-speaking children's evidentiality production and its predictive value on false-belief understanding, using two evidentiality tasks that were designed for Turkish language (Aksu-Koc et al., 2009; based on Ogel, 2007). While this was a valuable first step to achieve a comparison using the same set of tasks (e.g., as opposed to conducting retrospective comparisons with different task batteries), it generated a different issue. Given that evidentiality is compulsory and grammaticalised in Turkish, Turkish-speaking children required minimal motivation to use the appropriate evidentiality suffixes. However, the task was insufficient to elicit evidentiality use in English-speaking children as they were not forced to use evidentiality to communicate information in the same way. Therefore, it was unclear whether English-speaking children's evidentiality production did not predict their socio-cognitive skills, or the tasks were unable to measure English-speaking children's evidentiality skills. To address this issue, we designed a task aiming to account for the disparity between the two languages. The task involved 60 Turkish- and 60 English-speaking children (62 girls, Mage = 77 months old, SD = 10.3 months) learning about changes to the appearances of three toys in three ways: seeing, hearing, or inferring. The task involved two extra steps: a second experimenter who was uninformed about the changes and needed the participant's knowledge, and an explicit question that demanded the source of children's knowledge. Our study revealed that when the participants were explicitly asked about the sources of their knowledge, this improved English-speaking children's evidentiality performance. Additionally, we found that Turkish-speaking children's evidentiality performance was still better, but only significantly so for one of the three means of information source (significant for seeing, non-significant for hearing and inferring). The results of this research demonstrate that when given equal opportunities, 5- to 7-year-old children have a better chance of communicating about the sources of their information regardless of the language. This task can be used to better understand how the ability to

communicate the source of one's information can impact other socio-cognitive skills without risking structural differences between the languages to confound the results.

# P1.17. Comparing the prosody of IDS and ADS: How do ADS and IDS differ in their marking of intonational phrase

In-person presentation

Iris Leliveld, Utrecht University
Jorik Geutjes, Utrecht University
Caroline Junge, Utrecht University
Aoju Chen, Utrecht University

Contact: i.leliveld@uu.nl

Speakers use prosody to structure their speech into meaningful units, called prosodic phrases. They also use prosodic phrasing to disambiguate syntactic ambiguity. For example, the meaning of the sentence 'Mary says John is clever' depends on the insertion of intonational phrase (IP) boundaries: 'Mary says/John is clever' vs. 'Mary/says John/is clever'. IP boundaries can be realized via three types of acoustic cues across languages: a rise in pitch, the lengthening of the phrase-final syllable and the insertion of a silent pause after the IP boundary. It is essential that infants learn to recognize prosodic phrases because it aids their learning of basic syntactic structures and words.

Research on the production of IP boundaries has mainly focused on adult-directed speech (ADS), not infant-directed speech (IDS). However, studies that investigate infants' perception of IP boundaries use either ADS or IDS stimuli, assuming that IDS marks IP boundaries in the same manner as ADS. Moreover, studies comparing the production of IP boundary cues in IDS and ADS often only examine these cues when a boundary is present, but not relative to when it is absent. Therefore, it is unclear whether differences arise due to the speech register or the presence of a prosodic boundary.

Against this background, the present study addresses two questions: (1) How are IP boundaries produced in IDS as compared to ADS in Dutch? (2) Do the same cues differ in their relative importance in the marking of IP boundaries between IDS and ADS in Dutch?

The elicitation method used by Geutjes et al. (2023) was adapted for the current purpose. We recruited 9 mothers with their 4-12-month-old infants. All mothers were native speakers of Dutch and had no hearing or speaking impairments; one mother reported having dyslexia. The mothers were shown pictures displaying three girls wearing either the same or differently colored shirts to indicate team membership in a fictitious game called "Teamball". They were instructed to indicate the teams, using a sequence of names. The sequence either contained an IP boundary or no IP boundary after the second name, e.g. 'Bella en Demi/en Vera' vs. 'Bella en Demi en Vera'. The speech was elicited when the mother described the team composition to their infant (IDS condition), and when they were asked to image to explain the team composition to an adult listener (i.e. ADS condition). The order of the conditions was counterbalanced. PRAAT was used to mark the onset and offset of the

final syllable of the second name and the post-boundary pause following annotation conventions in phonetics. Afterwards, ProsodyPro was used to extract the duration of the final syllable, the pause and the maximum pitch of the final syllable.

Linear mixed models were constructed in R using packages lme4 and lmertest for each outcome variable (i.e. duration of the pause; duration and maximum pitch of the final syllable) with boundary condition and speech register as fixed factors, and name sequence and participant as random factors. The models indicated that all three cues were used in ADS to mark an IP boundary, but IDS only used the pitch and the pause cue to mark an IP boundary. Moreover, the pause cue was used to a larger extent to mark IP boundaries in IDS than in ADS. Furthermore, relative weight analysis was used to examine the weighting of the cues. It showed that for both speech registers the pause cue was the most important cue to indicate a prosodic boundary in Dutch.

In conclusion, our data has yielded the first evidence that Dutch IDS and ADS differ in the prosodic realization of IP boundaries, regarding both the types of cues used and the extent to which a cue is used. Notably, the relative weighting of the cues is similar in Dutch ADS and IDS, suggesting a possible transfer in speech register from mothers' IDS to their ADS. Together, our study contributes to a better understanding of what constitutes IDS prosodically from a functional perceptive.

## P1.18. Iconic words are more common in early interactions because they are more engaging

In-person presentation

Kirsty Green, University of Warwick
Marcus Perlman, University of Birmingham
Sotaro Kita, University of Warwick

Contact: kirsty.green@warwick.ac.uk

Iconicity is thought to play an important role in early communication. Words are iconic if there is a sense of resemblance between form and meaning, such as with onomatopoeias like woof or words in other semantic domains like wiggle. Studies have found that iconic words are among the earliest learned by infants, and they are used disproportionately often by infants and their caregivers. Iconicity may scaffold word learning by helping infants to establish referentiality. Iconic words may also consist of simpler phonetic structures that infants find easier to articulate. However, neither of these explanations takes into account the association between iconic words and fun. In this study, we examined the hypothesis that another function of iconicity is that it makes communication fun and increases infants' engagement in interactions with their caregivers. This might explain increased iconicity in infant-directed speech because caregivers are motivated to make interactions with infants more engaging. We examined video-recorded interactions between 18-month-old infants and their caregivers, using iconicity ratings of words collected from adults to measure iconicity in the mother's speech. Iconicity ratings were assigned to transcribed words in five mothers' utterances in interactions with their infants at 18-months. 10 high and 10 low

iconicity bouts for each dyad were identified by calculating the rolling average of iconicity per 5 words and focusing on a 5-second window before and after words with the highest and lowest averages. Engagement behaviours were coded according to three categories: attention, indicated by the infant's gaze being directed towards the mother or the subject of the conversation; positive affect, indicated by the infant smiling or laughing; and communicative effort, indicated by infant vocalization or gesture. Results generally showed evidence that high interactions were more engaging. Indicators of attention, positive affect and communicative effort occurred more often in high iconicity interactions. A finer-grained analysis of types of vocalizations produced by infants in different contexts also revealed that high iconicity interactions typically contained more speech-like verbalizations, while low iconicity interactions typically contained more non-verbal vocalizations, such as attention-getting noises. Verbalizations might be indicative of greater articulatory or cognitive effort by the infant in high iconicity interactions. Overall, these findings speak to the multi-functional nature of iconicity in parent-child interactions. They suggest that one reason iconic words might be prevalent in early interactions is because young language learners and their caregivers find these words to be intrinsically fun and engaging. Future work could consider whether higher levels of engagement brought about by increased iconicity in caregiver speech could result in accelerated vocabulary acquisition by infants.

## P1.19. How gesture repertoire and early pragmatic abilities predict first vocabulary independently in young children exposed to one or more language

In-person presentation

Letizia Volpin, University of Neuchâtel
Amandine Ballestraz, University of Neuchâtel
Salomé Schwob, University of Neuchâtel
Katrin Skoruppa, University of Neuchâtel

Contact: letizia.volpin@unine.ch

Children's early non-verbal communication skills are known to play a crucial role in the acquisition of oral language (Bates et al., 1979). For instance, many authors show a strong association between gestures usage and later language development (Goldin-Meadow, 2016). These findings are also evident in bilinguals (Serratrice, 2018), with some researchers even showing enhanced skills in multilingual populations (Nicoladis, 2007; Nicoladis et al., 2009). Similarly, early pragmatic skills (e.g. joint attention) have been linked to early vocabulary development in mono- and multilinguals (Aubineau et al., 2017; Tomasello & Farrar, 1986). However, to our knowledge, the strength and independence of these associations has not yet been compared comprehensively across mono- and multilingual populations.

Thus, we here investigate relevance of gesture and pragmatic skills for early vocabulary. As part of a larger study, 64 parents of babies with single (n=33, French) or multiple (n=31, French + other languages) language exposure reported about the repertoire of gestures

used by their child at 8 months (adapted from the MacArthur-Bates CDI Fenson et al., 2006). In addition, a live play session with an experimenter was held and coded for pragmatic skills such as interaction managing and joint attention. Four months later, at 12 months, parents filled in a questionnaire concerning the first words understood and produced by their child (multilingual questionnaire adapted from the different language versions of the MacArthur-Bates CDI Fenson et al., 2006).

Preliminary analysis showed that language exposure did not have an impact on the gesture repertoire and pragmatic skills of 8-month-old babies (for all skills $p > .1$) Interestingly, gesture repertoire and pragmatic skills did not correlate significantly with each other at this age ($r = .104$; $p > .1$). We then calculated receptive and productive conceptual vocabulary scores (across all languages) for mono- and multilingual children. As in previous research (De Houwer et al., 2014), these were similar across both groups (all $p > .1$), allowing us to collapse them in the following analyses.

Crucially, both gesture repertoire ($r = .514$; $p < .05$) and pragmatic skills ($r = .255$; $p < .05$) correlated with receptive vocabulary. Gesture repertoire also correlated with productive vocabulary ($r = .240$; $p < .05$), but pragmatic skills did not ($r = -.138$; $p > .1$). For gesture repertoire, the correlations remained significant even when controlling for other factors such as gender, parental education and pragmatic skills (receptive vocabulary: partial $r = .463$; $p < .01$; productive vocabulary: partial $r = .258$; $p < .05$).

Our results show that gestures seem to play an important role - in its own right, beyond general interactional skills - in the acquisition of first words, in particular on the receptive side. Indeed, the link seems to be even more strong than for pragmatic skills, although the interpretation of this comparison should be nuanced due to the different methodologies with which data were collected.

By the time of the conference, we project further analyses in order to better elucidate the role of gestures for early vocabulary development. We are currently coding infants' active usage of gestures during our play session, which will allow us to address the methodologic issue raised above. We are also following up our cohort at 18 months, and will thus being able to present detailed analyses on lexical growth. Finally, we will run a comprehensive analysis of these links in by means of multiple regressions, allowing us to study if the link between gestures and verbal language is stronger in children exposed to multiple languages, as the greater reliance on gestures in this population found by some authors (e.g. Mayberry & Nicoladis, 2000) may suggest. We will discuss the implications of our results for early language assessment in mono- and multilingual populations.

# P1.20. Do action boundaries help to segment speech?

In-person presentation

Monica Vanoncini, University of Potsdam and University of Vienna
Isabell Wartenburger, University of Potsdam
Birgit Elsner, University of Potsdam

Contact: vanoncini@uni-potsdam.de

Speech and actions are continuous information streams, and present some processing commonalities. Recent studies have found that speech and action segmentation show analoguous electrophysiological correlates in adults (Hilton et al., 2019). Remarkably, in adults, speech segmentation is facilitated by temporal audio-visual synchronicity between heard words and simultaneously presentated static pictures (Cunillera et al., 2010). However, in ecological contexts, speech often co-occurs with actions rather than static pictures.

Here we examine the effects of temporal synchronicity between boundaries in heard words and observed actions on speech segmentation in adults (Study 1) and 12-month-olds (Study 2). We expect enhanced speech segmentation when action boundaries align with word boundaries, compared to a control condition (between-subjects design). We use a synthesized artificial language (Hoareau et al., 2019) to ensure that only statistical regularities could cue boundaries of 3-syllabic words. Participants are familiarized with two frequent words (golatu, daropi; presented 90 times each) and two less frequent words (pabiku, tibudo; presented 45 times each). In synchronized familiarization, boundaries of spoken words and of observed actions align (lifting, shaking, rolling, sliding; one action for each word). In control familiarization, the same auditory input is combined with a slowly-moving fish. At test, all participants hear familiar frequent test words (golatu, daropi) and novel test words (tudaro, pigola), while seeing a cartoon figure.

Study 1: 36 German-speaking adults (18-35 years) are asked to indicate by pressing a key (y/n) whether they recognize a presented test word from familiarization (Marimon et al., 2022). We expect higher accuracy in the synchronized than control condition.

Study 2: 36 German-learning 12-month-olds receive an eye-tracking-based central-fixation paradigm at test. During listening to blocks of test words, we expect infants' looking times to the cartoon figure to be different between frequent and novel test words, and this difference to be larger in the synchronized that control condition.

A significant difference between synchronized and control conditions would suggest that action boundaries help both adults and 12-month-olds to segment speech.

# P1.21. Examining the concurrent effect of contingency on word learning in Japanese and French 13-month-olds

In-person presentation

Youtao Lu, The University of Tokyo
Megumi Ishikawa, Tsuda University
Maria Gohlke , Freelance technician
Emma de Araujo, Université Paris Cité
Panagiotis Boutris, Université Paris Cité
Sho Tsuji, The University of Tokyo
Reiko Mazuka, RIKEN CBS and Duke University

Contact: lu.youtao@mail.u-tokyo.ac.jp

Since their birth, infants quickly become aware of the surrounding social-communicative environment. Contingency, which can be roughly defined as the promptness and relevancy of responses, is one of the prominent cues that infants pick up on fairly early (e.g., Bigelow & Rochat, 2006). Recognizing agents that interact with them contingently further allows infants and toddlers to identify stable sources of learning. A fruitful line of research has focused on the phenomenon known as video deficit effect, which shows that infants and toddlers achieve better outcomes when learning from live instructors than from pre-recorded videos (e.g., Anderson & Pempek, 2005). These two learning conditions are crucially distinguished by contingency, which, when added to the video condition by using live videos, leads to learning outcomes close to those in the live condition at least among toddlers around two years old (e.g., Myers et al., 2016; Roseberry et al., 2014).

Some recent studies have tested the concurrent effect of contingency on word learning in controlled experiments to eliminate the confounding effect of other social cues. The manipulation of contingency was typically achieved by obtaining children's real-time eye-gaze with an eye tracker and pre-programming the eye-gaze of a virtual agent on the monitor to either mirror the eye movement of the child (contingent) or replay a child's eye movement recorded from a previous experiment (non-contingent/yoked). Interestingly, the effect seems to be modulated by the language-cultural backgrounds of infants. Japanese 12-month-olds were able to learn associations between nonwords and novel objects from a contingent virtual agent but not from a non-contingent agent (Tsuji et al., 2020), but French 16-month-olds failed to learn lexical associations in either condition (Tsuji et al., 2021). However, no robust conclusion could be drawn due the variations in methodology. This potential difference regarding how contingency influences word learning across different language-cultural backgrounds is the focus of the present study.

To replicate and expand the effect of contingency previously found in Japanese, we first ran a large-scale experiment among 1- to 3-year-old Japanese-learning children in the context of a science museum study. Each child was introduced to one nonword in either the contingent or the yoked condition (between-subject design). The results showed that children between 12 and 23 months of age had significantly better learning results in the contingent condition, and older children were able to learn nonwords regardless of contingency (interaction term between Age and Contingency: $t = 2.30$, $p = .021$; Permutation test within 1-year-olds: $p =$

.014). This finding aligns with previous results for 12-month-old Japanese infants (Tsuji et al., 2020).

Our second experiment is a controlled lab experiment that compares between Japanese 13-month-olds and their French peers. The experiment setup is similar to that of Experiment 1. A within-subject design is used, so each subject is introduced to one nonword in the contingent condition and another nonword in the yoked condition. Given the findings reported previously (Tsuji et al; 2020; Tsuji et al., 2021), we expect a significant facilitatory effect of contingency on learning nonwords among Japanese infants but not among French infants. Because the design allows separate examinations of the learning phase and the testing phase, we also plan to examine if contingency modulates infants attention during the learning phase, and whether the contribution of contingency is independent from any potential effect on attention.

## P1.22. Composition of the early lexicon across languages: A systematic review

In-person presentation

Dahliane Labertoniere, Université de Neuchâtel
Katrin Skoruppa, Université de Neuchâtel

Contact: dahliane.labertoniere@unine.ch

A phenomenon known as the noun-bias is often reported in the literature on children's early language development. This phenomenon is defined as a prominence of nouns over verbs (weak bias) or over every other word class (strong bias) in children's first lexicon. As questions remain on the universality of this bias, we conducted a systematic review on this subject and more broadly on the composition of the productive lexicon in many languages for children aged 1 to 3 y.o. After a rigorous database search resulting in 677 articles being reviewed based on abstracts, we conducted a critical evaluation of 65 papers, selected 28 of these on the basis of strict quality criteria with high interrater reliability, and found that, indeed, nouns occupy a major place in children's early productive lexicon, regardless of language (Caselli et al., 1995; Kauschke & Hofmeister, 2002; Kern, 2007…).

However, in certain languages with verb-friendly characteristics (e.g. saliency of the verb in speech), this bias is sometimes mitigated or absent (Choi & Gopnik, 1995; Tardif et al., 2008). Moreover, in bilingual children learning typologically distant languages (one language being more verb-friendly and the other noun-friendly), authors report a lesser proportion of nouns and a higher proportion of verbs in the lexical stock of the verb-friendly language than in the noun-friendly one (Kim et al., 2000). Besides, usage of the different word classes seems to vary with the situation of production. Notably, in cases of play contexts, the noun bias is less marked (or verbs even actually dominate nouns) than in cases of shared reading (Ogura et al., 2006; Tardif et al., 1997). In addition to linguistic factors like items' frequency and perceptive and morphological saliency in children's input and the situation of production, we also noted that cognitive factors could play a role in children's differential acquisition of nouns, verbs, and other word classes. Indeed, children's cognitive style could also influence

the rate at which they acquire nouns and verbs. In early development, some children could be more inclined towards the social and instrumental functions of language (leading to a more varied lexicon), and others more interested in its referential functions (leading to a noun-oriented lexicon) (Bassano, 2005). Later, this diversity seems to disappear, in line with the hypothesis that intra-language variability in the productive lexicon is greater at the beginning of development.

Thus, the causes of the noun bias seem to be partly universal and partly specific. We estimate that the universal factors are linked to conceptual parameters like the semantic categories of objects and actions: nouns denote mainly objects and verbs denote mainly actions, and objects are easier to conceptualise than verbs. But these universal causes could be progressively tempered by the structural properties of the language being acquired and other cognitive factors, like style, leading to a differential acquisition of the various word classes by different children. It is interesting to note that these universal factors seem to have an influence on children producing the words more than they have an influence on comprehending the words, since data in comprehension shows a higher proportion of verbs than data in production (Alcock, 2017 ; Caselli et al., 1995).

Lastly, the very first words in children's vocabulary seem to be neither nouns nor verbs but another word class altogether: socials terms, so if the noun-bias does exist in the early stages of language acquisition, it is mostly a weak bias.

We propose to discuss our systematic review in detail, focusing particularly on the crosslinguistic differences in the production of different word classes (nouns and verbs, but also adjectives and social terms) in children's early years.

## P1.23. Why some bilingual children actively use their heritage language more than others

In-person presentation

Sharon Unsworth, Radboud University

Contact: sharon.unsworth@ru.nl

BACKGROUND One of the greatest sources of frustration for parents raising their children bilingually is when they consistently use the heritage language (HL) to address their child but their child regularly - and sometimes exclusively - speaks back to them in the majority language. Given its societal relevance, it is perhaps surprising that the question of why some children become active HL users has received relatively little attention in the research literature. The available research has found children's HL use to be predicted by family language patterns (e.g., OPOL; De Houwer, 2007) and/or more general measures of input quantity (Verhagen, et al., 2022). In this paper, we examine the contribution of other variables: richness of HL input, children's HL proficiency, parental proficiency in the majority language, and language typology. We predicted that (i) richer HL input and HL proficiency would contribute to more active HL use; (ii) the more proficient parents were in the majority language, the fewer opportunities there would be for active HL use; and (iii) children whose

HL was more closely related to the majority language would be less active HL users (because their HL-speaking parents may be more likely to understand the majority language).

METHOD Participants were 4-to-10-year-old children (N=200, 102 girls) in the Netherlands who were acquiring Dutch alongside English (N=62), German (N=43), Greek (N=35), Italian (N=20), Spanish (N=19) or Turkish (N=21). Information about their bilingual experience and their HL proficiency was collected using a parental questionnaire (BiLEC; Unsworth, 2013). Given that children's HL language use depends in part on how much exposure they receive in that language, we created a measure of active language use by dividing children's relative HL use at home by their relative HL exposure at home. Active HL use scores < 1 thus reflected more exposure than use, whereas scores closer to 1 indicated comparable levels of use and exposure (i.e., more active HL use (M = 0.73, SD = 0 - 1.93). Following Blom et al., (2020), language typology was defined as 'close' (English, German; coded as '1') and 'distant' (Greek, Italian, Spanish, Turkish; coded as '0').

RESULTS & DISCUSSION A multiple linear regression analysis ($F(6,170) = 24.2$, $p < .001$; $R2 = .46$, Adjusted $R2 = .44$) revealed main effects of HL richness (Beta = .13, p = . 037), children's spoken HL proficiency (Beta = .52, p <. 001), parents' Dutch listening proficiency (parent 1: Beta = -.20, p = . 002; parent 2: Beta = -.23, p <. 001), and language typology (Beta = -.17, p = .009), but no effect of age (Beta = -.05, p = . 423). Our predictions were thus borne out: children were more likely to be active HL users if they had a richer input and were more proficient in the HL (Paradis, 2011), if their parents' Dutch proficiency meant that they needed to use the HL to communicate, and if their language was more distantly related to Dutch. Practical and theoretical implications will be discussed.

OUTLOOK We also collected direct measures of children's proficiency in each of their two languages. In additional analyses (yet to be conducted), we will include these objective measures of language proficiency.

## P1.24. Spontaneous bilingualism in a child with autism spectrum disorders: A case study

In-person presentation

Ingrida Balčiūnienė, Vytautas Magnus University
Aleksandr N.Kornev, Saint-Petersburg State Pediatric Medical University

Contact: ingrida.balciuniene@vdu.lt

During past decades, a number of studies in language acquisition in the autism spectrum disorders (ASD) has been rapidly increased. According to some previous observations, approximately 50% of children with autism never develop functional speech; however, some of them are able to learn a second language at school. In this paper, we present a case study of a monolingual Lithuanian boy with clinically referred ASD who spontaneously acquired English language at a preschool age. Although Lithuanian was the only home language and the boy had not had any previous exposure to English, since the 3rd year of

life he started demonstrating his preference for English as a language of media resources. Although the boy produced his first words both in Lithuanian and English at the same time, later on, a discrepancy between the languages was evidenced. Despite professional speech/language therapy (in Lithuanian), at the age of 10.5 years, the boy still demonstrates gross lexical and grammatical deficits in Lithuanian and remains clinically referred as having developmental language disorder. English is still his preferred language used not only for media activities but also for colloquial conversations (when it is possible) and written communication.

In cooperation with the family, we had an opportunity to carry out a longitudinal case study (to follow the boy for 8 years) and to collect unique data of the spontaneous bilingualism. Our data include a) parents' diaries, b) audio-/video-recordings of family conversations, and c) results of phonology, vocabulary, grammar, and discourse assessments carried out in both languages. The data is supplemented by clinical evaluations, since the boy was assessed by a multidisciplinary group of experts at the age of 4 years, and results of several post-testing carried out by a psychologist and speech-language pathologist at the age of 6, 8, and 10 years.

In this paper we focus on quantitative and qualitative differences between Lithuanian and English evidenced by phonological, lexical, grammatical, and discourse assessment carried out at the age of 8 years. Results of the study confirmed a discrepancy between Lithuanian and English at all linguistic levels. Moreover, when speaking English spontaneously, the boy used numerous cliches, stereotypes, lexical phrases, and other linguistic patterns of so-called frozen discourse; when speaking Lithuanian, the boy attempted to build his sentences word-by-word and this caused numerous grammatical errors. When speaking English, the boy used English words only (if someone was not able to understand his speech, the boy was trying to replicate it in a written form); when speaking Lithuanian, the boy demonstrated code switching at the lexical level and tried to inflect English nouns according to the rules of Lithuanian morphology. The given results supposed a hypothesis that in this case, Lithuanian and English languages have been (and, probably, still are being) acquired following different paths and strategies. English seems to be acquired in a more global way, by listening and repeating whole phrases, while Lithuanian was acquired following grammatical rules. This case of spontaneous bilingualism (which, probably, can be also considered as incomplete L1 acquisition due to the dominant L2) raises a question on the importance of language environment for children with ASD. While child-directed speech and communicative feedback are crucial for typically developing children, media exposure might be an alternative source for language acquisition in children with ASD.

# P1.25. Evaluating measures of language input to multilingual infants

In-person presentation

Anna Caunt, University of Plymouth
Rana Abu-Zhaya, University College London

Contact: anna.caunt@plymouth.ac.uk

Traditionally, in estimating a multilingual infant's exposure to each of their family languages, researchers have used parental questionnaires (de Houwer, 2011). However, with the advancement of day-long audio recording techniques (Casillas & Cristia, 2019), researchers have begun to record and analyse multilingual environments (Cychosz et al., 2021; Orena et al., 2019). These studies also examined whether the observed exposure to languages from day-long recordings matches the reported exposure obtained through parental questionnaires. Results showed that these measures do not always provide the same exposure estimates (Marchman et al., 2017; but see Orena et al., 2019 for a significant correlation between the measures) and this variability may stem from how caregivers interpret questions and from the sampling methods (e.g., amount of speech annotated). The current study extends this line of work and examines the relationship between the reported and observed input to multilingual infants growing up in London. In order to achieve a better estimate of the amount and type of input multilingual infants receive from each of their caregivers and given the time-consuming and costly nature of annotating full day-long audio recordings, it is crucial to use a combination of methods (such as defining more accurate sampling techniques and examining the validity of existing parental reports) to refine how we measure multilingual language environments.

The current study examines the reported and observed amounts of exposure to English and an additional language in a sample of 24 multilingual families raising 6-20 month-olds. Families recorded their home environments for two days and estimated their infant's exposure to each language using the Plymouth LEQ (Cattani et al., 2014). Thus far, we have annotated data from 19 families who provided on average 13.25 hours of data across both days (SD = 4.75, Range = 5.8-23.1). Following the ACLEW guidelines (Soderstrom et al., 2021) we annotated 6 x 5-minute samples across the morning, afternoon and evening (60 minutes total) per family. To estimate the reported exposure to each language, we used caregivers' responses to questions from the Plymouth LEQ that inquired about language use only at home and from the mother and father. Using our annotations of the audio recordings, we calculated the observed exposure score in each language by including speech produced only by the mother and father in all languages.

We observed considerable variability in the reported (English: M=33.66%, SD=25.47%, Range=0%-79.3%; Additional language: M=66.33%, SD=25.47%, Range=20.7%-100%) and observed exposure to each language (English: M=43.67%, SD=27.66%, Range=2.72%-80%; Additional language: M=56.32%, SD=27.66%, Range=11.94%-97.27%). Most caregivers overestimated their infants' exposure to the additional language (n=13) and underestimated exposure to English (n=12). We subtracted the observed percentages from the reported percentage to calculate a difference score: a difference score closer to 0 would

suggest caregivers were more accurate at predicting their child's language exposure. One-sample t-tests revealed that the difference score in English ($t(18) = 6.95$, $p = <.001$) and the Additional Language ($t(18) = 6.95$, $p = <.001$) were significantly different from 0. When adding a 15% error margin, the difference scores for English ($t(18) = 2.91$, $p = <.009$) and the Additional Language ($t(18) = 2.91$, $p = <.009$) were also significantly different from 15. These results suggest discrepancies between the reported and observed language exposure measures. In subsequent analyses of our full dataset, we will explore whether caregivers are more accurate at predicting their use of IDS in the input. Further, we will investigate whether the amount of speech that is sampled alters how closely the observed measure of exposure is related to caregivers' reported exposure.

## P1.26. Contrastive neural network reveals the structure of neuroanatomical variation within bilingualism

In-person presentation

Wei Li, Boston College
Aidas Aglinskas, Boston College
Joshua Hartshorne, Boston College

Contact: liacz@bc.edu

By definition, the brains of bilinguals differ from those of monolinguals, but how? This question is complex and intriguing, as the changes in neuroplasticity due to aging also influence language acquisition (Li, Legault, & Litcofsky, 2014; Patton, Blundon, & Zakharenko, 2019). Previous studies have indicated that the timing of language learning and the level of proficiency can shape the brain (Wei et al., 2015; Stein et al., 2015). However, these studies have produced a bewildering variety of conflicting claims, perhaps due to confounding factors unrelated to bilingualism, such as age and sex, as well as chronically low power (Pliatsikas et al., 2020).

In order to isolate bilingual-specific neuroanatomical variations, we employ a Contrastive Variational Autoencoder (CVAE). Building upon traditional deep neural network Variational Autoencoders (VAEs) that learn compressed latent representations, CVAE uses contrastive learning to separate latent features into two sets: "background features", which characterize the variability in the general population (e.g., brains of all speakers) and "target features" that characterize additional variability specific to a subpopulation (e.g., L2 speakers) (Aglinskas, Hartshorne, & Anzellotti, 2022).

We trained a CVAE on over 1,600 structural MRI scans, compiled from public databases. The brain images were collected from both bilinguals and monolinguals, encompassing broad variation in bilingual experience and proficiency, as well as age, sex, and other demographic variables. We then applied Representational Similarity Analyses (RSA, Kriegeskorte et al., 2008) to analyze the results.

Initial analyses focused on quality control. Of critical importance, these analyses showed that the background features - which characterize variability that affects all brains - were robustly

associated with which dataset a particular MRI scan came from (r =0.31***, p < .001). In contrast, the effect of dataset on the target features - which are expected to be specific to bilingualism - was far more mild. This confirms previous findings that CVAE is very effective at removing nuisance variation that has plagued large-sample MRI studies (e.g., artifacts of using different scanners, slightly different subject populations, etc.).

For our critical analyses, we used the already-trained model to analyze a set of structural MRI scans (145 monolinguals, 218 bilinguals). The dataset provides high-quality measures of language experience and ability. We found that the background features captured neuroanatomical variation associated with demographic differences unrelated to bilingualism (e.g., sex, r = 0.11***, p < .0001). This confirms that the CVAE was able to capture background variation. In contrast, the target features were only associated with proficiency in the L2 (r = .02***, p < .001). Strikingly, target features were not associated with age of acquisition (r = 0.00, p = .59).

These results suggest that while learning a second language affects brain morphology, there is little direct effect of age of acquisition. (Indirectly, of course, age of acquisition may affect attained proficiency.) In ongoing analyses, we are investigating whether there may be a (presumably subtle) interaction between proficiency and age of acquisition.

Additional ongoing analyses are localizing the neuroanatomical differences associated with L2 proficiency using the CVAE-based “synthetic twin” method pioneered by Aglinskas and colleagues (2022). As reviewed above, prior studies have presented conflicting results that our new method should address.

We discuss theoretical implications in the context of potential concerns and limitations as well as ongoing extensions of this work to functional connectivity.

## P1.27. Limits of variability in infant phonotactic acquisition: A study on the sonority sequencing principle

In-person presentation

Rowena Garcia, University of Potsdam, Max Planck Institute for Psycholinguistics, University of the Philippines Manila
Youtao Lu, The University of Tokyo International Research Center for Neurointelligence
Natalie Boll-Avetisyan, University of Potsdam

Contact: garcia1@uni-potsdam.de

Children’s acquisition of the permissible sound combinations of their ambient language (phonotactics) may be facilitated by supposedly universal biases such as the Sonority Sequencing Principle (SSP; Berent et al. 2011). The SSP requires that syllables ideally rise in sonority (~loudness) from the edges towards the nucleus (typically a vowel, Clements 1990). Glides are the most sonorous consonants (C), followed by liquids, nasals, and obstruents, respectively. Sonority rises (increase in sonority from C1 to C2; e.g., /blik/) are well-formed, while sonority plateaus (0 difference; e.g., */bdik/) and falls (decrease in

sonority from C1 to C2; e.g., */lbik/) are typically ill-formed. In line with a universalist view, newborns auditorily prefer SSP-conforming structures over SSP-violating ones (Gomez et al. 2014). However, computational models have shown that the SSP can be learned from the lexicon without an assumption of innate knowledge (Daland et al. 2011), supporting an experience-based view. Whether the SSP can be learned exclusively from experience can be experimentally tested in cross-linguistic comparisons, as languages differ in how much they adhere to the SSP. Germanic languages are claimed to generally follow SSP (van Oostendorp 2020), Slavic languages do not (Selkirk 1984); while other languages lack consonant clusters in the underlying forms altogether (e.g., Japanese; Kubozono 2006). The main aim of this study is to examine the extent to which SSP is learned through experience.

We plan to test 5- and 9-month-old infants who are being raised either with German (SSP-following) or Japanese (no consonant clusters) (i.e., 24 per age and language group). We will investigate through a central fixation paradigm experiment whether infants prefer listening to word-initial clusters that are more well-formed in terms of the SSP compared to less well-formed ones. For the first experiment, we are comparing German-learning infants' looking times to stimuli containing pseudowords with rising clusters (i.e., mlaga, dlaga) vs. pseudowords with fall clusters (i.e., lbaga, mdaga). The German dataset is expected to be completed by the time of the conference.

If the SSP is experience-independent, German- and Japanese-learning infants will show different looking times for the two conditions (most probably a familiarity preference for well-formed clusters). If the SSP is experience-dependent, we expect German-learning 9-month-olds to show a stronger preference for rises over falls compared to the 5-month-olds as the former have obtained more experience with clusters in the input than the latter. Additionally, we expect Japanese-learning infants to not show a preference for any condition as no support for SSP can be found in their language input.

For each sonority contour condition, two word-initial CC clusters which are neither attested in German nor Japanese, but attested in Russian were chosen. Russian clusters were considered to ensure that the stimuli were ecological and properly pronounceable as clusters. All Cs and vowels in the pseudowords are present in both German and Japanese phoneme inventories. Each pseudoword appears in 3 trials, resulting in 6 trials per condition. Each trial contains 14 tokens of one pseudoword, and is 14 sec. long. The tokens were recorded by a native Russian speaker in isolation. The recordings were controlled for duration, pitch, pitch accent, prosody, and intensity.

Each participant will encounter 1 practice (sonata), and 12 experimental (6 of each condition) trials. The data will be analyzed using linear mixed-effects models, testing for the main effects of sonority contour, age, and trial number; and the interactions of sonority contour and age, and sonority contour and trial number; on the infants' looking times.

Overall, our results will contribute to debates on how much of language acquisition is universal and how much is based on experience.

# P1.28. Rhythmic abilities and statistical learning in infancy

In-person presentation

Iris van der Wulp, Utrecht University
Marijn Struiksma, Utrecht University
Frank Wijnen, Utrecht University

Contact: i.m.vanderwulp@uu.nl

**Introduction**

Speech segmentation is an important first step in language acquisition. Statistical learning (SL) has been shown to support segmentation (Saffran, Aslin, et al., 1996). SL entails tracking transitional probabilities (TPs). TPs refer to the probability that an element X is followed by Y, given the overall frequency of X. Syllable TPs are higher within words than between words in natural languages (Saffran, 2003) and therefore useful for detecting likely word boundaries. Experiments using the head turn preference paradigm (HPP) have shown that infants can use TPs to segment continuous speech (Choi et al., 2020; Saffran et al., 1996; Singh et al., 2012, i.a.).

These results also show interindividual variability, which has been linked to individual differences in subsequent language development such as vocabulary size, or even development of language-related disorders (Siegelman, 2020; Singh et al., 2012). However, the HPP is not the most sensitive method for investigating individual differences (e.g., Kidd et al., 2018). In contrast, neural entrainment is a reliable measure of SL used during exposure that is more sensitive to individual differences than the HPP (Batterink & Paller, 2017; Choi et al., 2020).

We propose that interindividual differences in SL depend on differences in rhythmic ability (RA), i.e., musical rhythm perception and synchronization ability. RA is heritable and has been shown to also predict linguistic development (Lad nyi et al., 2020; Niarchou et al., 2022). Neural entrainment is also a reliable measure for RA through rhythm perception (Cirelli et al., 2016; Lenc et al., 2022) and parents' musical experience predicts better infant RA measured with neural entrainment (Cirelli et al., 2016).

Furthermore, there is evidence for shared neural mechanisms of rhythm and language via the auditory dorsal stream of speech processing (Hickok & Poeppel, 2007), which is also important for rhythm perception (Lenc et al., 2021; 2022). White matter areas of the dorsal stream are larger in adult participants who perform better in both a rhythmic task and subsequently also performed better in a behavioral linguistic SL task (Assaneo et al., 2019). Thus, more RA could yield more neural entrainment to auditory stimuli, predicting individual differences in SL. A remaining question is if infants with better RA also show better SL abilities measured with neural entrainment.

**Experimental methodology**

We will investigate if SL is correlated to RA in 6-8-month-old infants. To assess SL, we will expose infants to continuous speech consisting of four tri-syllabic words (TPs within words:

1.0, TPs between words: 0.33). During exposure, we will measure EEG and neural entrainment to the syllable and word frequencies of the input (similar to Choi et al., 2020). To assess RA, we will use the EEG neural entrainment paradigm as well, while exposing the same infants to weakly periodic musical rhythms (Lenc et al., 2022). Importantly, these stimuli will consist of different input frequencies than the stimuli in the SL task. Measures of neural entrainment will be comparable between conditions, but any effects cannot be contributed to specific input frequencies.

We will compare neural entrainment during SL and rhythm perception for each infant, assessing if this is inter-correlated. We will furthermore measure RA in both biological parents of each infant and investigate if parents' scores predict infant SL and/or RA based on the infant EEG measure of neural entrainment.

**Possible results**

We predict that infant neural entrainment in the SL task is correlated with neural entrainment in the rhythm perception task, indicating shared neural resources for SL and RA already available in infancy. We also predict that parents' RA are positively related to infant SL and rhythm perception. At the time of MPaL2023 we are finishing final preparations for this project and we invite the audience to discuss our planned Bayesian statistical analyses with us.

## P1.29. Do dialect-specific prosodic properties shape the path to contrastive focus? Production and comprehension data from 3-5 year-old children acquiring Stockholm or Scania Swedish

In-person presentation (by Althaus, Sayehli)

Gilbert Ambrazaitis, Linnaeus University
Nadja Althaus, University of East Anglia
Charlotte Bertilsson, Linnaeus University
Simone Löhndorf, Kristianstad University
Anna Sara H. Romøren, Oslo Metropolitan University
Susan Sayehli, Stockholm University

Contact: Gilbert.Ambrazaitis@lnu.se

Cuing information structure (IS) is a fundamental function of prosody in many languages. For instance, in English or Dutch, a contrastive focus on the color adjective in a phrase like *the green boat* is marked by a pitch accent on GREEN and, crucially, a lack of post-focal accent on BOAT: *the GREEN boat.* Listeners infer from this prosodic structure that *boat* represents already activated (given) information and that the color that is specially mentioned represents one out of a set of alternatives.

According to research findings, children achieve proficiency in the production of prosodic IS encoding within the age range of 4 to 8 years, displaying considerable variability. This variability is suggested to result from structural prosodic differences between languages. For

instance, Stockholm Swedish speaking children mark (non-contrastive) focus using the Swedish prominence cuing H(igh) tone in an adult-like manner already at 4-5 years, while Dutch speaking children handle Dutch intonational pitch accents only after the age of 7-8 years. One hypothesis is that this relates to the presence of lexical pitch accents in Swedish, which could make Swedish speaking children more sensitive to prosodic contrasts; in addition, the combination of lexical accent + prominence H results in a complex contour which is particularly salient. However, studies investigating this have usually had a strict focus on speech production.

The few previous studies that have conducted parallel production and comprehension experiments have typically used offline methods to assess comprehension. More recent studies using online methods such as eye tracking have usually not included children younger than 6 years of age and have not been complemented by production data.

In this study we combine production and comprehension experiments, using eye tracking, to study contrastive focus prosody in 3- to 5-year-old children speaking either Scanian or Stockholm Swedish. In Scanian, instead of adding the prominence H-tone for focus, phrase-level prominence is encoded through phonetic adjustments of the (lexical) HL accent patterns. By comparing these two Swedish varieties we can thus control for phonological features (incl. lexical tone), as well as grammar and lexicon, when exploring effects of prosodic-typological differences.

In our production experiment we elicit adjective-noun phrases in three different focus conditions (broad, contrast on adjective, contrast on noun), using an interactive video/card game. Production data are analyzed acoustically and auditorily.

As for comprehension, our visual-word eye-tracking experiment makes use of the same pictures of colored objects to investigate whether and how children rely on prosody for reference resolution (e.g., Where is the yellow boat? And where is the GREEN boat?). The time course of eye movements will be analyzed using growth curves. Both production and eye-tracking data will be analyzed as a function of dialect, age and standardized measures of language production and comprehension (The New Reynell Developmental Language Scales), as well as compared to data from adult controls. Data are currently being collected.

A preliminary analysis of eye-tracking data from 24 Scanian children (ages 3-5 years collapsed) and a subset of adults from both dialects suggests similar comprehension of focus prosody as in adults (as a mismatched focus prosody in the adjective successfully elicits looks at the foil item in all groups), although processing appears to be slower, and anticipatory strategies differ slightly from those of adults (as the color of the first-mentioned adjective in a trial elicits looks at the color-matched distractor in adults, but not in children). An analysis contrasting comprehension data for both dialects, as well as a preliminary analysis of production data will be presented at the conference.

# P1.30. Neural preparedness for spoken language: Neural speech tracking in newborns of Czech-speaking, Russian-speaking, and signing mothers

In-person presentation

Martina Dvořáková, Charles University & Czech Academy of Sciences
Kateřina Chládková, Charles University & Czech Academy of Sciences
Jan Kremláček, Charles University

Contact: martina.dvorakova@ff.cuni.cz

Shortly after birth, humans exhibit remarkable language-specific skills. They can distinguish the language(s) their mother spoke when pregnant from other unfamiliar languages and respond more strongly to familiar songs and nursery rhymes over unfamiliar ones (Moon et al., 1993; DeCasper a Spence, 1986; May et al., 2018). Although the early attunement mainly concerns global speech characteristics like melody and rhythm, recent evidence suggests newborns might even process individual vowel segments in language-specific ways. It is well-established that a newborn's brain is tuned to spoken language already at birth (Pena et al., 2003; May et al., 2018; Chladkova et al., 2021, etc.). However, it is unknown to what extent this early attunement is innate and to what extent it is learnt from exposure - this is because previous studies investigating newborns' speech processing have always worked with infants prenatally exposed to language.

In a series of experiments, we aim to assess whether the readiness for speech at birth is more likely shaped by prenatal language input or whether it arises from inherent biological mechanisms. To this end, we measure neural tracking of native and non-native speech in newborns born to Czech-speaking (N=30), Russian-speaking (N=30), and non-speaking (N=15) mothers who use sign language for communication. Infants are tested within the first 3 days after birth, while asleep. Their neural activity is recorded from 6 EEG scalp channels while a natural recording of children's story is played in Czech (lack of prosodic prominences at word level) or Russian (acoustically distinct marking of word-level stress), in infant-directed speech (IDS) or adult-directed speech (ADS).

We analyze total power, temporal response function, and inter-trial phase coherence. We predict that newborns will exhibit more accurate neural tracking of the language to which they had been exposed prenatally. This language-specific effect is predicted to be evident specifically in the acoustically most prominent frequency band which is the theta band in Czech (which mostly contains syllable-level prominences at about 4 to 5 Hz) and delta band in Russian (which, besides the syllable-level prominence also contains salient word-level prominences at about 1.5 to 2.5 Hz). Additionally, we explore whether the influence of mother tongue on speech processing at birth will be more pronounced during IDS or ADS. Data collection for our study is currently underway.

# Day 1 online posters

## OP1.01. Speech maturity dataset

Online presentation

William Havard, Département d'Etudes Cognitives, ENS, EHESS, CNRS, INRIA, PSL University
Loann Peurey, Département d'Etudes Cognitives, ENS, EHESS, CNRS, PSL University
Alejandrina Cristia, Département d'Etudes Cognitives, ENS, EHESS, CNRS, PSL University
Kasia Hitczenko, Département d'Etudes Cognitives, ENS, EHESS, CNRS, PSL University

Contact: william.havard@ens.psl.eu

Over the first years of life, children's spontaneous vocal productions become increasingly adult-like, both in their shape and phonetic properties, and lay the foundation for later phonetic and phonological development. Yet, research in this area has been limited to a narrow set of languages and communities, mainly Indo-European languages from Western(ised) speaker communities, and focused on a narrow age range (0 - 24mo).

We present a new publicly-available dataset, the Speech Maturity Dataset (SMD), consisting of 258,914 clips manually labelled for speaker and vocalisation type extracted from the long-form recordings of 398 children (209 male, 186 female) from 2 months to 6 years of age from 14 communities (ranging from rich industrialised societies to farmer-forager speaker communities) in 25+ languages. Albeit already massive, our dataset represents the first version of an ongoing and collaborative effort between field linguists, psycholinguists, and citizen scientists. The data set is expected to be expanded on a regular basis, since the project is still live (LINK REMOVED FOR DOUBLE-BLIND REVIEW).

SMD is a superset of the already existing BabbleCor dataset (Cychosz et al., 2019) which originally consisted of ~15k vocalisations. We followed the same methodology to constitute our dataset, whereby all the clips received a label based on the majority vote of at least 3 citizen scientists (i.e., non-scientific volunteers who devote time to annotate and label scientific data). Contrary to BabbleCor, which used the smaller and closed iHEARu-PLAY platform, we turned to the world's largest open citizen science platform, Zooniverse, as it had a larger and more diverse pool of citizen scientists. Citizen scientists labelled vocalisations taken from naturalistic long-form recordings with their vocalisation type: laughing, crying, canonical (speech-like vocalisation containing an adjacent consonant and vowel), non-canonical (speech-like vocalisation without an adjacent consonant and vowel), or junk (silence or non-human sounds). For a subset of the clips (N=110,577), citizen scientists also labelled the speaker type: baby (younger than 3 years), child (3-12 years), female/male adolescent (12-18 years), or female/male adult.

SMD, which includes a wealth of metadata (child's age/sex, linguistic environment, normativity, etc.), lends itself to several use cases. It can be used to study child vocalisation development at an unprecedented scale in a wide variety of communities, by computing indices of vocal development such as canonical proportion (i.e. the proportion of speech-like

vocalizations that contain an adjacent consonant and vowel - regardless of whether they are in babble or meaningful speech) or linguistic proportion (i.e. the proportion of vocalizations that are speech-like). This dataset can also be used to train vocalisation-type classifiers in an effort to make software dedicated to the study of child language acquisition free, open-source, and reproducible.

We showcase a potential use of this data set by presenting a preliminary analysis of canonical proportion and linguistic proportion. We fitted two linear mixed effect models to predict canonical proportion and separately, linguistic proportion from the child's age, sex and monolingualism as fixed effects, and child ID nested in corpus as a random effect to account for individual variation. While for both models we observe a statistically significant positive effect of age (which is natural, as we expect these proportions to increase with age), we do not observe any significant effect of monolingualism or sex, suggesting that children follow a similar development trajectory. Results like these promise to allow researchers to significantly expand their knowledge of early vocal development.

# OP1.02. Exploring links between visual attention and language production in children

Online presentation

Sarah Dolscheid (Verlage), University of Cologne
Martina Penke, University of Cologne

Contact: sverlage@uni-koeln.de

Background: The way speakers produce an utterance is closely linked to their allocation of attention. For instance, when asked to describe a picture with two characters, speakers are more prone to start an utterance with a visually cued character which is in the spotlight of attention (e.g., Gleitman et al., 2007). However, while such links between attentional orienting and language production have been attested for adult speakers, this relationship has not yet been investigated in children. In the present study, we sought to address this open issue by testing 4- to 5-year-old children in a picture description task while their gaze patterns were monitored via eye-tracking.

Methods: Twenty-seven German-speaking children (13 female, 14 male) were asked to describe pictures of two characters presented next to one another. Children were asked to describe the characters in terms of a conjoined noun phrase (e.g., a fisher and a farmer). We manipulated children's allocation of attention by means of a brief visual cue presented in the place where the left character was about to appear. The cue consisted of a small, red circle presented for the duration of 700 milliseconds. In a baseline condition, no cue was presented.

Results: A generalized linear mixed effects logistic regression model revealed that visual cueing was highly effective in modulating children's attention, as reflected by a significant increase in first fixations to the cued character compared to a baseline without cueing, $z.ratio = 6.85$, $p < .0001$. At the same time, children were also more likely to start their utterances

with the cued character compared to baseline, z.ratio = 2.91, p = .004. Children's first fixations to a character also correlated significantly with their propensity to first mention that character, demonstrating that children were more inclined to produce an utterance with an entity that was in their focus of attention, r = .51, p < .01. However, at the same time, we found not all children displayed an attentional cueing effect in the expected direction. Concerning the order of language production, 7 of 27 children (26%) did not show a cueing effect in the expected direction but rather a reversed cueing effect (i.e., a tendency to mention the non-cued entity before the cued character).

Discussion and Conclusion: Overall, we found that children's first looks to a character were predictive of their order of mention, showing that children were more likely to first mention a character when they had also initially looked at this character. Furthermore, by experimentally manipulating children's visual attention, we found that children were more inclined to start an utterance with an entity that was in their spotlight of attention. Therefore our findings provide first evidence of close links between visual attention and language production in children. However, at the same time, we found that not all children displayed a cueing effect in the expected direction. It appears that whether or not attention modulates children's order of mention is subject to inter-individual differences.

References:

Gleitman, L. R., January, D., Nappa, R., & Trueswell, J. C. (2007). On the give and take between event apprehension and utterance formulation. Journal of Memory and Language, 57(4), 544-569.

## OP1.03. Improving children's spoken language via implicit learning of syntactic and narrative structures

Online presentation

Athina Ntalli, University of Oxford
Jelena Mirković , York St John University
Adhvika Shetty , The Promise Foundation, India
Pooja Pandith , The Promise Foundation, India
M. N. Usha , The Promise Foundation, India
Sanjana Nagendra , The Promise Foundation, India
B. Kala, The Promise Foundation, India
S. Chandana, The Promise Foundation, India
Rinkle Crasta, The Promise Foundation, India
Deeksha Prabhu, The Promise Foundation, India
Gideon Arulmani, The Promise Foundation, India
Sonali Nag, University of Oxford

Contact: jelena.mirkovic@york.ac.uk

Strong spoken language skills are fundamental for literacy development when children start school, and for later academic achievement and life outcomes (Adlof & Hogan, 2019). In the current study we implement theoretical frameworks and findings from child language research to assess the extent to which structured language input can enhance children's

language in a multilingual setting. We examine this question in children speaking Kannada, an understudied morphologically rich agglutinating language of South India, used by 70 million speakers.

We build on the research that has established a strong role for implicit learning mechanisms and language production in learning syntactic structures (e.g., Chang et al., 2006; Hopman & MacDonald, 2018; Kidd, 2012), and we extend it to the learning of narrative structure (story grammar). We designed a story-based spoken language intervention with a primary aim to examine the role of repeated exposure to structured narratives and targeted syntactic structures in enhancing their use in a diverse sample of multilingual children where the target language (Kannada) was a first or an additional language. Our secondary aim was to assess the feasibility of a story-based psycholinguistically-informed spoken language intervention.

The intervention was implemented over ten consecutive daily sessions run in small groups of four to eight children in four urban settings in South India. The participants were 87 5-6-year old Kannada-speaking children. Each session comprised a story exposure phase followed by a question-asking phase. A different story was presented in each session. Each story included six common story-grammar elements presented in the same order (setting, characters, initiating event, problem, attempt, resolution). All stories included 15-17 sentences that included an early-acquired (in a first-language context; Hesketh et al., 2006) temporal subordinate clause (e.g., When Toto saw Avi cutting her hair, he laughed heartily.). The stories were presented as a shared book reading activity. A question-asking activity followed the exposure phase. It included 10 questions eliciting either the story-grammar elements (e.g., What problem did Toto and Avi have?) or the target sentence structures (e.g, What did Avi and Toto do after Mom and Dad left for work?). In half of the sessions the questions focused on the sentence structures, and in the other half on the story elements. The order of the sessions (sentence-structure, story-element) was counterbalanced across groups.

The effect of the intervention was assessed using a story retelling task using a previously unseen story run immediately before the intervention (T1), mid-way through (T2), immediately after (T3), and a month after the intervention (T4). This allows us to assess the overall effect of the intervention on the child's language immediately after the intervention (T3 vs T1) and after a delay (T4 vs T3), and additionally any specific effects of the focus during the question-asking phase (T2 vs T1, for groups receiving the story-grammar questions vs the sentence-structure questions). The stories were rotated across the ten intervention and four testing sessions, such that each story occurred across all sessions. The key outcome measures were the use of the story grammar elements and the target sentence structures.

Data transcription and coding are ongoing. The completed data analyses demonstrate a 10% increase in the use of the story grammar elements immediately after the intervention (T3 vs T1, using linear mixed-effects models with time point as a fixed effect, and child and story as random effects). Further planned analyses will examine the effects of the intervention on the use of the target sentence structures and the story grammar elements at different time points, and whether these effects are moderated by the child's language environment at home and in school, and their pre-exisiting Kannada language skills.

# OP1.04. Neither bilingual experience nor home language environment relate to cognitive control of bilingual children

Online presentation

Xiaowei Gong, Middle East Technical University,
Asli Aktan-Erciyes, Kadir Has University
Basak Sahin-Acar, Middle East Technical University
Dilay Z. Karadöller , Middle East Technical University

Contact, xiaowei.gong@metu.edu.tr

There is a growing interest in whether different dimensions of bilingual experience could be associated with cognitive abilities in bilingual individuals (Kang, 2019). Previous work demonstrated that a higher rate of language switches was associated with smaller mixing cost in errors in shifting tasks (Soveri, 2011). Additionally, the proficiency level of a second language, as well as the extent that people tend to mix their languages (i.e., language use) in daily lives are associated with the amount of practices implemented in various cognitive processes (Costa, 2009). Little is known about the interrelations between different dimensions of bilingual experience as well as their contributions on cognitive performance. Here we investigated the (1) interactions among the above-mentioned dimensions of bilingual experience both from young children and parents (i.e., children's and parents' code-switching frequency, language proficiency, language use), and asked (2) which of these variables are more strongly related to children's cognitive control abilities.

Participants were families (parents (n=48); children (n=24,AgeRange=2.5-4)) from Turkey applying more than one language within home environment on a daily basis. They provided 15-minutes long audio recordings of interactions that allowed us to conduct natural observations of code-switching frequency within the household. The Bilingual Language Experience Calculator (BiLEC) questionnaire (Unsworth, 2013) was applied to investigate children's and parents' language proficiency and language use. Children's cognitive control abilities are assessed via Dimensional Card Sort (DCCS) Task (Zelazo, 2013) and Visual Search Task (Verhagen, 2020) via online meeting.

Three multilingual researchers transcribed and coded audio recordings for code-switching frequency of parents and children. Additionally, four other bilingual experience-related variables (children's and parents' language proficiency and use) were calculated from the BiLEC. Lastly, children's cognitive control performance was coded as total accuracy scores of each task.

We conducted correlation analysis to detect possible associations among above-mentioned variables and age. Children's code-switching frequency was positively associated with children's language use (r=.402,p=.051), and negatively associated with age (r=-.438,p=.032) and parent's language proficiency (r=-.480,p=.018). Parents' language proficiency was negatively associated with parents' language usage (r=-.437,p=.033). Children's language usage was positively associated with parent's language usage (r=.460,p =.024) and children's language proficiency (r=.419,p =.042). Lastly, children's cognitive task

performance was strongly correlated with age (rDCCS=.559,p=.004, rVisualSearch=.585,p=.003) but not with any of the bilingual experience related variables from both children and parents (all ps>0.05).

Summarizing, preliminary results indicated that the more evenly children use their home languages, the younger the children, as well as the less proficient their parents' second home language, the more frequently children switched from one language to another on a daily basis. Also, the more proficient parents are in their second home language, the less likely they are to speak in a language that differs from each other's. Moreover, whether or not children use their home languages evenly is positively associated with whether children have equal mastery for those languages and whether parents apply the "one parent one language" policy. Lastly, we discovered that age but bilingual experience related variables act as a strong predictor for children's cognitive control abilities. This study is among the limited work that studied the variation within bilinguals incorporating evidence from multiple bilingualism dimensions as well as bilingualism executed in the home environment, and investigated the potential effect of each dimension on children's cognitive abilities.

## OP1.05. A maturational frequency discrimination deficit may explain developmental language disorder

In-person presentation

Samuel Jones, Bangor University and Lancaster University
Hannah Stewart, Lancaster University
Gert Westermann, Lancaster University

Contact: samuel.jones@bangor.ac.uk

Frequency discrimination deficits are widely recognised among children with developmental language disorder (DLD). Yet, the nature of these deficits and their relation to early speech processing problems remain unclear. The neural microarchitecture supporting high resolution frequency discrimination matures from the prenatal period through infancy and childhood, and it is possible that the frequency discrimination deficits seen among some children with language learning difficulties stems from a disruption to this typical developmental trajectory. Given that frequency tuning throughout the auditory pathway is grounded in the structural properties of the basilar membrane, we hypothesised that the atypical maturation of the structural properties of the basilar membrane may provide a good starting point for systematic inquiry into the source of frequency discrimination deficits and speech processing difficulties in children with DLD. Our hypothesis, then, was that:

Early disruption to the maturation of the physical properties of the basilar membrane which underpin that membrane's mechanical gradient (i.e., increases in fibre density, diameter, and linear regularity) may disturb the optimisation of the auditory pathway from the brainstem to the cortex, curtailing high-resolution tonotopic sensitivity and contributing to speech and language difficulties in some children with language learning difficulties.

We developed this theoretical account through a series of computational simulations of speech encoding, recognition, and retrieval. The networks used in these simulations incorporated biologically faithful inner ear models developed to replicate human cochlea function (McDermott & Simoncelli, 2011) that were fed into deep convolutional neural networks. A major methodological innovation in this study was to configure these cochlea models to mature according to different developmental trajectories – i.e., (i) baseline or optimal, (ii) regular, and (iii) delayed trajectories – and to analyse how the subsequent auditory pathway model optimised in the service of speech encoding, recognition, and retrieval.

Our analysis of networks in the delayed cochlea maturation condition qualitatively replicated the linguistic behaviour and neurophysiology of individuals with language learning difficulties in a number of ways, showing: (i) delayed acquisition profiles; (ii) lower spoken word recognition accuracy; (iii) word finding and retrieval difficulties and uncertainty even when performing accurately; (iv) 'fuzzy' long-term speech representations and neurophysiological signatures of immature neural optimisation that are often associated with speech and language difficulties; and (v) apparent working memory and attention deficits that are attributable to the imprecision of long-term speech representations (rather than a functionally discrete working memory bottleneck). Our results illustrate that optimising to low-resolution spectral representations from the inner ear significantly curtails the capacity of the auditory pathway to optimise to encode speech representations supporting efficient recognition and retrieval. These simulations illustrate the many negative cascading effects that a very low-level frequency discrimination deficit may have on early language development and generate precise and neurophysiologically testable hypotheses for future research into the nature and cost of auditory processing deficits in children with language learning difficulties. We believe that this project is of interest to the MPaL audience given its focus on the fundamental mechanisms and cascading effects that shape early neurotypical and neurodivergent language acquisition.

# Day 2 in-person posters

## P2.01. Believe what you see: Children's interpretations of perception verbs used for beliefs

In-person presentation

Serene Siow, National University of Singapore
Nick Huang, National University of Singapore

Contact: s.siow@nus.edu.sg

Perception verbs like see can be used to represent visual scenes (e.g., "I see a bird") or beliefs (e.g., "I see Jo is late"). The UNDERSTANDING IS SEEING metaphor has been used to explain how the belief sense of see may be learnt through correlations with visual situations (Johnson, 1999). When a viewer sees a bird in a tree, it is a prerequisite that a bird is there in reality, and the viewer thus gains a true belief of the bird's presence. This ties in with the belief sense of see, which is factive (presupposes that the statement accompanying the verb is true; "I see Jo is late" means that Jo is late in reality). However, this metaphor actually poses problems for the acquisition of Mandarin kan4 (look/think). Mandarin kan4 is generally interpreted as non-factive (no presupposition, like English think; "I think Jo is late" is still compatible with Jo not being late). If learners make inferences about factivity by reasoning that visual perception gives rise to true beliefs, we expect children to initially have a mistaken interpretation of kan4 as a factive verb. However, if children form independent hypotheses on the meanings of see and kan4 through other cues, such as syntax and pragmatics (Dudley et al., 2017), we expect even young children to interpret see as factive and kan4 as non-factive.

In this planned study, our sample will be 4 and 5-year-old bilingual children growing up learning English and Mandarin. The bilingual sample allows us to test both see and kan4 in the same participants. We use an experiment paradigm designed to test children's understanding of belief verbs, adapted from Moore and Davidge (1989). We set up a computerized 2AFC task where a main character Teddy plays hide-and-seek with the participant. On each trial, Teddy hides in one of two colored boxes and two other characters give the child clues on where Teddy is hiding (e.g., "I know Teddy is hiding in the red/blue box"). For English, we test contrasts between statements with see and those with know (factive) or think (non-factive). We use know and think as baselines to test children's understanding of see's factivity. Children as young as 4-years-old have been found to reliably use a statement with know over one with think to guide their guesses on where the experimenter has hidden a target object (Moore & Davidge, 1989; Howard et al. 2008). For Mandarin, we test contrasts between zhi1dao4 (know: factive), jue2de2 (think: non-factive) and kan4 (look/think: non-factive). We supplement these analyses by also comparing a sentence containing kan4dao4 (see: visual) against zhi1dao4 and jue2de2, to test the assumption that children interpret visual verbs as depicting fact. For English, we use a sentence that elicits the visual sense of see ("I saw Teddy hide in the red box").

If children learn the belief sense of see and kan4 by reasoning a link between perception and true belief, we expect children to treat both see and kan4 as factive verbs. Operationalised, when given the contrasts of see–think or kan4–jue2de2, children should reliably choose the statement containing see or kan4 as the one more likely to be true, and show chance performance on see–know and kan4–zhidao4 conditions. On the other hand, if children form independent hypotheses on the meanings of see and kan4 from their occurrence contexts, see should be factive and kan4 non-factive. However, one criticism could be that bilingual children mistakenly treat kan4 as factive not because of the metaphor, but because of cross-linguistic transfer from English see to Mandarin kan4. Bilinguals' performance for the Mandarin task will be compared against that of a Mandarin monolingual group. If monolinguals and bilinguals show similar patterns for kan4, it would suggest that patterns can be attributed to shared learning mechanisms rather than cross-linguistic transfer. Findings from this study will shed light on the acquisition process of polysemous belief verbs in two languages.

## P2.03. Multimodal referential communication in newly-sighted children: A test of adaptive pragmatics

In-person presentation

Vrinda Bhatia, Jawaharlal Nehru University
Vishakha Shukla, New York University
Anwesha Mahapatra, Jawaharlal Nehru University
Madeleine Long, University of Edinburgh
Paula Rubio-Fernandez, Max Planck Institute for Psycholinguistics

Contact: vrindabhatia28@gmail.com

We recently investigated how gaze following, cued by head motion, supports referential communication in a unique population: newly sighted children who were treated for dense congenital cataracts after years of visual deprivation. Adopting the name of the humanitarian/scientific organization that sought their treatment in India (Sinha and Held, 2012; Sinha, 2013), we refer to these children as Prakash children. In a referential communication task with pre-intervention (static), intervention (videos), and post-intervention (static) trials, Prakash children benefited from the motion cues in the videos, both when comparing their initial performance with static gaze cues to their performance with dynamic head turning, and their performance with static cues before and after the videos (Rubio-Fernandez et al., 2022). Our results therefore confirm that Prakash children rely on head motion as a strong cue to referential intent.

Here we report a follow-up study investigating Prakash children's sensitivity to referential cues in face-to-face interaction. Experiment 1 was a pre-test, in which two cohorts of Prakash children performed a referential communication task in pairs, while one of the children wore eye-tracking glasses. The first cohort included 8 children (ages: 6-15; M: 10) tested 3 times (from pre-op to 6m post-surgery) and the second included 6 children (ages: 6-16; M: 11.3) tested 4 times (from pre-op to 1y post-surgery). Age- and gender-matched controls were recruited from a local school in Delhi. All children took turns to describe their

favorite toy from a set of 2 or 3, and their partner had to guess which toy they were describing, across 10 trials. The results of the pre-test confirmed that Prakash children have strong pragmatic skills: these children produced sufficiently-informative descriptions in 80% of trials (e.g., 'I like the blue teapot'), while the control group was at ceiling, and both groups showed a preference for color over size in their descriptions. The eye-tracking data revealed that Prakash children looked less at their partner's face, both as speakers and as listeners, than their matched controls.

In Experiments 2a and 2b, Prakash children could make use of various referential cues to disambiguate an instruction ('Could you give me that one?' – from a line of 3 rolls of red tape placed between the child and the Experimenter): Head orientation + Voice direction; Head orientation + Pointing; Head orientation only, and Gaze only (presented in that order for increasing difficulty). The Experimenter looked at the target object in all four conditions and, except for the first condition, she made the verbal request looking at the child *before* providing the disambiguating cue(s). The task was short (1 warm-up trial + 8 experimental trials, 2 per condition) and at the end of the last testing session, the Experimenter collected control data by asking the child: 'Look at my face, where am I looking now?' and shifting her gaze (6 trials).

As expected, children found the Head-only and Gaze-only conditions the hardest, clearly benefitting from voice direction and pointing. Interestingly, however, children were better at following the Experimenter's gaze in the control trials than in the experimental conditions, suggesting that they required prompting to follow the Experimenter's gaze. By contrast, the neurotypical controls were at ceiling in all conditions. The eye-tracking data confirmed that Prakash children did not naturally orient towards the Experimenter's face during the task.

Experiment 2b used the same task but with feedback, such that Prakash children were asked to pay attention when they selected the wrong object. Once again showing their strong pragmatic skills, Prakash children started orienting more towards the Experimenter's face when they received feedback on their referential choice, even though they were never directly prompted to do so.

# P2.04. Rhythmic discrimination of languages in infants with hearing loss

In-person presentation

Gaia Lucarini, University of Padova
Caroline Nallet, University of Padova
Davide Brotto, University of Padova
Alessandro Martini, University of Padova
Patrizia Trevisi, University of Padova
Judit Gervain, University of Padova, CNRS & Université Paris Cité

Contact: gaia.lucarini@phd.unipd.it

Introduction: During the last trimester of pregnancy, the fetus can hear and starts to experience speech. The maternal tissues act as low-pass filters, preserving mainly the prosody of speech. At birth, newborns show sensitivity to the rhythm of their native language, i.e. the language they heard prenatally, being able to discriminate it from a rhythmically different language and the native language is triggering a greater and/or more left-lateralized brain activations (Peña et al. 2003, May et al., 2018). A current hypothesis (Gervain, 2018; Nallet & Gervain, 2021) suggests that prosody, perceived before birth, provides the basis of early speech perception and helps infants discover other linguistic units after birth, when the full-spectrum speech signal is available. Prenatal experience is thus hypothesized to be foundational for language learning. But what happens when the prenatal experience is disrupted?

Methods: To investigate this, we are testing the ability of 0-10-month-old infants with hearing loss (HL) to discriminate their native language (Italian) from a rhythmically different unfamiliar language (English). Sentences in both languages are presented forward and backward. Backward speech, with perturbed temporal features, is a standardly used non-linguistic control, matching the physical properties of forward speech overall (Peña et al. 2003). A control group of age-matched normal hearing (NH) infants is also tested. The two groups are tested using the same paradigm, and their brain activity is recorded using functional near-infrared spectroscopy (fNIRS) recorded in twenty channels covering the frontal, temporal and parietal regions, bilaterally. The sentences in each of the four conditions are presented in a simple block design, with the order of blocks intermixed and counter-balanced across infants. The sentences in the two languages and in the two orders of presentation (forward and backward) have been matched in intensity and duration.

Results: Data collection is ongoing ($n$ = 20 HL, $n$ = 20 NH). Once the final sample is reached, statistical analyses will be performed to investigate whether the brain activation in response to the native language and to the unfamiliar one differs in the hearing loss group, as well as in the control group. Comparison will be performed between the two groups of infants. Concerning the HL group, the hearing thresholds will be taken into account as a continuous variable to investigate its impact on prosodic perception. Preliminary results suggest that both NH and HL infants show positive, canonical hemodynamic responses to

Italian, but inverted responses to English. Group comparisons and the comparison of the forward and backward conditions are ongoing.

Conclusion: If found, a deficit in prosodic perception in infants with hearing loss could provide theoretical insights into the role of prenatal and early postnatal experience in language development, as well as important applications for screening and intervention in this population.

## P2.05. The development of Italian vocabulary, morphology and syntax: An observational study

In-person presentation

Benedetta Colavolpe, University of Padua
Lara Burgato, University of Padua
Gaia Lucarini, University of Padua
Judit Gervain, University of Padua, CNRS & Université Paris Cité

Contact: benedetta.colavolpe@unipd.it

Introduction: Despite increasing attention to language development across typologically different languages, acquisition remains understudied in many languages. Italian, an Indo-European language with moderately complex fusional morphology and Verb-Object word order, is one such example. To fill this gap, we longitudinally document and analyze the language development of a cohort of typically developing Italian-learning toddlers. Our aim is to track vocabulary growth, morphological development, the emergence of syntax and the interactions between them, as well as to contribute a new Italian corpus to the CHILDES database.

Methods: 7 toddlers were first assessed between 18 and 29 months and followed longitudinally over 10 months. The participants were recruited from a kindergarten in the north-east of Italy, all of them were Italian monolingual speakers, and healthy, with no reported concerns about language development. We assessed vocabulary using the Italian version of the MacArthur-Bates Communicative Development Inventory (Caselli et al., 2015) during the 1st and the 7th months of the observation period. We tested participants' knowledge of nominal morphology using an adapted Italian version of the Wug Test (Berko, 1958) at the beginning of the period, as well as their spontaneous speech productions recorded during free play and book-reading sessions and other kindergarten activities. Children's productions were recorded approximately every two weeks. All recorded speech samples were transcribed into CHAT format and were analyzed with CLAN (MacWhinney, 2014). To assess syntactic development, we calculated the MLU in words and in morphemes. The frequency of major lexical categories, non-prototypical word order and the emergence of subordinate clauses were also marked.

Results: All children were within the norm for their age on the CDI, despite considerable inter-individual differences. All achieved 100% correct responses on the Wug Test, exhibiting complete knowledge of nominal plurals. Nominal suffixes for gender and number were also

correctly produced in spontaneous speech, in line with previous findings for Italian (Caselli et al., 1995). MLUs scores increased considerably over the 10-month period, and we documented the emergence of combinatorial syntax. Open-class words were more frequent than functors and nouns were predominant at younger ages, while verbs prevailed from 30 months onwards (Caprin & Guasti, 2009). A more detailed analysis of lexical categories and of word order is ongoing. Vocabulary size and MLU will be correlated.

Conclusion: Our study documents the emergence of early productive language in Italian, an understudied language. The results support a model of language acquisition whereby different levels, e.g. morphology, syntax and vocabulary, develop in parallel, possibly interacting with one another.

## P2.06. Multimodal skills, but not motor skills, predict narrative and pragmatic skills in typically and non-typically developing preschoolers

In-person presentation

Júlia Florit-Pons, Universitat Pompeu Fabra
Mariia Pronina, Universitat Pompeu Fabra
Alfonso Igualada, Universitat Oberta de Catalunya
Pilar Prieto, ICREA; Universitat Pompeu Fabra
Courtenay Norbury, University College London

Contact: julia.florit@upf.edu

Many studies have investigated the link between body movements and language in development. Specifically, body movements can be non-communicative and be just muscle and limb movements (i.e., motor skills) or be also communicative involving hand gestures, body movements, facial expressions and prosody (i.e., multimodal skills). Research has been conducted assessing either motor or multimodal skills in relation to linguistic skills, especially in early childhood (for reviews see Hübscher & Prieto, 2019; Leonard & Hill, 2011). Importantly, recent studies have shown that multimodal skills can be predictive of language development (Castillo et al., 2023; Özçalışkan et al., 2016; Pronina et al., 2023; Wray et al., 2016). Nevertheless, to our knowledge, no previous study has directly compared multimodal and motor skills in relation to linguistic abilities, focusing on narrative and pragmatic abilities, which are key abilities for children's further social and academic success (Dickinson & McCabe, 2001). The aims of this study are two-fold: a) to determine whether multimodal skills can predict narrative and pragmatic skills in development by comparing them to the relationship with motor skills; and b) to compare between typically-developing (TD) children and children with neurodevelopmental disorders affecting language and communication (non-TD).

To do so, 140 children (57 girls; 87 TD and 53 non-TD) aged 3 to 7 (TD: M = 5.3; SD = 0.3; non-TD: M = 4.9; SD = 0.8) participated in the study. Children were administered different tests measuring their linguistic, narrative, pragmatic, multimodal and motor skills. Language

was assessed using CELF-5 or CELF Preschool 2 (Wiig et al., 2009; 2013). Narrative skills were evaluated using a narrative retelling task (adapted from Vilà-Giménez et al., 2019). Pragmatic skills were assessed using expressive and receptive measures, involving the Audiovisual Pragmatic Test (Pronina et al., 2019) and PleaseApp (Andrés-Roqueta et al., 2020). Multimodal skills were assessed with a multimodal imitation task (Castillo et al., 2023), a gesture elicitation task (Wray et al., 2016) and a gesture-speech integration task (Andrés-Roqueta et al., 2020), while motor skills were measured with two subtests from NEPSY-II (Korkman et al., 2007).

Preliminary results will be reported. First, we ran a correlation analysis which showed a significant positive correlation between multimodal skills and narrative and pragmatic skills in both TD and non-TD groups. Motor skills were only found to positively correlate with narrative skills in the TD group. After that, and in order to have a clearer picture of this relationship and to assess whether multimodality could predict narrative and pragmatic performance, two multiple regression analyses were run, with narrative and pragmatic abilities as dependent variables. The multiple regression models indicated that multimodal, but not motor skills, were significant predictors of both narrative and pragmatic skills. CELF and age were also found to be predictors of narrative and pragmatic skills. A main effect of group was also reported suggesting that group is contributing differently to the model. Moreover, the interaction between group and multimodal abilities was not found to be significant suggesting that the relationship between multimodal and narrative and pragmatic skills is not different depending on group.

This study is the first to assess the relationship between multimodal skills and narrative and pragmatic skills comparing them to motor skills. Our findings have highlighted the close relationship between multimodal and narrative and pragmatic abilities in both TD and non-TD children. Also, this close relationship seems to be dependent on age and language level. All in all, the current study shows that the communicative component of body movements (multimodality) is what predicts linguistic (narrative and pragmatic) abilities as opposed to non-communicative motor skills.

# P2.07. The relation between sleep and vocal learning in songbirds, a model for speech acquisition

In-person presentation

Sita ter Haar, Utrecht University
Yang Zheng, Utrecht University
Gabriel Beckers, Utrecht University

Contact: s.m.terhaar@uu.nl

Sleep is important for development, learning, health and stress reduction in humans and other mammals. Studies on humans have shown that sleep improves language acquisition. Furthermore, there is a possible relation between disrupted sleep and Developmental Language Disorder. For example, memorization of speech sounds after sleep is decreased in adults with DLD compared to controls. Investigating the exact causal mechanisms in humans is challenging for multiple reasons. Animal models such as songbirds can help elucidate neural mechanisms of the relation between sleep and vocal learning, including some related to language acquisition. However, in birds relatively little is known on sleep disruption and it is unknown if there is a causal relation between sleep and song learning. We designed a new sleep deprivation device for birds, and tested the effect of sleep deprivation on song learning in juvenile zebra finches (Taeniopygia guttata), recording the whole developmental period. Furthermore, we studied whether neural changes related to plasticity were caused by sleep deprivation. We confirmed that the method induced at least partial deprivation, by measuring the time the birds keep their eyes open. Preliminary results indicate subtle differences in entropy variance (a measure for song maturation) just after sleep deprivation. However, final song similarity between juvenile and tutor (a measure for song learning) on the syllable level was not different in these preliminary data. This suggests sleep disruption might temporarily disrupt song learning, but the effects are restored by subsequent sleep. A neural marker for increased plasticity around the onset of a critical period (parvalbumin) was reduced in sleep deprived birds. This preliminary finding may suggest a disruptive effect of sleep deprivation in early development, in line with the behavioral data. Further analyses of the whole developmental trajectory and more detailed analyses are necessary to confirm these findings. If the findings persist, this can guide human language acquisition research, focusing on neural changes as a result of sleep deprivation, particularly early in development.

# P2.08. Exploring the sociality of infant strain sounds in naturalistic interaction

In-person presentation

Iris Nomikou, University of Portsmouth
Emily Hofstetter, Linköping University

Contact: iris.nomikou@port.ac.uk

One of the earliest sounds an infant produces is a strain sound, as they exert their bodies. However, these sounds are mostly treated as 'vegetative' and usually excluded from analysis. Language development literature to date has largely focused on vocalic or 'speech-like' vocalisations – and caregiver responses to them – as the first in many steps towards producing words, treating strain sounds as by-products of bodily activity (e.g. Buder et al. 2013).

Few observational studies of infant grunting have found evidence to support the theory that grunts are originally produced 'purely' for physiological purposes and gradually reappropriated as tokens to communicate (McCune et al. 1996); the occurrence of communicative grunts increased over time while grunts coded as physiological (coordinated with movement) decrease over time. Yet little is known about this developmental transition towards language and even less about whether these vocalisations are treated as communicative and how they are scaffolded within interaction.

In this paper, we analyse naturalistic data of German speaking mothers interacting with infants and draw from a 15-hour longitudinal video corpus of monthly video recordings of 17 mother-infant dyads in a routine activity when the infants were 3-8 months old. Using Multimodal Conversation Analysis as our analytical framework we focus on a collection of infant strain sounds at three different time points; when the infants were three, six and eight months old. We focus on the timing of infants' body motions and strain sounds, and the mother's responses. We also capture the development of these practices across time.

Our initial findings suggest that through their responses, mothers treat infant strain sounds as communicative.

We observe how:

a. the coordinated strain sounds and motions are attributed as doing specific social actions,

b. the mothers display an attunement with the infant and attribute the sounds as arising from specific body events, as goal-oriented,

c. responses to infant strain vocalisations orient to the infant's ongoing bodily effort and acknowledge the infant as an agent in the interaction.

Our analysis proposes a sequential mechanism by which grunts come to be seen as meaningful, which may scaffold infants' learning that sounds and motions can accomplish social action. Furthermore, this evidence suggests that even sounds that are taken to be

physiological by-products cannot be straightforwardly separated from social action. This study thus supports an understanding of language development that is not solely oriented to language as an abstract system, but instead towards language as a situated, multimodal production of action.

## P2.09. German number cues and their variability of strengths within and across time

In-person presentation

Dinah Baer-Henney, University of Düsseldorf
Ulrike Domahs, University of Marburg

Contact: domahsu@staff.uni-marburg.de

In this corpus analysis of child-directed speech (CDS) and the investigation of the availability of German number cues along different learning mechanisms, we will demonstrate an instance of variation in early language development. This variation arises from the structural properties of the German number system and the varying accessibility of number cues in the input during the ages of three to five years. We assessed for each of the German number markers whether different learning mechanisms (frequency-based vs. discriminative learning algorithm) predict the same or different developmental trajectories.

We tested a frequency-based (Köpcke et al., 2021) and a discriminative learning algorithm (Baayen et al., 2011) on the importance of concrete number cues that were included in a child-directed speech corpus of a three-, four- and five-year-old German child. This corpus was constructed by selecting all occurrences of nouns of the child-directed input provided in the LEO-corpus (Behrens 2006, in CHILDES database, MacWhinney, 2000). The corpus included nouns Leo encountered from his third year of life up to the end of his fifth year during weekly or monthly recording sessions of spontaneous speech. The data for our analyses consisted of word forms, their frequencies of occurrence and their morpho-syntactic number tags, and were complemented by information about the phonetic form, the number of syllables, the position of word stress as well as the noun's stress pattern taken from the Celex database (Baayen et al., 1996). The corpus was divided into three subcorpora representing the input Leo received until his third, fourth and fifth birthday.

The subcorpora were then analyzed according to the occurrence of the markers -(e)n, -e, -er, -s, umlaut, and the prosodic pattern final trochee in singular and plural forms. It was tested whether these are valuable cues to infer a certain number meaning and whether their strengths varied with age. For this purpose, we analyzed different properties of the selected number cues: 1. their frequency of occurrence in singular and plural forms (Köpcke et al., 2021) and 2. their discriminative strength (Baayen et al., 2011). The results revealed that according to the frequency of occurrence, most cues' strength does not change over time, with a higher occurrence rate in singular nouns compared to plurals, except for the ending -(e)n, which occurs more often with plural meaning. However, considering predictions on the basis of discriminability of cues in a Naïve Discriminative Learning model, we obtained that the association strength of number cues with singularity and plurality changes over time and

cue types. For instance, while umlaut seems to be a stronger cue for plurality at age 3, the association strength decreases over time and even becomes reversed by age 5. For the suffix -s we detected the inverted pattern with a higher discriminative strength for singular at age 3 that changed to a stronger association with plural at age 5. In addition, for final trochees and forms ending in -s, we found contradictory results for frequency-based analyses and discriminative learning: although both occur in the CDS corpus predominantly with singular meaning, their discriminative strength is highest for plurality.

Overall, the analyses of CDS show that – based on the same data – learning models can yield very different outcomes depending on distinct underlying mechanisms. This is a valuable demonstration that different usage-based approaches come to different predictions with regard to the developmental trajectory of different cues within the same morphological paradigm. In addition, the stratified analyses conducted along the time axis reveal that the acquisition of the German number paradigm encompasses not only variability at the form and strength of number cues, but also in the timing at which cues unfold their strengths in number interpretation.

## P2.10. What I say matters: Longitudinal changes in children's response and interaction in Japanese question sequences

In-person presentation

Tomoko Tatsumi, Kobe University and Max Planck Institute for Psycholinguistics
Julian Pine, University of Liverpool
Contact: tt@port.kobe-u.ac.jp

Children's language development involves changes in their verbal behavior during interaction over time. Why children change their own behavior is an obvious yet understudied question. We address this question using a corpus-based study of Japanese question sequences in conversation. Specifically, we analyze how children change their own responses to their caregivers' Who-questions over development, and explore how these changes impact on the question sequences in interaction. We focus particularly on the functions of different lexical and grammatical elements within a turn, in order to shed light on important changes in linguistic details. Our hypothesis is that children monitor how their own linguistic behavior affects the subsequent interaction, and that they learn to adjust their linguistic choices to act cooperatively and progressively in social interaction.

In a first analysis, we examine whether children's responses become more cooperative as they grow older. Our results show that expected responses, which pick out an animate referent in answer to a Who-question, increase over development (Estimate = 0.042, SE = 0.010, z = 4.111, p = 3.94e-05). Another response type that increases is cooperative but unexpected responses such as repair initiation and admitting being unable to answer the question (Estimate = 0.027, SE=0.012, z=2.302, p=0.021). In contrast, unexpected and unintelligible responses reduce over time (Estimate = -0.057, SE = 0.011, z = -5.396, p = 6.80e-08, and Estimate = -0.058, SE = 0.018, z = -3.165, p = 0.002, respectively).

In a second analysis, we show that the responses become longer (Chi-sq (1, N = 311) = 18.178, p = 2.012e-05) and, more importantly, more multi-functional. Most early verbal responses are only propositional, and simply provide the piece of information requested by the interlocutor's Who-question. Later responses tend to include different linguistic elements as well. These elements, such as fillers, evidential expressions and politeness markings, add modal and interactional functions that specify and manage different aspects of the ongoing interactional sequence. Also, children start to actively manipulate the interaction by initiating a new sequence with a question or command of their own, as they grow older.

In a final analysis, we explore the dynamic link between changes in children's linguistic behavior and the interactional sequences in which this behaviour is embedded. We demonstrate that the provision of longer and more multi-functional responses tends to be associated with question sequences that are completed more quickly (Chi-sq (1, N = 311) = 21.587, p = 3.381e-06). In addition, multi-functionality in children's responses are negatively associated with that in caregivers' subsequent turns within a given question sequence (Chi-sq (1, N = 311) = 7.3571, p = 0.007). This implies that children's linguistic choices change in a way that contributes to a cooperative and progressive conversation. These choices affect interaction dynamics too, from early caregiver-lead interaction to a more balanced joint activity by both child and caregiver at later stages.

These results support our hypotheses, and suggest that children's linguistic choices allow more cooperation as well as more control over the interaction. We will discuss the importance of incorporating this active and strategic aspect of language use in social interaction in our search for a better understanding of language acquisition.

## P2.11. Is "he" the tiger or the hedgehog? Individual differences in children's processing of pronoun ambiguity in German

In-person presentation

Angelika Golegos, University of Konstanz
Theodoros Marinis, University of Konstanz

Contact: angelika.golegos@uni-konstanz.de

Research on pronoun ambiguity in German has mainly focused on adults. This phenomenon is far less researched in children and to our knowledge, no studies have investigated individual differences. In ambiguous contexts, German allows for two different third person singular masculine pronouns to resolve this ambiguity, namely the personal pronoun er and the demonstrative pronoun (henceforth d-pronoun) der, see Example (1).

1. Der Tiger(j) will den Igel(k) vorsichtig auf die Hand küssen Aber er(j)/der(k) kann nicht stillstehen.
   The tiger wants to the hedgehog carefully on the hand kiss. But he cannot hold still.
   'The tiger wants to kiss the hedgehog carefully on the hand. But he cannot hold still.'

Previous studies with adults have shown a strong preference to resolve the d-pronoun towards the object. For the personal pronoun, results showed an overall preference for a subject resolution. However, while the preference pattern for the d-pronoun seems to be stable, the preference pattern for the personal pronoun seems to be more flexible and therefore is partly also resolved towards the object (Bouma and Hopp, 2007; Schumacher et al., 2017). To date, for German only one study has investigated processing of pronoun ambiguity in 7 to 10-year-old children comparing them to adults. The aim of this eye-tracking study was to disentangle the cues that drive pronoun processing and how they differ between children and adults. Overall, for simple SVO sentences, children behave as predicted but still differ from adults. The authors argue for a developmental path but they do not present the child data in detail and therefore little is known about the nature of the differences (Blything et al., 2021). Our study aims at filling this gap, by investigating individual differences within a child group.

The present study investigates 6 to 8-year-old monolingually raising German children (n=20, mean age=7;4, SD=0,61, age range=6;1-7;11, 7 female). The data collection is ongoing aiming for 40 participants in total. In an online picture selection task, participants listen to sentences that contain two competing characters, followed by an ambiguous third-person singular masculine pronoun: the personal pronoun er and the d-pronoun der, see Example (1). While listening to the sentences, participants see three images on the screen, representing the competing subject and object as well as a distractor. After the end of the sentences, participants are asked a comprehension question that forces them to interpret the pronoun towards one of the two characters. Responses are given by clicking on the image of the respective character.

Preliminary results indicate that children show similar processing patterns to adults. In line with previous adult studies, children preferably resolve the d-pronoun towards the object and the personal pronoun towards the subject. However, their preferences are far less consistent and show variability. Contrary to the predictions, especially when children encounter the personal pronoun, they resolve it not only towards the subject but often towards the object. We will discuss how individual differences in processing of pronoun ambiguity are driven by internal and external factors. For internal factors, we are taking into account the factor age and cognitive abilities, in terms of working memory. For external factors, we are including in the analysis the factor reading frequency and socioeconomic status, in terms of maternal education.

# P2.12. Evidence for a morphosyntactic marker of genericity in Turkish: *-dır*

In-person presentation

Naz Deniz Atik, Northwestern University
Gregory Ward, Northwestern University
Sandra R. Waxman, Northwestern University

Contact: denizatik@u.northwestern.edu

Generic statements convey information about category members as a whole (e.g., zebras), rather than about particular individual members (e.g., the zebras). As a result, they are integral to how a category and its members are represented (Carlson, 2009; Gelman, 2003).

Generic statements are considered to be cognitively 'privileged': they are remembered more accurately by adults and children alike (Gelman & Raman, 2007; Gelman et al., 2015). Moreover, generic statements support both adults and children when learning about new categories (Hollander et al., 2009) and reasoning about familiar ones (Gelman et al., 2009). Therefore, it is important to understand how generics are expressed on the surface of a sentence, especially because the linguistic devices that characterize generic statements vary considerably across languages (Behrens, 2005).

Contrast "Zebras are herbivorous" with "The zebras are herbivorous". The former conveys information about zebras as a kind, but the latter is more naturally interpreted as refering to a particular group of individuals. However, in Turkish, both of these sentences are expressed in the same way: *Zebralar otçul* (zebra-PLU herbivorous), where the present tense copula (to be) is generally omitted. If this contrast between generic and non-generic statements is not available in Turkish, then what other cues signaling genericity are available to Turkish speakers?

Some have proposed that in such sentences, the optional copula *-dır* functions as a genericity marker (e.g., *Zebralar otçuldur* - zebra-PLU herbivorous-dır) (Göksel & Kerslake, 2004). However, this proposal has yet to be tested empirically.

Here we test the proposal that *-dır* is a powerful genericity marker. We expect *-dır* to induce a generic interpretation of a statement, whether the property described is generalizable (e.g., herbivorous) or not (e.g., hungry) (Chierchia, 1995). For example, if inflected with *-dır*, even a predicate expressing an episodic property (e.g., hungry), as opposed to an enduring property (e.g., herbivorous), should be understood as suggesting that the state of being hungry is a characteristic of the category in question.

Participants, adult Turkish speakers (), are given short sentences featuring pseudo-nouns (e.g., mirno) and adjectives that convey either enduring (e.g., herbivorous) or episodic (e.g., hungry) properties, like, *Mirnolar otçul/aç(dır).* – mirno-PLU herbivorous/hungry(*-dır*). In half of the sentences, the predicate is inflected with *-dır*. Participants are asked to judge the connection between the property (e.g., hungry) and the category in question (e.g., mirnos).

Specifically, they are given four diagnostic statements, each tapping in to a different aspect of generic statements. For the example above, the diagnostic statements are: (1) Being hungry is an essential property of mirnos, (2) In general/Usually, mirnos are hungry, (3) If X is a mirno, X is probably hungry, (4) All mirnos are hungry. Participants are asked whether each diagnostic statement is true or false, and how certain they are of their answer.

Data collected support the prediction that when a predicate is inflected with *-dır*, participants are more likely to judge it to be generic in each of the four aspects tested (*p*s < .05). . Moreover, participants are more certain in “typical” statements (2) and “probable” statements (3) when the predicate is inflected with *-dır (ps < .05)*
Our results are consistent with the proposal that *-dır* marks genericity in Turkish. This finding opens new questions about language development, including when Turkish-acquiring children make use of this marker to convey generic information.

# P2.13. Language input from mother-mother dyads: An exploratory study of gender/sex-related variability in the use of parentese

In-person presentation

Adeline Braverman, University of Washington
Lili Correa, University of Washington
Naja Ferjan Ramirez, University of Washington

Contact: abrave@uw.edu

Purpose: A growing body of research shows that environmental, social, and familial factors influence the language input that a child receives. In particular, several studies have identified differences between mothers and fathers in overall amount of talk and the use of parentese, a style of infant-directed speech distinguished from standard speech by its higher pitch, slower tempo, and exaggerated intonation (Fernald et al., 1989; Fernald & Simon, 1984; Soderstrom et al., 2008). In families headed by heterosexual couples in the USA, fathers provide less input to their infants and use less parentese than mothers (Ferjan Ramírez et al., 2022; Leaper et al., 1998; Pancsofar & Vernon-Feagans, 2006; Shapiro et al., 2021). These differences are generally explained by either sex-based biological or gender-based social factors. In research with heterosexual (mother-father) families, it has been difficult to tease these two explanations apart because women are usually also the main caregivers. Families with same-gender parents are an understudied population in which gender/sex-based factors are less relevant and, consequently, the hypothesis that familial roles influence parental language input can be studied. Here we examine language input from mother-mother dyads, as compared to mother-father dyads, in an effort to tease apart the relationship between language, gender/sex, and familial roles.

Methods: Two daylong LENA recordings were collected from twenty-two 3- to 24-month-old infants and their English-speaking mother-mother caregivers; the recordings were manually annotated to derive the amount of parentese and the amount of speech from each of the two

mothers, using a combination of previously published (Ferjan Ramírez et al., 2022; Shapiro et al., 2021) and novel annotation procedures. The data was compared to a previously published LENA dataset of twenty-three English-speaking families with mother-father parents (Shapiro et al., 2021). Each of the two mothers also completed a questionnaire about the division of caregiving responsibilities.

Results: In the mother-mother sample, we found a significant positive correlation between the rate of individual parentese use (i.e., the proportion of coded segments containing parentese from each mother) and the individual caregiving responsibilities scores for each parent ($r=0.448$, $p=.002$). Additionally, we found that the degree to which the mothers differed in their use of parentese (i.e., parentese lopsidedness score, Figure 1) was related to the degree to which mothers differ in their caregiver responsibilities ($r=0.620$, $p=.002$). In comparing the present sample to the mother-father sample, we found that mother-mother dyads produced significantly more words compared to mother-father dyads ($t(43)=4.982$; $p<.001$). However, there was no difference between the mother-mother and mother-father dyads in the degree to which parentese use differs between caregivers ($t(43) = -0.942$, $p = 0.351$, Figure 2).

Conclusions: Our results suggest that differences in overall amount of talk may be related to gender/sex, but differences in the rate of parentese among caregiver dyads may be attributed to differences in their involvement in caretaking. Based on these results, we argue that the relationship between gender/sex and language input is more complex than previously reported. These findings have implications for the broader field of language acquisition. Research with same-gender couples enables us to gain insight on language learning from a novel perspective and underscores the need to include all families in research on language input.

## P2.14. Child-caregiver conversational sequences that look for the communicative encounter: A look through Mexican families

In-person presentation

Cecilia Rojas-Nieto, Universidad Nacional Autónoma de México (UNAM)

Contact: crojas@unam.mx

In the smallest scale of human language interaction, conversational sequences, interactants are expected to engage in rapid interchanges of moves and countermoves, and to face and comply with the specific commitments of each conversational move (Clark 1996), all within a window time of about one or two seconds (Rosano 2019). Similarly, children are expected to engage in these exchanges and to comply with those particular commitments, presumably at a slower pace.

Despite the universal tendencies set by the interactional engine (Levinson, 2019), in the scenario of these complex, highly specific, and fast-solving tasks, a number of differences may affect children’s participation. A genre of differences arises from interacting with

different caregivers, who may offer different responses after a child's particular move, requiring different sequential tasks for the child.

In this presentation we will show the different sequential exchanges that take place between a child and different caregivers, when they interrupt the continuity of an interaction to seek and ratify the communicative encounter, responding to a child's conversational move with either an assertive interpretive confirmation (1-line 2), a try interpretation (2-line 2), an explicit correction (3-line 3), and more (Clark 2020; Casillas & Hilbrink 2020; Dingemanse et al. 2015).

We draw on data from videotaped interactions of 6 young children (2;00 to 3;00 years) from a longitudinal database of spontaneous interaction in Spanish monolingual middle-class Mexican families. The scale of observation is the moment-to-moment interaction, focusing on the interrelated steps of sequences beginning with the movement in which the child produces an utterance, the interlocutor responds interpretatively to it, and the child either ignores, ratifies, or discusses the interactant's interpretation. We analyze such sequences between children and their primary and secondary caregivers, and examine the moves and counter-moves provided by different interactors.

Preferences for particular moves can vary and be skewed between different family members (mothers, fathers, grandparents, aunts and uncles), providing the child with more or less cooperative or demanding interventions. Children's responses can also vary, ranging from ignoring the interlocutor's move, producing assentives (1, line3) or confirmations (4, line 5), to counter-proposals and corrections of an inaccurate interpretation (3, line 3).
Despite their differences, the sequential exchanges of moves that we focus on seek a communicative encounter as an outcome, which they gradually build up, moving from a preliminary interpretation, to recognition and acknowledgement, to finally regaining the continuity of the conversation.

Although the characterization of the different interactional patterns and their links to general or specific effects on language development needs and awaits further and future work, this presentation analyses some changes in children's participation over the period we have covered, and suggests some possible steps in the development of children's conversational competence to ratify, correct and align their interventions to the conversational moves of caregivers, together with their growing sensitivity to adapt their responses to different interactional moves by different interlocutors.

Appendix

(1) Nata (1;11,25) touching her head

1 Nata: mía, una moca [initial utterance]
'Look, a fly'
2 Fat: ay, se te paró una mosca [interpretative acknowledgement
'oh, a fly landed on you'
3 Nata: sí, en la cabeza. [assentive + new information]
'yes, in the head'

(2) Tita (1;05,25) pointing a figure in a book of Pepa Pig

1 Tita: eta e Susi [initial utterance]
‘this is Susi’
2 Mot: ¿esa es una foto de Susi. [try interpretation]
‘Is this Susi’s photo?’
3 Tita: sí [assentive]
`Yes’
Mot: ah, ¡muy bien! [acknowledge + evaluation]
‘oh, very good’

(3) Luan (2;02,7) with figures for Noel

1 Nanny: ¿qué traes aquí?
what do you have there?
2 Luan: anina (=gallina) [initial utterance]
`hen’
3 Nanny: ah, gallina [acknowldge + asertive interpretation]
oh, hen
4 Mot: son gallos [correction]
‘they are rosters’

(4) Tita (2;08,2)

1 Tita: aquí teno gero [initial utterance]
‘here I have gero’
2 GMoth: ¿fierro? [try interpretation]
‘iron?’
3 Tita: no, gero [rejects interpretation + reformulation
‘no, gero’
4 Mot: Jerónimo [recognitional refomulation]
(proper name)
5 Tita: Jerónimo [confirmation]
6 GMot: ah [acknowledge]

# P2.15. What did you say? The role of audio-visual cues on speech perception in noise by monolingual and bilingual toddlers

In-person presentation

Giovanna Morini, University of Delaware
Mels Ayala, University of Delaware
Stephanie Stollar, University of Delaware

Contact: gmorini@udel.edu

Young children often find themselves in noisy settings (e.g., daycares classrooms with multiple children). There is evidence suggesting that (i) noise makes it harder for language comprehension to take place, and (ii) bilingual children have greater difficulty than monolinguals understanding speech in noise (Morini & Newman, 2021). One possible way to

facilitate bilingual children's speech perception in noise is to provide visual speech cues (e.g., lip reading). Previous research suggests that audiovisual speech cues have the ability to aid monolingual children's speech perception in noisy environments (Lewkowicz & Hansen-Tift, 2012); less is known about bilinguals in this context.

We relied on a Preferential Looking Task to examine the degree to which monolingual and bilingual toddlers utilize audiovisual speech cues to support their recognition of familiar words in noisy listening conditions. An increase in mask-wearing due to the recent pandemic has made it so that listeners do not always have access to the visual cues provided by the speaker, and so a better understanding on of this topic is timely. Two groups of typically-developing children between 24-35 months were included in the study. Monolingual children were raised in households where English was spoken at least 90% of the time. Children in the bilingual group were being exposed to a minimum of 30% and a maximum of 70% of each of two languages since birth (one of the two languages being English).

Participants saw pairs of familiar objects on a screen (e.g., apple-cookie) that were preceded by a video of a female speaker instructing them to look at one of the objects. Speech produced by the speaker was heard in (i) quiet and (ii) in the presence of white noise presented at 0dB signal-to-noise ratio (SNR). On half of the quiet trials, the speaker on the screen was wearing a face mask, and so only auditory cues (i.e., the speech) were available (auditory-only + no-noise condition). On the other half of the quiet trials, the speaker had no mask and so visual cues from the lips were available (auditory-visual + no-noise condition). Similarly, for the noise trials, half were presented with a mask on (auditory-only + noise condition), and half without a mask (auditory-visual + noise condition). Testing appointments were conducted online via Zoom, and videos of children's looking behaviors were recorded during each testing session. Eye-movements were coded off-line frame-by-frame and used to calculate the proportion of looking time that participants spent looking at the target object on the screen across the 4 experimental conditions.

To date, data from 17 monolinguals and 19 bilinguals have been analyzed. Data from additional participants will be available by the time of the conference. Accuracy for monolinguals appears to be similar for the 'auditory-visual + no-noise' (M=.71; SD=.17), the 'auditory-only + no-noise' (M=.73; SD=.12), the 'auditory-visual + noise' (M=.71; SD=.08), and the 'auditory-only + noise' (M=.72; SD=.12) conditions. Bilinguals on the other hand appear to perform best in the 'auditory-visual + no-noise' (M=.73; SD=.14) and 'auditory-only + no-noise' (M=.70; SD=.12) conditions, followed by the 'auditory-visual + noise' condition (M=.66; SD=.20), and lastly the 'auditory-only + noise' condition (M=.64; SD=.13). This preliminary pattern of results suggests that while the particular noise level that we used did not appear to affect monolingual performance across the 4 conditions. However, for bilinguals, the presence of noise lowered accuracy, and this may be particularly true for trials in which the speaker was wearing a mask and visual cues were not available.

# P2.16. Analyzing age-dependent lexical and syntactic changes in child-directed speech using CHILDES

In-person presentation

Daniil Kocharov, Tampere University
Okko Räsänen, Tampere University

Contact: daniil.kocharov@tuni.fi

Understanding language input available to children is central to understanding the language learning process at large. In this context, age-dependent changes in input are also of interest. While so-called long-form recordings of children's everyday environments, such as those available on Homebank (https://homebank.talkbank.org), provide the most naturalistic data available to date, such data rarely comes with extensive manual annotations. In contrast, CHILDES (MacWhinney, 2000, The CHILDES project: Tools for analyzing talk) consists of several corpora of child-directed speech with millions of transcribed word tokens spoken to children of different ages. However, the variety of the corpora types included in CHILDES is much larger than in naturalistic long-form recordings, including a range of data collection scenarios in and out of lab.

The question we ask in this work is whether CHILDES, despite its heterogeneity, can be used to model age-dependent lexical and syntactic changes in child-directed speech. We use the so-called AO-CHILDES (Huebner and Willits, 2021, *Using lexical context to discover the noun category: Younger children have it easier.*) as a source of speech transcript in our study, which contains about 5M words of American-English. Our experimental material consisted of speech directed at children of 6 months up to 5 years of age, as there is little data outside this age range for systematic analysis. In our experiments, we analyzed dependency of certain syntactic and lexical properties of the transcripts text on infant age using age bins of 3 months, and while controlling for the amount of data for each age bin.

A number of linguistic properties of transcripts were extracted for these age bins and tested for the dependency on age by the means of Spearman's rank-order correlation. The list of linguistic properties we tested is following:

- vocabulary size,
- type-token ratio,
- mean word perplexity for a random 100 80-token-long chunks within a dataset,
- mean sentence length in words,
- mean number of verbs per sentences,
- mean number of verb modifiers (number of words dependent on a syntactic root of a sentence)

Perplexity is a measure of surprise of a given word depending on a preceding context, it depends on a probabilistic language model which incorporates both syntactic and lexical properties of the language. The GPT-2 model we utilized is a general Transformer-based language model of English developed by OpenAI. The automatic sentence segmentation,

tokenization and parsing of transcripts was performed by means of Stanza toolkit (v 1.4), developed by Stanford NLP Group.

The statistical analysis showed:

- a significant positive dependency on age (p-value < 0.01) of:
  - word perplexity based on GPT2 model,
  - sentence length,
  - number of verbs per sentence,
  - number of verb modifiers.
- significant positive dependency on amount of textual data of:
  - vocabulary size,
- significant negative dependency on amount of textual data of:
  - type-token ratio.

The analysis shows that with the age of target child the speech gets more complicated in terms of the number of verbs and their modifiers per sentence and consequently in terms of sentence length. The language gets more variable and less predictable by computational LM models. These findings match previously published results on the topic (Huttenlocher et al., 2007, *The varieties of speech to young children*). The lexical diversity of speech known to change over child age (Cychosz et al., 2021, *Acoustic-lexical characteristics of child-directed speech between 7 and 24 months and their impact on toddlers' phonological processing*), but this is not detected in CHILDES data when controlling for the amount of data per age group. However, this may also be a limitation of the used metrics for lexical diversity, and should be investigated in future research.

## P2.17. Relation of infants' and mothers' pointing to infants' vocabulary development measured directly and with parental report

In-person presentation

Sura Ertaş, Koç University
Sümeyye Koşkulu-Sancar, Utrecht University
Ebru Ger, University of Bern
Ulf Liszkowski, University of Hamburg
Aylin C. Küntay, Koç University

Contact: sertas19@ku.edu.tr

Around their first birthday, infants begin to follow and produce points. Previous research on the relation of pointing to language development mainly focused on vocabulary as a measure of infants' early language development, using parent-reported measures such as checklists. However, there are inconsistent results on the relation between infants' pointing and their receptive vocabulary such that while some studies showed that there was an association between infants' pointing gestures and receptive vocabulary skills (e.g., Goldin-Meadow, 2007), others did not find such a relation (e.g., Blake et al., 2003). In addition, a

few studies demonstrated that parents might under- or over-estimate infants' language comprehension and production, especially regarding early vocabulary knowledge (Houston-Price et al., 2007; Reese & Read, 2000). On the other hand, infants' handshape of pointing seems to matter for infants' language development such that 12-month-old infants who pointed with only whole-hand but not with the index-finger had significantly lower language skills and a higher risk for language delay one year later (Lüke et al., 2017). The current study examined the association between mothers' and infants' pointing gestures and infants' concurrent and prospective vocabulary skills through the direct measure (lexical processing efficiency; LPE) and indirect measure (parental checklist) by considering different handshapes.

We longitudinally examined 44 mother-infant dyads from diverse SES backgrounds when the infants were 14 and 18 months old. To measure pointing frequency, we used the decorated room paradigm, where the mother-infant dyads were invited into a room with 21 objects hung on the walls and walked around the room without touching the objects for 5 minutes spontaneously (Liszkowski et al., 2012) when the infants were at 14 months. We measured the frequency of mothers' index-finger points and infants' whole-hand and index-finger points. To measure infants' LPE, we used a version of the Looking While Listening task (Fernald et al., 2008) on an eye-tracker when infants were at 14 and 18 months. Infants were presented with two objects (one distractor and one target) on a screen while they heard the name of the target object across 32 trials. We obtained two types of scores by calculating (i) reaction time (RT), which was the average latency (in ms) to shift the gaze from the distractor picture to the target picture after target noun onset among the distractor-initial trials, and (ii) accuracy, which was the average proportion of looking time at the target picture relative to the total time they looked at the target or the distractor picture within the time window 300-1800 ms after the target word onset. To measure infants' receptive vocabulary at 14 months, we used Turkish Communicative Development Inventory - I (TCDI-I; Aksu-Koç et al., 2019), and for infants' expressive vocabulary at 18 months, we used TCDI-II, both of which are parent reports of infants' vocabulary.

We found that only infants' index-finger pointing frequency at 14 months predicted their prospective RT ($\beta$=-.624, $p<.001$) and accuracy ($\beta$=.390, $p<.05$) scores at 18 months. Infants' index-finger pointing did not predict their concurrent LPE scores. Similarly, mothers' pointing and infants' whole-hand pointing did not predict concurrent or prospective LPE. Moreover, neither maternal pointing nor infants' pointing predicted their parent-reported receptive or expressive vocabulary.

Our findings corroborated the evidence that the handshape of pointing plays an important role in the relation between infants' pointing and their language skills (Lüke et al., 2017). Crucially, the results extended the evidence on the relation between index-finger pointing and language acquisition to a more direct measure of LPE. Furthermore, the current study may inspire the use of different measurements in future developmental research, especially conducted with infants at an early age.

# P2.18. Preference for Infant-Directed Speech in 6-9-month-old infants: A cross-linguistic, cross-laboratory approach

In-person presentation

Melanie Soderstrom, University of Manitoba
Caroline Junge, Utrecht University
Natalia Kartushina, University of Oslo
Gaye Soley, University Bogazici
Julien Mayor, University Oslo
Virginie Durier, University Rennes
Stephanie Barbu, University Rennes
Zuzana Ocel kov, Charles University, Praha
Katerina Chladkova, Charles University, Praha
Filip Smolík, Charles University, Praha
Paula Fikkert, Radboud University

Contact: c.m.m.junge@uu.nl

Infants prefer listening to infant-directed speech (IDS) over adult-directed speech (ADS; Dunst et al., 2012). However, the majority of IDS studies have examined preference for English IDS elicited by American-English speaking parents, who tend to produce rather extreme voice exaggerations and might present some features that are not shared with the IDS in other languages. For instance, the ManyBabies Consortium tested the variety/scope/limits of this phenomenon by presenting American-English stimuli in both registers to 2329 infants from 69 labs in 16 countries ('MB-1'; ManyBabies Consortium, 2020). Effect sizes from individual labs were not only modulated by type of method and infants' age, but also by language background: effect sizes were larger for native infant listeners of American-English than for those who were non-native. Yet, it still remains to be tested whether infants across a variety of cultures/language backgrounds also display a preference for IDS in their native language. The aim of this cross-laboratory project is to examine preference for infant-directed speech over adult-directed speech in 6-9-month-old infants acquiring a language other than English (namely, French, Dutch, Norwegian, Czech, Turkish). We hypothesize that infants across all tested languages will show a preference for IDS over ADS in their native language, but that the effect vary between languages. Finally, by comparing within-lab results from the original MB-1 we expect that preference for IDS to be stronger in the native languages than in the non-native language (American-English).

We aim to follow the MB-1 procedures as closely as possible, just replacing the non-native stimuli to native stimuli. We pre-registered the study on OSF (https://osf.io/ng3v6). Our aim is to have at least 16 infants (aim = 32) per language who are tested on their IDS preference in their native language. So far we have completed testing in two labs, and we continue testing to September 1, 2023.

In the coming months, we are completing analyses, and fitting linear mixed-effects models to assess effects of nativeness and language. The results will show whether we can robustly infer that infants prefer IDS across a range of languages.

# P2.19. Will you benefit from taking part in parental intervention? Factors influencing the rate of increase in the knowledge after taking part in an intervention about early bilingual development

In-person presentation

Agnieszka Dynak, University of Warsaw
Katarzyna Bajkowska, University of Warsaw
Jolanta Kalinowska, Oslo Metropolitan University
Joanna Kołak, University College London
Magdalena Krysztofiak, University of Warsaw
Magdalena Łuniewska, University of Warsaw
Karolina Muszyńska, University of Warsaw
Nina Gram Garmann, Oslo Metropolitan University
Ewa Haman, University of Warsaw

Contact: agnieszka.dynak@psych.uw.edu.pl

Rich and diverse input is crucial for children's language development. Parent-directed interventions can improve the quality and quantity of child-directed speech and thereby enhance children's language development in later years (Reese et al., 2010). Multilingual children are at risk of limited language input in at least one language from birth, which can affect their language skills. Thus, bilingual families are an important target group for parent-directed early interventions (Luk & Bialystok, 2013).

To investigate whether we can improve parental knowledge about (bilingual) language development even before the child is born, we designed a research-based intervention in the form of an online workshop for expectant Polish-speaking parents living in Norway. Currently, there are over 100 000 Polish people living in Norway, which makes Polish immigration the largest one in Norway (Statistics Norway, 2022).

The intervention consists of 6 blocks covering the topics of preverbal communication, communication milestones, input quantity and quality, parentese, bilingualism and child media exposure. Program followed the guidelines for effective language interventions including: building upon background knowledge, explicitly describing and illustrating content, providing opportunities to actively apply and generalize learned content in real-world contexts, and supporting metacognition throughout the training process (Biel et al., 2020).

Each block of the workshop includes a presentation with research-based information and practical tips, followed by an activity to increase participants' engagement and skills.
We provided the experimental intervention to n = 46 participants (42 mothers and 4 fathers) and assessed their knowledge about language development and cargiver's behaviors that promote it before and after the intervention. Paired t-test showed that intervention effectively increased parental knowledge ($t = -5{,}97$, $p < 0{,}001$). We also conducted a linear regression to verify what are the best predictors of the participants' increase in the knowledge. The regression was statistically significant ($R2 = 0{,}6$, $F(4,41) = 15{,}32$, $p < 0{,}001$). The best predictor of increase in knowledge was lower level of knowledge before the intervention. The

higher the participant's knowledge beforehand, the lower was their knowledge gain due to the participation in the program ($\beta = -0,61$, $p < 0,001$). Other significant factors that influenced the level of increase in knowledge after the intervention were the lack of older children in the family. Parents expecting their first child gained more from the intervention, $\beta = -0,25$, $p = 0,027$.) and the level of engagement in the intervention (Participants who spontaneously spoke more during the intervention, e.g. shared their experiences after the exercise/ asked a clarification question, showed greater increase in their knowledge, $\beta = 0,22$, $p = 0,047$). The only variable that was found not to be a good predictor of increase in knowledge was the participant's education. To verify if this result is due to the shared variation between education and the level of knowledge before the intervention we conducted additional analysis confirming that there is no correlation between the participant's education and increase in their knowledge (although there is a weak correlation between the education and their knowledge before the intervention, $r = 0,29$, $p = 0,048$). This is interesting, considering that most of such interventions are addressed to low educated communities (Durán, et al., 2016).

Our study suggests that providing early interventions addressed to parents that plan to raise their children in the bilingual environment increases their knowledge about how to support their children's language development and that those who have lower initial knowledge (regardless of their education level) would benefit most from taking part in such intervention.

## P2.20. Exploring the role of prosody on prompted repair sequences in child-adult interaction: A case study on first language acquisition of Spanish

In-person presentation

Laura Cristina Villalobos-Pedroza, UNAM

Contact: lvillalobos@comunidad.unam.mx

Repair practices play a crucial role in communication by addressing problems and establishing mutual understanding and common ground [1]. These practices are ubiquitous in conversation between children and adults and constitute a very relevant scenario for language acquisition. Requests for repair provide explicit feedback to children regarding their language performance and offer them positive evidence on how to correct their own errors. These requests follow a pattern of error, request, and repair, forming enchronic sequences that are interconnected in a unique manner [2].

Research shows that children are responsive to various types of repair requests, including open requests (e.g., "huh?"), restricted requests (e.g., "where?", "who?"), and restricted offers (e.g., "he ran across the road?")[3]. Additionally, children display sensitivity to prosody from an early age, with prosodic cues accompanying every communicative action. Prosody, along with lexical and syntactic information, provides additional cues for children to identify what needs repair when faced with a request for repair.

In this proposal, we examine repair practices between a child in the process of acquiring Spanish and her primary caregivers in a natural interaction setting. The data analyzed come from the ETAL database [4], covering the age range from 1;9 to 2;6. Our analysis focuses on the three types of requests mentioned earlier [3]. We aim to address two main questions: i) what prosodic resources are present in repair practices during child-adult interaction, and ii) how do the pragmatic functions and prosody of repair requests in child-directed speech relate to child repair.

We selected sequences of prompted repair and classified them based on the type of request. For each sequence, we examined the prosodic properties and pragmatic functions of the repair request, as well as whether the child responded to the request. We also conducted prosodic analysis of cases where the child intended to repair.

The results indicate that repair requests in child-directed speech contain prosodic cues that encourage child's engagement in interaction. For example, recurring prosodic patterns related to invitation questions in Spanish, such as L* HH%, are observed. Regarding child repair properties, we found evidence of syllable lengthening, tonal field expansion, and other non-prosodic strategies like changes in phonetic articulation and reformulations.

Furthermore, the study reveals that the prosody of repair requests in child-directed speech provides valuable cues to children about the specific repairs their interlocutors expect. However, it is not solely the prosodic cues that enable appropriate responses to repair requests. In the enchronic framework, the amalgamation of prosodic cues and pragmatic functions constitutes specific types of actions, prompting the child to respond effectively most of the time. When the action is contingent, the child actively engages in the interaction and provides a response, whereas in non-contingent cases, phatic responses or passive adherence to the interaction are more common.

In conclusion, our research sheds light on the prosodic aspects of repair practices in child-adult interactions. We demonstrate that prosodic cues in child-directed speech facilitate children's understanding of what repairs are needed, supporting their language development. However, the integration of prosodic cues with pragmatic functions within the enchronic framework is crucial for appropriate responses to repair requests.

1. Schegloff et al (1977). The Preference for Self-Correction in the Organization of Repair in Conversation. Language, 53(2), 361-382
2. Enfield, N. (2013). Relationship Thinking. Oxford: Oxford University Press.
3. Clark, E. (2020). Conversational Repair and the Acquisition of Language. Discourse Processes, 57(5-6), 441-459.
4. Rojas Nieto, C. (2007). La base de datos ETAL. In A. Vigueras (Ed.), Jornadas Filológicas 2005 (pp. 575-599). México: UNAM.

# P2.21. The effect of labelling and sustained attention during parent-child interaction on novel-word retention

In-person presentation (Madhavan)

Ming Yean Sia, University of Goettingen and Leibniz Science Campus Primate Cognition
Rajalakshmi Madhavan, University of Goettingen and Leibniz Science Campus Primate Cognition
Xiaoyun Chen, Lancaster University
Nivedita Mani, University of Goettingen and Leibniz Science Campus Primate Cognition

Contact: smadhavan@uni-goettingen.de

In a naturalistic environment, children are typically exposed to a range of objects they are more or less familiar with. Object novelty impacts how parents interact with and talk about the object (Chen et al., 2021), and how children handle objects (Schatz et al., 2022). Furthermore, parental input such as object labelling, and features of parent-child interaction such as joint and sustained attention (when parents and children mutually direct their gaze to the same object in the immediate environment; Yu & Smith, 2013) impacts children's vocabulary size (Peters & Yu, 2020). Against this background, the current study examines the quality of parent-child interaction, parent labelling and children's handling of objects when they naturally interact with objects varying in their familiarity to the child. Furthermore, we examine how this quality of interaction influences children's learning of the labels for these objects. In particular, we investigated whether (i) parents lead more instances of joint attention when playing with novel objects relative to familiar ones, (ii) parents preferentially label novel objects relative to familiar objects and (iii) children's learning of novel word-object associations is affected by the frequency of object labelling and children's sustained attention towards the objects. To test these predictions, we recruited 20 parent-child dyads (age range of children: 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) – as we examined their eye-movements and labelling behaviour during the play phase. Following that, we tested children's recognition of the labelled novel objects. We find that (i) parents led more novel object JA instances (ii) a higher frequency of object labelling behaviour during familiar object play compared to novel object play. However, we found (iii) no improved recognition of novel toys if these toys were frequently labelled when they were attending to the toys. Such findings would highlight how the quality of social interaction between caregivers and infants is influenced by the objects in their natural environment, and that novel word retention is currently not influenced by these factors.

# P2.22. Word frequency imbalance does not guide noun comprehension of 6- to 14-month-old German-learning infants within the looking-while-listening paradigm

In-person presentation

Jessica N. Steil, University of Tuebingen
Ulrike Schild, University of Tuebingen
Claudia K. Friedrich, University of Tuebingen

Contact: jessica.steil@uni-tuebingen.de

Recent studies have shown that infants' success in fixating a named target picture when it is presented simultaneously with a distractor picture in the looking while listening (LWL; Fernald et al., 2008) task might be determined by contextual factors (for a review see: Borovsky, 2022). Post-hoc correlation analyses of previous results pointed to a modulating role that word frequency differences within specific stimulus pairings might play (Kartushina & Mayor, 2019; Steil et al., 2021). According to these correlations, infants were more successful if the labels of the target and the distractor differed in their frequency of appearance in child-directed speech (compared to pairs that were more balanced in word frequency). Combined evidence from multiple studies suggests that especially young infants on the verge of noun comprehension might rely on these frequency cues. That is, young infants might match more often heard words with their presumably more often appearing referents (and vice versa match less often appearing word with less often appearing referents). Thus, we hypothesized that in particular young infants instrumentalize frequency imbalance as an early strategy (with a rather short livability) to succeed within the LWL task (see also Kartushina & Mayor, 2019).

In this pre-registered study, we first probe early noun comprehension of 6- to 24-month-old German-learning infants within the LWL task. Second, we test whether young infants between 6- to 14-months exploit word frequency imbalance as a cue to success within the LWL task. Going beyond previous work, we systematically manipulated the frequency imbalance within stimulus pairs presented in the LWL task. In contrast to previous studies, the same target and distractor words appeared within frequency imbalanced and within frequency balanced stimulus pairs. This aimed at constructing comparable frequency conditions that only differed in the experienced imbalance of word frequency and that did not differ in further aspects that might relate to the testing of different target words.

In an online LWL task realized via e-Babylab (Lo et al., 2021), we collected eligible data of 81 German-learning infants between 6- to 24-months. We found strong evidence for noun comprehension across the whole sample both in by-infant analysis as well as in by-pair analysis. The effect was not that robust for the 6- to 14-month-olds (n = 43), for whom only by-infant analysis revealed evidence for noun comprehension. The LWL performance of infants between 6- to 14-months was not related to their age, suggesting that the above chance performance of these infants cannot be exclusively attributed to the older children within this group. Contradicting to previous results (Kartushina & Mayor, 2019; Steil et al., 2021), there was no evidence that infants between 6- to 14-month-olds did rely on frequency

imbalance cues to detangle between target and distractor objects (while still overall succeeding within the task). That is, infants' performance in frequency balanced pairs and frequency imbalanced pairs did not differ when target words were kept constant.

We discuss present and previous LWL results obtained from infants by considering the observed high interindividual variation, which might make it even more difficult to compare the results of studies that differ in methodological aspects. Interstudy differences relate not only to the individual choice of words and images presented and their respective pairings, but also to the frequency with which infants experience these words and the respective referents in their individual environment. Even word frequency estimates vary between studies ranging from parental report to corpus data. All these aspects render it difficult to reproduce systematic differences in early noun comprehension. Taken together, our results show good feasibility of online LWL application to show infants' overall success in detecting the target picture in the LWL task. However, we did not find evidence that infants between 6- to 14-months exploit word frequency imbalance between stimulus pairs when frequency conditions contained the same target words.

## P2.23. Fast mapping abilities and their predictive effect on receptive vocabulary in 3 to 5 year-old monolingual and bilingual children

In-person presentation (Belogi)

Solène Belogi, Université de Neuchâtel
Katrin Skoruppa, Université de Neuchâtel

Contact: solene.belogi@unine.ch

To acquire new words, children need to associate new phonological forms and meanings. While all children are going through this procedure, bilingual children have to do it in both their languages and with less input in each language than monolinguals. Thus, their newly acquired words can be distributed between their two languages and it is not surprising that studies often find a disadvantage in lexical level for bilinguals, especially when assessing only one of their languages and comparing them to monolinguals (e.g. Thordardottir 2011 for 5-year-olds learning English and French). Despite this bilingual disadvantage, Byers-Heinlein (2013) showed that 14-months old monolingual and bilingual infants performed at comparable levels during fast mapping tasks that test children's quick initial associations between new phonological forms (e.g. dax) and meanings (e.g. an unknown object), thus arguing for the robustness of this effect through diverse language environments. As reported by Kan and Windsor (2010), there is a large variation in the amount of exposure and children's success in fast mapping studies, and the relevance of such experimental procedures for real-life vocabulary can be questioned, as most studies don't link up the two. However, Kan (2014) showed significant correlations between fast mapping, novel word retention and lexical diversity in spontaneous speech in 5-year-old bilingual children in English and Hmong.

In order to further examine the relationship between fast mapping skills and receptive vocabulary skills, we tested 196 monolingual and 125 bilingual 3- to 5-year-old children learning (Swiss) German, French, Italian and/ or Turkish as part of a larger longitudinal project. They completed a digital receptive vocabulary task (word-picture matching) in all their languages, as well as a fast mapping task, where they were exposed to and then tested on new form-meaning mappings.

As expected, monolingual and bilingual children differed in their society language receptive vocabulary ($t = 9.99$, $df = 269.64$, $p < .001$). However, there were no significant differences between the two groups in our fast mapping task (bilingualism: $OR = 0.76$, $p = .25$) in an ordinal regression on fast mapping, including bilingualism, age, non-verbal reasoning, and parental education level as covariates. In order to assess the links between fast mapping and receptive vocabulary without disadvantaging the bilinguals, we used a combined score of their two languages (instead of the society language score only). Two separate linear regressions indicated that fast mapping was a significant predictor of receptive vocabulary abilities for both groups ($ß = 0.19$, $p < .001$ for monolinguals / $ß = 0.15$, $p = .006$ for bilinguals) when including bilingualism, age, non-verbal reasoning, and parental education level as covariates. In the coming weeks, we will also run longitudinal analyses to assess the predictive value of our fast mapping skills on the evolution of receptive vocabulary skills over a one-year period.

This study makes an interesting link between ‘artificial’ learning tasks like fast mapping with non-words and ‘real-life’ language receptive vocabulary knowledge. To sum up, we showed similar language learning patterns for monolingual and bilingual children: despite differences in receptive vocabulary skills, both groups displayed equivalent abilities in the fast mapping task, and this task was a reliable predictor of receptive vocabulary for all children. We will discuss the theoretical and practical implications of our findings with respect to the need for unbiased language assessments for bilingual children in clinical and educational contexts.

## P2.24. Building on the Looking While Listening paradigm: What are the individual differences in the performance on the LWL for 2-5-year-olds?

In-person presentation

Martin Teunisse, Utrecht University
Roy Hessels, Utrecht University
Caroline Junge, Utrecht University

Contact: m.k.teunisse@uu.nl

YOUth is an ongoing, longitudinal cohort study following Dutch children from preterm to childhood, aiming to capture meaningful individual differences. YOUth obtained language measurements from 600+ children aged 2 to 5 years, including a Looking While Listening (LWL) task and the Peabody Picture Vocabulary Test (PPVT). The LWL-task monitors spoken language comprehension by tracking the eyes of children who are listening to

speech labeling 1 of 2 items visible on a screen. This task yields measures of accuracy and reaction time (Fernald et al., 2008), both of which have been linked to concurrent and later vocabulary measures (e.g., Weisleder & Fernald, 2013). However, it has mainly been tested in infants up to 28 months. In contrast, the YOUth cohort uses the LWL-task (with always the same set of early acquired familiar words) in older children: 2-5-year-olds. But are there developmental trends in this task, or will see children reach plateau from a certain age onwards (RQ1)? Second, are there developmental trends in concurrent validity between the LWL-task and the PPVT, or do relationships prove stable across development (RQ2)? The current paper sets out to explore these questions.

We have already collected the data: 600+ children participating both in the LWL-task and the PPVT on the same day. In the coming months we will address our research questions in the following ways. First, to examine variability within the LWL-task across development, we created 6 age-bins: 2;0 – 2;6; 2;6 – 3;0; 3;0 – 3;6; 3;6 – 4;0; 4;0 – 4;6; 4;6 – 5;0. We will then carry out T50 analyses, which allows a simultaneously description of (1) when each target is first fixated upon naming and (2) the percentage of participants that fixated on a target (Hooge & Camps, 2013). Thus the T50 analyses assesses not only age-related differences in how accurate children are in fixating the target, but also age-related differences in the time it takes for children to fixate the target. We will run T50 analyses separately for all trials (accuracy) as well as for distracter-initial trials (reaction time). Results are informative for interpreting individual differences in this task: children might continue to develop their speech comprehension skills with age (thus requiring us to control for age), or results will show whether and when children reach plateau upon reaching a certain age in the LWL-task outcomes.

Second, to explore whether LWL-tasks yields meaningful individual differences, we will test concurrent validity with the PPVT over all children, and separate per age bin. Here, results will tell us whether performance in this variant of the LWL-task might be more informative across the wide age-range of children covered, or whether one age range proves more insightful than others in explaining individual variation.

The primary objective of this paper is to broaden our understanding of the LWL task by testing its effectiveness in assessing language comprehension in older children. By doing so, we aim to expand our knowledge and insights regarding the applicability and utility of the LWL method for the YOUth cohort.

# P2.25. Examining the relationship between lexical speed of processing and novel word learning

In-person presentation

Julia Egger, Max Planck Institute for Psycholinguistics and Vienna Cognitive Science Hub
Caroline F. Rowland, Max Planck Institute for Psycholinguistics
Christina Bergmann, Osnabrück University of Applied Sciences and Max Planck Institute for Psycholinguistics

Contact: julia.egger@univie.ac.at

Children who are able to process familiar words quickly have been reported to have a larger expressive vocabulary than slower processing children (Fernald et al., 2006). However, the underlying nature of the relationship between processing speed and vocabulary development is still unknown. Several authors speculate that there might be a causal link between new vocabulary growth and lexical speed of processing (SoP; Fernald & Marchman, 2012; Law & Edwards, 2015). Investigating the proposed link, Lany (2018) found that only 17-months-olds with fast SoP learned novel words. However, at 30 months the effect was only shown in a more elaborate word learning paradigm. Therefore, Lany speculated that SoP only facilitates learning if the task is difficult. Furthermore, Lany (2018) found no relationship between general visual reaction time and SoP, which could be seen as an argument that SoP is not linked to an intrinsic language-independent information processing ability. This stands in contrast with the hypothesis supported by findings such as by Marchman and Fernald (2008), who revealed that SoP measured at 25 months predicted working memory and IQ at eight years of age. These inconsistent results show that the underlying mechanisms which cause individual differences in SoP are still unknown.

The present study replicated Lany (2018), using the same novel word learning task and assessing their SoP in an eye-tracking paradigm. Additionally, we measured the infants' SoP of the newly acquired words. The aims of the study were 1) to test the faciliatory effect of SoP on novel word learning in 17-month-old Dutch learning infants and 2) to explore the nature of SoP by comparing lexical processing of familiar and novel words with visual reaction time as well as vocabulary size with each other to gain a more complete picture of the role of SoP in early language acquisition. To this end, we tested 111 infants. Infants learned four novel objects with pseudoword labels. We then tested their knowledge of the novel words in a looking-while-listening paradigm, where the infants saw two of the new objects and heard one of them labelled. We separately measured the infants' SoP, using both pairs of familiar objects and pairs of novel objects. Additionally, we assessed the infants' visual reaction time as well as concurrent vocabulary size using the Dutch CDI.

The present study shows that under certain circumstances (strict inclusion criteria to reduce noise, see also Byers-Heinlein et al., 2021) we can find weak evidence to support the conclusion of Lany (2018) that 17-month-old infants who are fast to recognise familiar words, and thus are fast processors, might be better at learning novel words than their slower processing peers. It furthermore extends these findings by measuring the SoP of the novel newly-learned words in an attempt to shed some light onto the underlying nature of lexical SoP. The results indicate that rather than general cognitive capacities or lexicon-specific

processing it is more likely that SoP may be dependent on word-specific features such as frequency and experience with individual words.

# P2.26. The use of mutual exclusivity in monolingual and bimodal bilingual children acquiring American Sign Language

In-person presentation

Allison Fitch, Rochester Institute of Technology
Amy Lieberman, Boston University

Contact: ahfgsh@rit.edu

Mutual exclusivity is a word learning constraint in which the learner assumes that a given word refers to only one category of objects (Markman & Wachtel, 1988). In spoken languages, mutual exclusivity has been demonstrated in monolingual children as young as 17 months (Halberda, 2003) and cross-linguistically (Haryu, 1991; Imai & Gentner, 1997). Multilingual learners show an attenuated mutual exclusivity bias, in part because for these learners, objects have more than one label (Byers-Heinlein & Werker, 2009; Davidson & Tell, 2005). To date, mutual exclusivity has not been robustly demonstrated in deaf children acquiring American Sign Language (ASL). Further, it is unclear if mutual exclusivity applies to those learning both a signed and a spoken language. Like unimodal bilinguals, bimodal bilingual (BiBi) children learn two words for an object, but these words are separated by modality. A BiBi child could therefore assume that all objects have two words (like unimodal bilinguals) or that all objects have one spoken word and one sign (within-modality mutual exclusivity). The goals of the current study were to demonstrate mutual exclusivity in monolingual deaf children acquiring ASL, and to determine if BiBi deaf children utilize mutual exclusivity within each modality.

Twelve (of a planned 40) deaf children (19-58 months, M = 42 months) acquiring ASL only (n = 6) or ASL and spoken English (n = 6) (according to parent rating of child language use and comprehension) participated in a behavioral two alternative forced-choice paradigm (Jaswal, 2010). In each trial, children were presented with two toys on a tray (one familiar, one novel) and asked (in ASL) to give the experimenter one of them. The experimenter requested the object one of three ways: 1) gaze only: the experimenter gazed toward the familiar object as a control; 2) novel label: the experimenter used a novel sign to test mutual exclusivity; or 3) conflict: the experimenter gazed toward the familiar object but used a novel sign label, to determine relative weighting of cues. Participants received multiple trials of each type in a pseudorandom order; in the current analysis we extracted the first trial of each type.

For each trial type (gaze, novel sign, or conflict), Fisher's exact tests were run to determine the relationship between choosing the novel object and language group (monolingual vs. BiBi). Findings (see Figure 1) demonstrated that all monolingual and 4/6 BiBi children correctly selected the familiar object in gaze (control) trials, with no significant relationship between object choice and language group ($p = .45$, $OR = 7.2$). When presented with the

novel sign, 5/6 monolingual children and zero BiBi children selected the novel object; Fisher's exact test was significant ($p = .015$, OR = .02). When both cues were presented, 3/6 in each group chose the novel object ($p = 1$).

Preliminary findings suggest that the mutual exclusivity assumption is robust in monolingual deaf children acquiring ASL. In contrast, BiBi children showed no mutual exclusivity assumption. When gaze and linguistic cues conflicted, children varied in their responses. Taken together, findings suggest that young deaf BiBi children are not tracking if a referent already has a sign and/or spoken label. Instead, they may recognize that objects tend to have multiple labels, and are agnostic about the modality. Additionally, in contrast to hearing children (Jaswal, 2010), neither monolingual nor BiBi deaf children strongly prioritized mutual exclusivity over gaze for mapping words to meaning, suggesting that deaf children may be highly attuned to gaze when perceiving input.

## P2.27. Cross Linguistic Influence and intergenerational language change in Irish Gaelic

In-person presentation

Clara Kunst, Max Planck Institute for Psycholinguistics
Diarmuid Johnson, Academy of Modern Celtic Ethnography
Evan Kidd, The Australian National University
Sharon Unsworth, Radboud University

Contact: clara.kunst@mpi.nl

Background
Multilingual contexts are often drivers of language change. This study investigates language change in Irish Gaelic (Gaelic), the indigenous language of Ireland. The small population of fluent Gaelic speakers today is mostly bi- or multilingual. In this context, Gaelic is undergoing rapid language change under the influence of the majority language English (Ó Catháin, 2016). This study examines which aspects of their multilingual contexts influence Gaelic-English speakers' grammatical judgements of five syntactic structures in Gaelic. Four of the five structures have previously been shown to elicit cross linguistic influence in other bilingual populations (Serratrice, 2013). In addition, there are already some indications of potential ongoing change in three of the five structures (Carnie, 1996; Kilgarriff et al., 2006).

Participants and method
Data collection is underway and is expected to be complete by summer 2023. One hundred adult Gaelic speakers will be recruited to participate in an online acceptability judgement task. Participants will judge 52 test items (+ 20 fillers) presented auditorily on a 7-point Likert scale. Minimal pairs consist of a grammatical Gaelic structure (e.g. left-headed double-noun compounds) and a structural variation that is ungrammatical in Gaelic but grammatical in English (e.g. right-headed double-noun compounds). Participants will also complete an adapted version of the LEAP-Q (Marian et al., 2007) to measure their language dominance and sociolinguistic attitudes. Statistical analyses will fit a linear mixed effects model for each

grammatical structure tested, with acceptability judgement measures as dependent and demographic measures as independent variables.

Expected results and contribution
The results of this study will provide novel insights into (i) the status of language change at the level of morphosyntax in the Gaelic speaker population as a function of various participant-level measures, and (ii) cross-linguistic influence as a potential key driver of intergenerational language change in endangered indigenous languages in multilingual contexts.

Outlook
This study is part of a larger research project investigating language acquisition and cross linguistic influence in Irish-English bilingual children at the level of morphosyntax. The results of this study will inform subsequent research on the effects of language dominance on cross linguistic influence in bilingual language production and comprehension during development.

## P2.28. Exploring individual differences in dual pathways to the vowel height contrast: the f0 and F1 routes

In-person presentation

Jérémy Genette, Universiteit Antwerpen
Steven Gillis, Universiteit Antwerpen
Jo Verhoeven, City, University of London

Contact: jeremy.genette@uantwerpen.be

Individual differences in the use of multiple acoustic cues to convey vowel height contrast are investigated in children's early word productions. Crucial to speech development is children’s ability to differentiate between vowels through acoustic cues. For instance, it is generally assumed that vowel height is primarily conveyed by F1 manipulation. However, extensive research has now established that there is also a robust relationship, known as intrinsic vowel pitch (IF0), between f0 and vowel height. Although the underlying cause of IF0 remains a subject of debate, some scholars argue that speakers actively control IF0 to enhance the distinction between high and low vowels (i.e., a functional account), as opposed to a purely biomechanical explanation (i.e., a physiological account).

These elements suggest that two distinct yet complementary cues (i.e., f0 and F1) can be used by children to convey one single contrast (i.e., vowel height). While F1 is assumed to correspond mostly to the acoustic properties of the oral cavity configuration during the production of high and low vowels, the acquisition by children of the f0 cue is believed to occur gradually, as predicted by the functional account. Consequently, more variability is predicted in the utilisation of f0 compared to F1 in conveying vowel height contrasts in very young children's speech. Variability in the use of both cues will be investigated in young children's early word production.

For this purpose, a longitudinal investigation into the vocalic productions of 30 Dutch-acquiring children was conducted. These children were recorded monthly from the emergence of their first words until they reached the age of 24 months. All high vowels /i, u/ and low vowels /a/ in lexical utterances were extracted, yielding a total of more than 15,000 vowels. These vowels were acoustically analysed for f0 and F1.

The results of the modelling analysis demonstrate that children consistently rely on F1 as an acoustic cue to distinguish vowels of different heights. In addition, children's use of f0 for the same purpose as F1 is demonstrated. Nevertheless, a notable observation is the large variability in the extent to which children resort to f0 whereas the utilisation of F1 is constant across children. In analysing the relative usage of both cues, it was observed that some children use both f0 and F1 in almost equal proportions, while others primarily rely on F1 and show minimal reliance on f0.

In conclusion, this study highlights that F1 is a consistent cue for vowel height used by all children. Conversely, the extent to which children use f0 as an additional cue to distinguish high and low vowels varies widely. Some children rely on both f0 and F1 to similar extents, while others predominantly rely on F1 and hardly resort to f0. These findings suggest that children differ in their acquisition trajectory of these cues. While F1 is primarily determined by the acoustic properties of the oral cavity configuration, the control of f0 to fulfil its contrastive role is more difficult to acquire by children. Consequently, there is larger observed variability in the use of f0 compared to F1.

## P2.29. The potential of digital media to support monolingual and bilingual children's language development.

In-person presentation

Joanna Kołak, University College London
Gemma Taylor, University of Salford
Padraic Monaghan, Lancaster University

Contact: j.kolak@ucl.ac.uk

High quality media have the potential to support language development (e.g., Madigan et al., 2020). Children in the UK spend an increasing amount of time engaged in digital media (Ofcom, 2022). Thus, using media to support children's language development (alongside books and child-directed speech) would be invaluable, particularly when supporting bilingual children who are at risk of starting school with poorer language skills in the majority language than their monolingual peers (Hoff, 2013). Recent studies reveal that the most popular educational apps for pre-schoolers in the UK include higher quality language than non-educational apps, but they involve small proportion of complex sentences and questions ? constructions crucial for language development of pre-schoolers (Kolak et al., 2022; Taylor et al., 2022). However, an in-depth analysis of language in the most popular TV programmes for children in the UK has not been performed yet. A Singapore-based study (Sun et al., 2022) showed that bilingual children aged 4-6 spend more time engaged in digital media in their majority than in their minority language. However, no studies to date have investigated

the differences in the quantity and quality of digital media use in mono- and bilingual children, or whether mono- and bilingual children in the UK are exposed to similar types of digital media (i.e., whether parents who are not native speakers of English make similar choices to English parents when selecting media in the majority language ? English - for their children).

In this study we collected questionnaire data from 72 parents of Polish-English bilingual children aged 3,5-7 years living in the UK who speak primarily Polish in the home, and from 43 parents of English monolingual children of the same age. As per 2021, around 696 thousand Poles lived in the UK, one of the largest immigrant communities in the country. A modified version of the QQ-MediaSEED questionnaire (Sun et al., 2022) was used to collect the data on the quantity and quality of children's digital media use, children's favourite apps and TV programmes, and language exposure to Polish and English in the bilingual group.

The data transcription and analyses are ongoing. The aim of this study is to investigate: (a) the differences in the quantity and quality of digital media use between the two languages of Polish-English bilingual children in the UK, (b) the differences in the quantity and quality of digital media use in the majority language (English) between mono- and bilingual children, (c) the differences in the quality of language in the apps and TV programmes that bilingual children are exposed to compared to the ones monolingual children are exposed to. Language samples from the 10 most popular educational apps and 10 most popular TV programmes per mono- and bilingual group (40 apps/TV programmes in total) are being transcribed and coded for the psycholinguistic features (following the method by Kolak et al., 2022): age of acquisition, concreteness and frequency on the word level, and utterance types (fragments, copulas, imperatives, questions, subject-predicates, complex) on the utterance level. The analyses regarding differences in the quantity and quality of digital media use will be performed with the use of t-tests and ANOVAs, and the analyses regarding the quality of language will be performed with the use of mixed models.

The results of the study will illustrate the family media habits of bilingual children in the UK, when compared to their monolingual peers, and will provide insights into the quality of language in the media that monolingual and bilingual children are exposed to. They will also help produce recommendations for parents on how to effectively support their children's language development in both languages with the use of digital media.

# Day 2 online posters

## OP2.01. Learning the meanings of numbers from the syntax of nouns

Online presentation

Sebastian Holt, University of California, San Diego
David Barner, University of California, San Diego

Contact: sholt@ucsd.edu

When languages develop expressions for large, exact numbers, such as ‘twenty-six’, they do so by composing small number-words together through a system of generative rules. For example, Mandarin “èr-shí-lìu”, twenty-six, is composed directly of words meaning ‘two’, ‘ten’, and ‘six’ (Comrie, 2013), which are added or multiplied together based on their syntactic position within the whole expression. While young children quickly master the generative structure of their native language, the structure of its number system remains opaque to them until several years after they begin to use number words (e.g., Guerrero et al., 2020).

However, this protracted timeline may be an artifact of the languages studied. The most commonly studied languages in the acquisition literature exhibit base-10 systems, in which only numbers greater than 10 exhibit compositional rules, limiting children’s early exposure to composition. Furthermore, with morphological irregularities in the 10s (e.g., ‘twelve’ in English but not ‘two-teen’), compositional rules may not become apparent before age 4 or 5, when children have learned number words in the 20s or 30s.

It therefore remains possible that children might learn the generative structure of smaller base systems faster, as those systems express the earliest-learned numbers compositionally, and especially if they reuse earlier-acquired morphosyntax. Even 2- and 3-year-olds may have the conceptual tools to do so: they understand the logical operations of conjunctive constructions (Bloom et al., 1980) as well as small, exact, number word meanings like “one” and “two”. Together, these might support the composition of numerical meanings (Hurford, 1987; Spelke, 2017), analogous to conjunctive forms attested across languages (e.g., ‘vingt-et-un’ in French; ‘eenentwintig’ in Dutch). Older children who have already learned to accurately count large sets (sometimes called “Cardinal Principle knowers” or “CP knowers”) can indeed compose small numbers multiplicatively, when taught an artificial construction featuring familiar syntax (Cheung et al., 2016). However, it remains unclear whether younger children who have not yet mastered counting in their native, base-10, system (a.k.a. “subset knowers”) are also capable of acquiring such rules.

In a pre-registered experiment, we ask how CP and subset knowers interpret numerical constructions composed of small number words. In the Conjunction task, children are asked for small sets of 2-4 objects featuring implicit conjunction (e.g., “Can you get two-two apples?”) or explicit conjunction (two-and-two apples). CP knowers are additionally asked for large sets of 11-19 (e.g., ten-and-one). Critically, many subset knowers do not understand

number words greater than 2, raising the question of whether they can extend the novel constructions to create sets that they do not already have words for. In the Multiplier task, children are asked for 1-2 pairs of objects, expressed via a familiar nominal label (e.g., "[one lunch / two lunches] of bananas", where each 'lunch' contains 2 bananas) or a numeral label ("[one two / two twos] of bananas").

Preliminary results suggest that although subset knowers comprehend conjunction and the words they're asked to conjoin, only CP knowers interpret conjunctive number constructions additively, and only when they contain the word "and". Also, only CP knowers successfully create sets of four when asked for 'two lunches' or 'two twos'. Data collection is ongoing, and we have recently hired a team of assistants to complete it over the summer.

# OP2.02. Predicting child language outcomes using narrow and broad socioeconomic factors

Online presentation

Sneh Jhaveri, Southern Methodist University
Abbie Heidenreich, Texas Christian University
Sarah Kucker, Southern Methodist University

Contact: sjhaveri@smu.edu

Children vary in vocabulary size and growth as well word learning skills (Rowe et al., 2008). While the reason behind these individual differences in language acquisition is not very clear, cognizing these underlying factors is essential in understating language development in children. Socioeconomic status (SES) is one such variable that explains some individual differences; however, there is no consensus on either the factors that are important for studying SES and language or how they are measured. Parents education, income and neighborhood demographics are commonly used factors to measure SES with studies using a combination of them or utilizing one of them as a proxy variable for SES (Hoff et al., 2012; Sirin, 2005). Thus, we aim to study the impact of SES factors related to household demographics (narrow factors) as well as the neighborhood demographics (broad factors) on child's word learning and vocabulary growth. We predict for aim 1 that each of the narrow SES factors (maternal education, paternal education and household income) will predict language outcomes [vocabulary, comprehension, known referent selection (KRS) and novel referent selection (NRS)], after controlling for age. For aim 2 and 3, each narrow and broad SES factors (neighborhood education and income), respectively, entered in the same model will uniquely predict language outcomes. Lastly, narrow factors will predict the child's language outcomes over broad factors, because the children's younger age means the influence of parents tends to outweigh the neighborhood.

A subset of 303 kids (n = 144 females) from a large cross-sectional study were examined here. Children were between 16-30 months old (M = 23.32). Parents completed the MacArthur Bates Communicative Developmental Inventories - Words and Sentences (MBCDI-WS) for a measure of the child's vocabulary and reported their highest level of education and household income. Additionally, their zip codes were used to obtain medium

household income (neighborhood income) and percentage of individuals with a bachelors or higher degree in the neighborhood (neighborhood education) from the Census. Children completed a series of lab tasks such as a known comprehension task with all familiar items, and a known (KRS) and novel (NRS) referent selection task, in which the child selected either a known or novel object from a set of two known and one novel object.

Each SES metric was compared to children's vocabulary and performance on each task. Vocabulary, Comprehension and KNS were correlated with each narrow SES factors but not broad SES factors, except for neighborhood income that correlated with comprehension. Each SES factors were correlated with each other, $r < .5$, $p < .5$. Each aim was then tested:

- Aim 1: Each narrow SES factor resulted in 1-3% change in vocabulary, comprehension and KNS, over and above the child's age.

- Aim 2: Narrow SES factors entered in one model resulted in significant change in all language outcomes besides NRS but did not uniquely predict any language outcomes.

- Aim 3: Broad SES factors lead to 2% change in comprehension. Additionally, neighborhood income uniquely predicted comprehension over and above neighborhood education, after controlling for age.

- Aim 4: Narrow SES factors predicted change in vocabulary, comprehension and KNS over the broad factors, after controlling for age. SES factors did not uniquely predict language outcomes.

These results emphasize the importance of narrow factors and caution against using neighborhood factors as a substitute for SES, which can yield erroneous conclusions, especially for children in a younger age group. Furthermore, although the results imply that narrow factors can predict language outcomes as proxies for each other, it is important to note that this does not provide a comprehensive measure of SES. Further work is required to test for a comprehensive SES measure.

## OP2.03. Verbatim narrative prompting to Nungon-speaking children

Online presentation

Hannah Sarvasy, MARCS Institute, Western Sydney University

Contact: h.sarvasy@westernsydney.edu.au

The Nungon Child Speech Corpus contains 184 hours of recorded and transcribed child-caregiver interactions for nine children aged 1;1-5;10 learning the Towet village dialect of the Papuan language Nungon, spoken by about thirty households in a remote river valley of Morobe Province, Papua New Guinea. When the first child-caregiver cohort began to participate in the study, parents showed a predilection to prompt children to tell narratives, usually by 'feeding' the children each narrative, clause by clause, for them to repeat back. This practice is not just an artefact of the recording context; in fact, verbatim prompting more

generally, even between adults, is widespread and socially acceptable among Nungon speakers in a range of contexts, and there is a Nungon verb, ok yi-, that means ‘to repeat after someone’ (Sarvasy, 2017).

While these verbatim narrative prompting stretches do not showcase children’s independent productions, they can be useful in other ways (for instance, to illuminate children’s articulatory development as they try to mimic a target form). This speech style may also serve to advance our understanding of adult language use, beyond the child-directed speech context.

I examined verbatim prompting of seven narratives by two mothers in dyadic mother-child conversations; the prompted narratives together lasted 744 seconds. The duration of prompts was highly consistent across the mothers, and the children responded readily to most prompts, such that the average duration between the onset of one prompt and the onset of the following prompt was 3.05-3.86 seconds across all the narratives. Most prompts comprised a single clause, though some prompts contained just a noun phrase, or, rarely, two clauses. Even for illiterate and non-formally educated mothers, the clause is clearly a prosodically and perhaps semantically highly salient unit into which to chunk a narrative for prompting.

Perhaps most spectacular, however, is the mothers’ impeccable maintenance of switch-reference relations across clauses. Nungon is a clause chaining language (Longacre, 1983, Sarvasy, 2017, 2020, 2022a, b), such that most narratives are told through a series of multi-clause sentences, in which only the final clause has a tensed predicate, and all preceding clauses have tense-less ‘medial’’ verbs as predicates. All medial verbs are marked for ‘switch-reference’ (Haiman & Munro, 1983), which means that a speaker must indicate through a suffix on every medial verb A whether the subject of the following verb B will be co-referential with A’s subject, or not. As colleagues and I have shown (Sarvasy et al., 2023), this seems to force the speaker to plan speech about two clauses, or about three seconds, in advance, when telling monologual narratives. This is three times farther ahead than English speakers are known to plan (e.g., Griffin & Bock, 2000).

When Nungon-speaking parents prompt children to repeat narratives, clause by clause, the temporal duration of their planning would seem to double, since they must plan across the child’s repetitions. This could entail planning speech about six times farther ahead than English speakers are known to do in ordinary circumstances. We plan to use a similar method to our previous work on monologual sentence planning in Nungon to try to understand the planning process for verbatim narrative prompting.

In sum, the consistency and regularity of verbatim narrative prompting to children in the Nungon Child Speech Corpus suggests that both children and adults are well-accustomed to this speech style. Although it has been rare that language acquisition research has enriched typology (Bowerman, 2010), the widespread presence of verbatim narrative prompting in the Nungon Child Speech Corpus enables new insights into adult sensitivity to prosody and perhaps to syntactic units, and a potential expansion of the temporal upper limit of speech planning in Nungon-speaking adults.

# OP2.04. Socioeconomic status, parental play and book-reading, maternal work satus and vocabulary development in young Korean children

Online presentation

Jongmin Jung, Chosun University
Jun Ho Cha, Chosun University
Eon-Suk Ko, Chosun University

Contact: jongminjung169@gmail.com

The association between socioeconomic status (SES) and child language development is expected to vary because of the heterogeneous community contexts in which children are engaged (e.g., Hoff & Tian, 2005). This study aimed to investigate the influence of SES on children's vocabulary abilities in Korea, where maternal education levels exhibit relatively low variability. We also investigated whether the quantity of parent-child play/book-reading (PBR) practices mediated the effect of SES on vocabulary and determined the influence of maternal work status on children's vocabulary abilities.

Korea offers a unique context in which to study the relationship between SES and children’s language development. With a high proportion of women achieving a college education, maternal education shows a limited variation (OECD, 2022). However, the employment rate among women is below the OECD average, possibly influenced by traditional stereotypes emphasizing mothers' child-rearing roles (Yoo 2021). When mothers work, reduced interaction time may negatively impact their children’s vocabulary development, despite the potential SES benefits from increased income. However, support from family or childcare facilities can mitigate this effect (Laing & Bergelson, 2019). Interestingly, the majority of 1-2-year-old Korean children, regardless of maternal work status, are enrolled in childcare facilities (Korea Institute of Child Care and Education, 2021). This may indicate that children may have similar levels of communication interactions, regardless of their mother's employment status. However, understanding of the link between SES, mother-child interactions, and language outcomes in young Korean children remains limited.

A total of 261 mothers with children aged 8-36 months participated in the study (SAHM, n = 111; WM, n = 150). Information on family SES, children's vocabulary scores, and parental play/book reading frequency and duration (PBR) were collected. More than 90% of mothers obtained tertiary education. Structural equation modeling (SEM) was employed, utilizing latent variables representing SES and PBR. Specifically, we examined the mediating role of PBR on the influence of SES on vocabulary outcomes.

The SEM results revealed that family SES significantly predicted children's vocabulary scores, albeit with a relatively small coefficient ($\beta = .208$, $p < .05$). In the mediation analysis, the effect of SES on vocabulary scores was fully mediated by the PBR ($\beta = .201$, $p < .05$). An additional regression analysis showed that book-reading frequency was the most robust predictor of vocabulary scores. In contrast, although the WM group exhibited higher scores

across all three SES indices and read books more frequently than the SAHM group (W = 6751.5, p = 0.007), there were no significant group differences in vocabulary scores.

The findings indicated a significant but modest impact of SES on Korean children's vocabulary development. Parental efforts to engage in interactions with children through play and book-reading mediated the effect of SES on vocabulary scores. Despite time constraints, working mothers showed comparable play frequency and playtime to their children, along with a higher book-reading frequency than stay-at-home mothers. However, the factors affecting the relationship between SES and vocabulary scores, based on maternal work status, remain unclear. Further research is required to uncover the underlying mechanisms that link SES and language development.

## OP2.05. The initiator effect in conversational interactions and its association with children’s language outcome

Online presentation (by Jun Ho Chai)

Eon-Suk Ko, Chosun University
Jun Ho Chai, Chosun University
Jongmin Jung, Chosun University

Contact: junhoc94@gmail.com

Conversational interaction plays a vital role in children's language development (Casillas et al., 2016; Hilbrink et al., 2015; Stivers et al., 2018), yet the complex dynamics between speakers and their predictive impact on children's language outcomes are not fully understood. While previous studies have highlighted the importance of language input (Bergelson et. al., 2019; d'Apice, Latham, & von Stumm, 2019), recent studies have shown that the order of interlocutors in conversational turn-taking may also have an impact on a child's response pattern (Ko et al., 2016) and, to some extent, on children’s language outcome (Salo et. al., 2022). This study focuses on the role of conversational interactions in child language development, providing evidence that adults’ agentive roles in conversational interactions are associated with child’s vocabulary outcome.

We analyzed 40 daylong LENA recordings of Korean children involved in dyadic interactions between an adult (female or male) and a child (19 girls; 13-14 months of age). Children’s vocabulary size was measured using the MacArthur-Bates Communicative Development Inventories - Korean adaptation (K-CDI; Pae & Kwak, 2011). LENA pre-processes the recordings by classifying utterances as silence or noise, and further categorizes non-silence utterances based on the speaker (child, adult-female, adult-male, other child, and media sounds) and the initiator of the conversational block (adult vs child-initiated). Our research investigated the interaction patterns at the level of conversational blocks (i.e., verbal interactions identified by LENA based on silence intervals of 5 seconds or longer) focusing on the effect of initiator of the blocks.

We constructed a series of generalized linear mixed models examining the relation between interlocutor order and language outcome by measuring four aspects of adult-child

interactions: segment duration, number of segments, response interval, and the number of turns. Both adults and children spoke longer and spoke more often in their own initiated block, as well as both speakers produced more responses in their own initiated block than the other speakers (p's < .001). Analyses of three-way interactions revealed that adults produced longer segments (in CIC) and spoke more often (in AIC) with children who had a higher K-CDI percentile. The finding that there is an opposite trend in how often children spoke in the function of K-CDI percentiles in AIC and CIC suggests a dynamic interplay between adult initiative role and children's active participation in shaping their language skills.

We corroborated the so-called initiator effector, reported in English-speaking population (Ko et al,, 2016), in the Korean adult-child dyads, by showing that interlocutors speak more and longer, and also have a tendency to respond more and quicker in their own initiated series of conversations. We presented evidence that an adult's active effort in conversational exchanges and children's active participation is associated with children's outcome as measured by K-CDI. Future studies addressing the limitations of the current study such as the K-CDI measures concurrent with recording and the incorporation of multimodal cues will be necessary to further our understanding of the relation between the agentivity in the interaction and the outcome.

## OP2.06. Exploring bilingual and monolingual children's ability to combine mutual exclusivity and eye gaze across different contexts

Online presentation

Shannon P. Kong, Oxford Brookes University
Olivia Afonso, Oxford Brookes University
Nayeli Gonzalez-Gomez, Oxford Brookes University

Contact: 19062026@brookes.ac.uk

Word learning heuristics enable young children to determine the referent of unknown words by using cues from context or speech itself. One such heuristic is the mutual exclusivity (ME) bias (Markman & Wachtel, 1988) which refers to the tendency to map novel labels onto novel objects (Halberda, 2003). This heuristic is often studied in isolation, however, in a real-life setting, it is likely to be used in combination with other word learning strategies, such as eye gaze. Previous research has found mixed results for children's interpretations of eye gaze combined with ME. For example, some research found that monolingual children relied upon ME rather than eye gaze when the cues conflicted (Jaswal & Hansen, 2006); whilst other research found that monolingual, but not bilingual children, prioritised eye gaze to learn a novel label for a familiar object (Gangopadhyay & Kaushanskaya, 2020). Due to this discrepancy and limited research with bilingual children, the current study aims to explore whether bilingual and monolingual children rely on eye gaze or ME when cues are in conflict across different contexts. For example, whether the novel word is legal in English or if the speaker appears to be bilingual or monolingual.

In this eye-tracking study, 35 bilingual and 54 monolingual 4-and-5-year-old children watched two videos of a bilingual and monolingual speaker. These videos followed the same format, except the bilingual-speaker video began with the speaker talking on the phone in Turkish and then switching to English for the rest of the experiment. In the monolingual-speaker video, she spoke on the phone in English instead. Each experiment consisted of teaching and testing phases. During the teaching phases, the speaker looked at and labelled one of two objects. Within each experiment, half of the trials presented were congruent and incongruent. During the congruent teaching trials, the speaker's gaze and mutual exclusivity cue provided the same information (i.e. the speaker looks at the novel object whilst saying a novel label). Whilst in the incongruent trials, the speaker's gaze and the mutual exclusivity cue provide conflicting information (i.e. the speaker looks at a familiar object whilst saying a novel label). Additionally, half of the novel words presented were illegal or highly infrequent in English. Five minutes after watching the videos, the children were shown pictures and asked to point at objects from the videos. This tested whether the children could retain the labels and apply them in a different context.

A linear regression confirmed that participants were able to learn new novel words using these word learning heuristics, $F(5, 1089) = 3.77$, $p = .002$). There were no significant differences when the cues were congruent or incongruent ($p = .074$). This means that in the congruent condition, children learnt that a novel label referred to the novel object; whilst in the incongruent condition, they learnt that the novel label referred to a familiar object. There were no significant differences when the speaker was monolingual or bilingual ($p = .596$), if the words were legal or illegal in English ($p = .131$), nor if the child was bilingual or monolingual ($p = .389$). Significant differences were identified between 4 and 5-year-olds ($p = <.001$) with older children relying more strongly on eye gaze. These preliminary findings suggest that in ambiguous word learning contexts, monolingual and bilingual children are more likely to rely upon eye gaze than ME to learn new words. However, on the retention task, children were more likely to identify the correct object when the trial was congruent rather than incongruent. For example, 66% of children identified the correct object from a monolingual-speaker congruent trial; whilst only 50% of children identified the eye gaze referent from a monolingual-speaker incongruent trial. This suggests that when eye gaze and ME cues align, children may be more likely to retain the labels.

# OP2.07. Multimodal predictors of early object noun recognition in Tseltal

Online presentation

Kennedy Casey, Princeton University
Marisa Casillas, University of Chicago

Contact: kcasey@princeton.edu

What are the key predictors of word learning in Tseltal? Tseltal (Mayan) early language environments have been described as both non-child-centered and non-object-centered (Brown, 2011, 2014). Directly-addressed speech from adults makes up a minority of Tseltal learners' available language input (Casillas et al., 2017). And while Tseltal children frequently handle objects (Casey et al., 2022), object labeling by adults is rare (Brown, 2011, 2014). Thus, opportunities for direct mapping of noun labels onto handled objects are sparse. These observations lead to a theoretical puzzle, given that mainstream accounts from middle-class Western contexts posit that object labeling and handling are key predictors of early word learning (e.g., Braginsky et al., 2019; Muraki et al., 2022; Suarez-Rivera et al., 2022). We ask: do these multimodal factors similarly influence Tseltal children's lexical development? If so, Tseltal data would support the utility of these input features across diverse learning contexts. If not, we would need to rethink what drives Tseltal children's early word learning (e.g., a larger influence of overhearable and observed input).

Method: 62 children up to age 4 (mean=2;07.02, range=0;09.09-3;11.24) participated in a word-recognition experiment (30 object nouns; Looking-while-Listening (LWL, Fernald et al., 2008)). Adult object labeling and child object handling frequencies—estimated from daylong photo-linked audio recordings (Casillas et al., 2017) from 43 children in the same community/age range (31 overlapping with LWL sample)—were used as predictors of LWL performance. Labeling frequency was counted in 45 randomly-sampled minutes per recording (target-child-directed language only), and object handling frequency was counted in each full daylong photo stream (~2 photos/minute). Raw frequency counts were centered and scaled to test for item-level variation in looking behavior based on relative, aggregate input statistics across our dataset.

Results (Accuracy): A linear mixed-effects regression with by-child and by-word random intercepts revealed that children's overall, salience-corrected accuracy in looking to labeled target objects was above chance ($\beta=0.19$, SE=0.02, $p<0.001$), with positive comprehension scores for 28/30 object nouns and significant improvements over age ($\beta=0.06$, SE=0.02, $p<0.001$). Labeling and handling frequency did not significantly impact overall LWL accuracy ($ps>0.05$).

Results (Timecourse): A growth-curve analysis (Mirman, 2014) revealed mixed evidence for effects of labeling and handling frequency on the dynamics of children's looking behavior. We found positive two-way interactions only between the cubic time term and labeling ($\beta=0.07$, SE=0.02, $p<0.001$) and handling ($\beta=0.06$, SE=0.02, $p=0.004$) frequency. We also found significant three-way interactions between both frequency predictors and the linear and cubic time terms ($ps<0.01$), suggesting an advantage in online word recognition for the

most frequently labeled and handled objects. Age also negatively interacted with labeling ($\beta$=-0.04, SE=0.005, $p<0.001$) but not handling ($\beta$=-0.02, SE=0.004, $p<0.001$) frequency, indicating stronger effects of this predictor for younger children.

Discussion: Tseltal children under age 4 showed reliable recognition of object nouns (see also Foushee & Srinivasan, 2022). Adult object labeling and child object handling frequency did not affect overall word-recognition accuracy, but preliminary evidence suggests that, at the group level, children were faster to recognize objects that were among the most frequently labeled and handled. Our results indicate that, in addition to object handling experiences, Tseltal children's online word recognition may be influenced by labeling frequency in directly-addressed speech, but current findings leave open the strong possibility that Tseltal children's early word learning is also, or better, predicted by their experiences with overhearable language.

## OP2.08. Characterizing infant-directed communication and links to caregiver-infant synchrony

Online presentation

Jessica Kosie, Princeton University
Casey Lew-Williams, Princeton University

Contact: jkosie@princeton.edu

Everyday caregiver-infant interactions are dynamic and multidimensional. However, existing research underestimates the true dimensionality of infants' experiences, often focusing on one or two communicative signals (e.g., speech alone, or speech and gesture together). Our goal is to augment research on IDS by investigating "infant-directed communication" (IDC): the suite of communicative signals from caregivers to infants including speech, action, gesture, emotion, and touch. Across three studies, we examined: (1) how caregivers use overlapping dimensions of IDC during everyday interactions with infants, (2) variation in caregivers' use of IDC across everyday activity contexts, and (3) relations between IDC and brain-to-brain synchrony between caregivers and infants.

A total of 144 caregivers and their 18- to 40-month-old toddlers participated in our studies. These families were predominantly white, middle-class families in the United States. In Study 1 (N = 44), caregivers and infants were recorded (via Zoom) during a single interaction in which caregivers were asked to gather a few toys and play with their infant as they normally would. In Study 2 (N = 40), caregivers and infants were recorded a total of six times; during playtime, mealtime, and book sharing on two different days. In Study 3 (N = 60), caregivers and infants were invited to the lab where we simultaneously measured neural activity in the brains of caregivers and infants as they played together. Across all studies, videos of the interactions were coded for caregivers' use of each of the five dimensions of IDC (speech, action, gesture, emotion, and touch) as well as infants' vocalizations and gestures using extensively detailed and previously-validated methods.

We found that multiple, overlapping dimensions of infant-directed communication occurred throughout the entire interaction. Significantly more than half of the speech that infants heard (M = 64%, SD = 12%) overlapped with one or more non-speech cues ($p < .001$) and the number of overlapping multimodal cues from caregivers increased sharply in response to infant vocalizations ($p < .02$) and gestures ($p < .001$). We also found that, while individual caregivers tend to use communicative cues in similar ways within an activity context, their use of cues varies across both activity contexts and caregivers ($p < .001$). Preliminary findings on relations between IDC and brain-to-brain synchrony suggest that the stability and predictability of caregivers' communication may be linked to stronger neural synchrony with their infant.

Our results demonstrate that everyday caregiver-infant communication is highly multidimensional; caregivers frequently use multiple overlapping speech and non-speech cues during everyday interactions with infants. Further, while individual caregivers use IDC similarly on two different days within a context, the use of IDC varies across contexts and across caregivers. This finding perhaps reflects caregivers' adaptation of cues to their own infants' needs in each unique context. In ongoing work, we are exploring how the dynamics of caregivers' everyday communicative interactions with infants may support synchrony at the neural level, likely in a way that enhances learning over time. We conclude that the multidimensionality of IDC is necessary both for theory-building and for understanding the real nature of individual differences across infants' communicative environments.

## OP2.09. Characterizing input from older children in North-American daylong recordings

Online presentation

Federica Bulgarelli, University at Buffalo

Contact: fbulgare@buffalo.edu

Infant's language development is inherently tied to their linguistic input, but the majority of research investigating infant's input has focused on adult caregiver speech. For example, Hart and Risley's (1995) quantity estimates use only speech from one primary caregiver, and the LENA system estimates input quantity only for adults. However, children do not exclusively interact with adults. In the US, 80% of children's households include additional children (Census Bureau, 2010). The focus on adult caregiver input thus does not fully capture the experience of the majority of children. Research finds that infants with older siblings have lower language skills relative to first or only children (Havron et al., 2019), and suggests this could be due to differences in parental resources for families with multiple children (e.g. Blake, 1981). An unexplored possibility is that infants' experiences with child speech shape their language development. We seek to quantify infant's experiences with speech from children, to begin to understand the prevalence of child speech in the input.

We used daylong recordings from the Waurlamont Corpus (Warulamont et al., 2016) on Homebank. These ongoing analyses report data from 10 daylong recordings, from 5 participants each at 3 and 6 months, all reported to have 1-3 siblings. We used LENA

speaker tags to classify speech segments from adults or electronics. To ensure accuracy on other-child tags (CXN), research assistants manually tagged whether each CXN segment contained speech from children. Since the target children in the recordings are 3 and 6 months old, child speech heard in the recordings must be from other children. 4595 (68%) of LENA CXN tags were found to actually contain child speech. Since LENA only provides estimates of word counts from adults, we used the number of LENA-identified segments for each speaker tag (manual for CXN and from LENA for adult and electronics) to estimate differences in exposure. Most segments in the recordings were tagged as electronics (55% segments) and adult speech (33% segments); only 12% of segments on average contained child speech. However, this percentage varied widely, from 1% to 29% of segments across recordings.

We next quantified how speech from different sources is distributed in time. Infants heard adult and electronic speech most hours of the day (hours with adult speech = 11.4; hours with electronics = 10.5), but child speech was less frequently distributed over the daylong recordings (hours containing child speech = 6). However, there was wide variability across participants here as well, ranging from only 1 hour with child speech to 11 hours across recordings, likely reflecting differences in childcare arrangements or day of recordings. We further measured the distance between the start of segments for each speaker category. Adult and electronic speech segments occurred closer in time (every 29sec and 17sec respectively) than child speech (every 44sec). Having more siblings resulted in more frequent child speech (every 36sec vs. every 51sec).

This first investigation of the prevalence of child speech in infants' real world environments suggests great variability in experience, both in proportion of input (estimated by number of speech segments), and in the distribution of that input across time. In ongoing analyses, we are transcribing child speech segments to understand what children talk about in the presence of infants and to what extent child speech is infant directed. This will allow for comparisons to cross-linguistic research estimating infant-directed-speech from older children (Casillas et al., 2021). Further, as the temporal structure of experience with words relates to language learning (e.g. Slone et al., 2023; Brodky et al., 2007), understanding how topics in child-produced speech are structured in time will further our understanding how both consistent and clustered exposure to child speech influences language development.

## OP2.10. Language environment and early language skills in Slovenian toddlers: A pilot study using daylong recordings

Online presentation

Urška Fekonja, University of Ljubljana
Naja Ferjan Ramirez, University of Washington
Ljubica Marjanovič-Umek, University of Ljubljana

Contact: naja@uw.edu

Children's language environment is important for the development of early language. The cornerstone method employed across many recent studies has been the Language

ENvironment Analysis (LENATM), which facilitates day-long audio recordings in natural environments via an unobtrusive recorder placed into a child vest. The LENA software provides an automated estimate of the amount of child speech (CVC) and adult speech near the child (AWC), and can be supplemented with manual analyses to extract additional measures. While LENA has transformed the research on language input, the overwhelming majority of studies have considered exclusively English. Here we use LENA to assess the language environment of toddlers learning Slovenian, a morphologically complex SVO language spoken by ~2 million people. Using traditional methodologies, previous studies have linked factors such as parental education or frequency of shared book reading to Slovenian toddlers' language skills; however, associations between language input and child language have not been studied extensively, and daylong recordings have not yet been utilized. The present study asks three questions:

Q1: How do language environment and child language measures from daylong recordings in Slovenian compare to those previously observed in American English?

Q2: Do measures from daylong recordings correlate with the Slovenian MacArthur-Bates Communicative Development Inventory (CDI)?

Q3: What characteristics of the language environment relate to Slovenian children's language skills?

Daylong recordings were collected on one weekend day from 40 typically developing Slovenian children (22 girls) between 16 and 30 mo of age (mean age: 707 days). Children's language environment and speech production were quantified via two automatic LENA measures, AWC and CVC. Additional manual measures were derived by annotating 100 30-s segments per child using previously published procedures and included: 1) the proportion of infant-directed speech (IDS), 2) the frequency of conversational turns 3) the frequency of child words and 4) word combinations in daylong recordings. Parents also filled out the Slovenian CDI, Words and Sentences.

Measures of language environment and child language showed large variation, but were comparable to previous studies in American English, with the exception of AWC, which was higher in the Slovenian sample (AWC validation for Slovenian is currently in progress). CVC, the frequency of child words and child word combinations in daylong recordings were significantly correlated with the CDI productive vocabulary, CDI sentence length and a CDI grammatical complexity (all ps < .005, rs between .40 and .74). Controlling for child age, AWC correlated with child words in daylong recordings ($p=0.01$, $r=.40$) and with the CDI productive vocabulary ($p<.001$, $r=.59$). Parental IDS correlated with child words ($p<.001$, $r=.50$) and word combinations ($p<.001$, $r=.51$) in daylong recordings, and children's CDI sentence length ($p=.04$, $r=.34$). The frequency of conversational turns correlated with children's words ($p<.001$, $r=.78$) and word combinations ($p=.008$, $r=.42$) in daylong recordings.

The results demonstrate a link between Slovenian children's language environment and language development, measured for the first time with daylong recordings and aligning well with traditional measures. Follow up analyses will investigate the role of family factors (parental education, knowledge, frequency of shared reading and media exposure) as potential mediators/moderators of these associations.

# OP2.11. Estimating children's language exposure: A comparison of random and volume sampling from daylong recordings collected in a bilingual community

Online presentation

Naja Ferjan Ramirez, University of Washington

Contact: naja@uw.edu

In North America, the characteristics of a child's language environment have been shown to predict language outcomes. For example, differences in bilingual language exposure, exposure to electronic media, and exposure to child-directed speech (CDS) have been related to infants' language growth. Recently, estimates of these predictors have been made through the use of daylong recordings. Because existing automated tools do not distinguish between different languages, cannot parse out CDS from other speech registers, and may not be reliable in detecting electronic media or contingent conversational turns, researchers often estimate these variables from daylong recordings via manual annotation, which is resource intensive. As such, researchers typically extract samples from daylong recordings for manual annotation. One important question to consider is whether the chosen sampling technique affects research findings and if so, how. Some researchers choose to sample at random, which has the advantage of producing estimates that are unbiased. However, for certain research goals, random samples may not provide sufficient amounts of relevant data, and one may instead opt for extracting segments in which specific language behaviors are more abundant (aka., volume sampling). While volume sampling is a reasonable and frequently used approach (i.e. see Orena et al., 2019; Ram¡rez-Esparza et al., 2014, Ferjan Ram¡rez et al., 2021), it is unknown how it compares to random sampling, which has been shown to be a promising approach to efficiently estimate ambient characteristics from daylong recordings (Cychosz et al., 2021)

Here we consider correlation and agreement (using the Bland-Altman approach) to compare random vs. volume sampling in daylong recordings collected from 37 USA-raised bilingual (Spanish-English) infants between 4 and 22 months of age. From each child's two daylong recordings, 100 30-second segments were extracted in two ways: 1) At random, after excluding segments that contained only silence; 2) Based on the highest adult word counts (AWC) and at least 3 minutes apart, after excluding segments that contained only silence. Together, this generated 7,400 30s snippets (3,700 minutes of audio), which was manually annotated for the following variables: Language (English, Spanish, MixedEng+Sp), CDS (present/absent), Electronic media (present/absent), Social context (infant in one-on-one interaction, infant in group interaction), Infant babble (present/absent), and Turn-taking (number of contingent turns).

Results demonstrate that estimates across the two samples were highly correlated for all variables studied (Pearson's rs between .98 and .77 ; ps<.001 ). However, interesting between-condition differences emerged in agreement analyses. For Language, estimates from the two conditions did not differ for English (p=.6) or Spanish (p=.36); however, the amount of language mixing was significantly higher in the high AWC sample compared to

the random sample (p<.001). There was significantly more CDS in the high AWC sample compared to the random sample (p=.003), and the reverse was true for Electronic media (p<.001). The high AWC sample contained a higher proportion of group interactions compared to the random sample (p<.001), and the reverse was true for one-on-one interactions (p<.001). Finally, the amount of infant babbling was comparable between the two samples (p=.16), but the number of conversational turns was significantly higher in the high AWC sample compared to the random sample (p<.001).

To our knowledge, this is the first attempt to directly compare different sampling techniques from daylong recordings using correlation and agreement analyses. We discuss advantages of choosing one technique over the other, depending on the research question and variables at hand. Follow-up studies will compare these two sampling techniques against parent report.

## OP2.12. The interdependence of vocabulary and morphosyntax development in blind and sighted children

Online presentation

Lillianna Righter, Duke University & Harvard University
Erin Campbell, Duke University & Boston University
Eugenia Lukin, Duke University & Harvard University
Elika Bergelson, Duke University & Harvard University

Contact: lilli.righter@gmail.com

Recent work finds that blind toddlers lag ~7 months behind their sighted peers in productive vocabulary size (Campbell et al., under review). However, vocabulary acquisition may be more closely tied to the lack of visual input than other linguistic skills because many cues to early-learned word meanings are visual (e.g. shared gaze, salience of objects or events out of reach; Tomasello & Farrar 1986; Yu & Smith 2012). Vision's impact on other facets of language learning are unclear. Morphosyntactic acquisition may be propelled by lexical growth and information in the linguistic signal (Wojcik et al. 2017), rather than inferences about observed referential relationships (Dominey & Dodane 2004). Here we ask whether blind children differ from vocabulary-matched sighted peers in morphosyntactic skills, and examine the relationships between age, vocabulary, and morphosyntax across these groups.

We matched 32 blind children (14-57mo.) to 32 sighted children (24-36mo.) by productive vocabulary and compared their performance on the Sentences & Grammar part of the Am.English Words & Sentences CDI (Fenson et al, 1994). This provided 4 morphosyntax scores: Word Endings, Irregulars, Overgeneralizations, and Combination Complexity. We also derived 2 measures from parents' examples of children's 3 longest utterances: Mean Length of Utterance (MLU) and a new measure, Syntactic Features, quantifying e.g. agreement, extraction and negation, to tease apart sentence length and complexity.

We found that blind and sighted children did not differ on any of our 6 morphosyntactic measures (ps> .05; paired Wilcoxon Test). Moreover, productive vocabulary size and morphosyntax scores were similarly and strongly correlated across groups (Rs .4-.9; ps<.0125). In contrast, while age and morphosyntax correlated in blind children for 1/6 measures (Combination Complexity), they correlated in sighted children for 6/6 measures. Finally, a mediation analysis tested whether vocabulary growth accounts for the relationship between age and morphosyntax. With age, all children produced more words (sighted=39 words/mo.; blind=10 words/mo.) and more complex morphosyntax (sighted=.74 morphemes/mo., blind=.12 morphemes/mo.), though monthly growth was significantly slower for blind children (Vocab: $z = -2.45$, $p = 0.01$; MLU: $z = 2.40$, $p = 0.02$). For both groups, vocabulary mediated the majority of the relationship between age and morphosyntax (Prop.MediatedBlind= 62%; Prop.MediatedSighted= 92%); bootstrapping analyses indicated that the indirect effect of vocabulary on 5 of 6 measures was significant for both groups.

This work provides first steps in considering the links between age, vocabulary, and morphosyntax in the context of divergent sensory experience. On one hand, we find a tight vocabulary and morphosyntax link regardless of sensory input. This supports longstanding ideas regarding the inseparability of the grammar and the lexicon (Bates & Goodman 1997) and builds on established theories of how children uncover meaning from structure (Gleitman 1990): language knowledge begets language knowledge. On the other hand we find that age and morphosyntax links diverged in our blind and sighted groups, both across measures and in rate of change with age. At the same time, vocabulary mediated the majority of the age to morphosyntax relationship, for almost all measures.

We suggest that slower morphosyntactic advancement may be explained by slower early vocabulary growth, tentatively proposing that visual experience may be more critical for building a vocabulary than for extracting morphosyntactic regularities from linguistic input. Notably, blind adults readily attain fluent language (which even surpasses sighted adults on some measures; Loiotile et al. 2021). Investigating the mechanisms by which blind children catch up is ripe for future research.

## OP2.13. Harnessing learning theory to achieve robust manual annotation: Insights into training na‹ve listeners to identify infant vocalizations in everyday audio

Online presentation

Kayla McComb, University of Oregon
Caitlin Fausey, University of Oregon

Contact: kmccomb@uoregon.edu

We propose a manual annotation training protocol that systematically manipulates variability across training iterations in order to prepare annotators to categorize infant vocalizations in longform audio recordings. This protocol is motivated by elements of cognitive learning theory, specifically about ordering listeners' exposure to variability in to-be-learned

categories (Raviv et al., 2022). We first train annotators using an input set of prototypical infant vocalizations. We then vary subsequent input sets such that variability is introduced first along non-discriminative features (e.g., background audio context) and then along discriminative features (e.g., consonant onsets in canonical vocalizations). The goal is to achieve reliable annotation of multiple difficult-to-learn types of infant vocalization (i.e., canonical vocalizations like “ba”, non-canonical vocalizations like “ee”, laughing, and crying).

Quantifying properties of everyday experiences is essential for making discoveries about how infants build knowledge and skills (Adolph, 2019; de Barbaro & Fausey, 2021; Warlaumont et al., 2021). Recent technologies, like LENA recording devices (Ford et al., 2008), make the collection of longform audio recordings possible. Strides toward automated transcription of these recordings have been made in recent years; however, reliable automated transcriptions are still not fully feasible. Therefore, manual annotation of daylong recordings is essential in order to advance discoveries about experience-dependent learning as well as to generate gold-standard training data for algorithm development. Although the need for manual annotation is widely recognized, detailed and reliable annotations can be difficult to achieve due to challenges with large quantities of recorded audio, personnel hours, and strenuous mental effort. Exploration into how to best handle these difficulties and prepare individuals for manual annotation is needed. Further, transparent and publicly available protocols - specifically about how to train naïve listeners - may advance collective progress by enabling multiple laboratories to conquer annotating shared corpora (Beyak et al., 2022; Cychosz et al., 2021; Soderstrom et al., 2021). Thus, our first aim in this ongoing project is to implement and share a protocol for training na‹ve listeners to reliably recognize canonical and non-canonical vocalizations, laughing, and crying, in full streams of everyday audio. We discuss lessons learned throughout the protocol design and implementation process, and present results and qualitative feedback from annotators undergoing training.

We also present preliminary insights about the environmental patterns identified by trained annotators. Specifically, we assess the extent to which features of everyday music episodes (Mendoza Music Corpus; Mendoza & Fausey, 2018) are associated with rates and kinds of infant vocalizations. We know from prior evidence that music is prevalent during infants’ everyday lives (Mendoza & Fausey, 2021), but we know little about how infants themselves vocalize before, during, and after these musical episodes. We report on the extent to which rates of canonical and non-canonical vocalizations, laughing, and crying are associated with vocal, instrumental, live and/or recorded music in the everyday lives of infants (6- to 12-months-old sampled from primarily USA English-speaking white families; Mendoza & Fausey, 2021). Because infant vocalization practice is important for language development (Lee et al., 2018; Vihman, 2022), understanding the extent to which musical episodes structure opportunities for such practice will advance theories of language learning.

Overall, both categorizing and vocalizing are impressive learning feats; we speculate about multiple solutions offered by the input that learners - annotators and infants alike - experience.

# OP2.14. Properties of infant-directed speech in unilingual and mixed-language contexts

Online presentation

Erika Exton,University of Maryland, College Park
Rochelle Newman, University of Maryland, College Park

Contact: eexton@umd.edu

Previous studies evaluating the impact of mixed-language input on bilingual children's language outcomes have focused on the frequency of code-switching and relative proportion of each language that children hear (i.e. Ruan, et al., 2023; Kremin, et al., 2022; Carbajal & Peperkamp, 2020; Bail, et al., 2015; Place & Hoff, 2011, 2016). However, relatively few studies have evaluated the characteristics of the speech itself, including how properties commonly associated with infant-directed speech such as higher and more variable pitch, slowed speech rate, and shorter and simpler utterances, compare between mixed-language and single-language input. By studying these characteristics in a bilingual context, we will be able to determine whether the speech that bilingual infants hear follows these previously-described patterns, as well as how the input for a particular child may differ across settings and languages. As the properties of IDS have been shown to vary somewhat across languages and cultures (i.e. Fernald, et al., 1989; Kitamura, et al., 2002), it is possible that they could vary across languages or between multilingual vs. unilingual contexts in a single household. Further, there is an ongoing discussion regarding the extent to which IDS is geared toward emphasizing some aspects of the signal in order to aid learning. If IDS does emphasize important contrasts, it could be used to highlight code-switches or the differences between languages. Thus, studying IDS in a mixed-language context provides an important contribution to our understanding of how the properties of parental speech may meet these pedagogical goals.

In the current study, Spanish-English bilingual mothers narrate a set of six wordless picture books. Three stories are told to their infant (6-15 months old) and three are told to a bilingual adult. In each register, mothers use English for one story, Spanish for another story, and freely switch between the two languages for the third story. These narrations are recorded in the participants' homes, at a time of their choosing, in order to maximize our ability to record natural speech while standardizing the language contexts and approximate content across individuals. Participants also complete a questionnaire where they self-report frequency of use for each language in a variety of settings (i.e. book reading, storytelling, other conversation). All stories are transcribed and annotated for a variety of measures including utterance length (seconds, syllables, morphemes), speech rate (syllables/sec and morphemes/sec), and pitch (F0).

Preliminary results suggest that in both single-language and mixed-language contexts, English utterances are longer (contain more syllables and morphemes) in ADS than in IDS. Further, utterances in English-only contexts are longer and have a faster speech rate than English utterances in a mixed-language context across registers. In both languages, utterances have a higher and more variable pitch in IDS than in ADS, regardless of whether the utterance was produced in a single-language or mixed-language context. These findings

replicate previous work regarding differences in utterance length and pitch between ADS and IDS in an understudied population (bilingual mothers). By comparing these language contexts within each participant, they also show that these properties of IDS are likely to be relatively stable for an individual regardless of the language(s) being used. As more participants are recruited, future analyses will also be able to study how these cross-linguistic properties of IDS vary due to the age of the child, the participant's familiarity with each language and habits regarding using each language when speaking to their child, and how often the participant reports using various features of IDS.

# OP2.15. An Examination of Maternal Linguistic Input of Bilingual Mothers.

Online presentation

Mariam El Amin University of South Carolina
Jennifer Brown, University of Georgia

Contact: mariamelamin1@gmail.com

Parents and caregivers play an essential role in their children's language development (Tamis-LeMonda et al.,2001). The quantity of language input children receive from their parents is documented to be related to children's receptive and expressive vocabulary sizes (Rowe, 2008). Additionally, the quality of language input by parents affects a child's language development. Hoff and Naigles (2002) found that the syntactic or grammatical complexity of maternal utterances predicted children's expressive vocabulary. Parental linguistic input directed at their children, also known as Child-Directed Speech (CDS), has received considerable attention in the research literature (Hoff et al., 2020; Kalashnikova & Carreiras, 2022; Masek et al., 2021; Rowe, 2008; Tamis-LeMonda et al.,2001).

Given the connection between language and culture, it is reasonable to expect that the characteristics of CDS might differ from one language to another. Language socialization is a term used to describe the relationship and connection between language and culture (Schieffelin, 1990). Children learn cultural norms and expectations through language. Additionally, the ways individuals communicate stem from cultural beliefs. However, the findings in the literature mostly come from Western, Educated, Industrialized, Rich Democracies (Henrich et al.,2010). This highlights the need for more diversity in child language acquisition research in languages other than English in order to reach a comprehensive theory of child language acquisition and a better understanding of CDS across cultures.

Lebanese Arabic

Arabic as a language is spoken by around 300 million people worldwide. Lebanese Arabic (LA) is a variety of Arabic spoken in Lebanon. Arabic is known for its diglossia, meaning it has two variations: a spoken variation such as Lebanese Arabic that is used in everyday communications, and a modern standard Arabic variation. Modern Standard Arabic (MSA) or classical Arabic is the variation that is used for literacy practices, such as reading and

writing. It is also used for formal communications such as the news and is the language of the Quran, the religious language of all Muslims everywhere (Saeigh-Haddad & Henkin-Roitfarb et al., 2014).

According to Kidd and Garcia's (2022) review, there were 15 articles that focused on language acquisition research in Arabic from 1974 until 2020. Given that Arabic as a language contains various dialects that are spoken in different Arab countries; therefore, the representation of each dialect of Arabic (such as Lebanese Arabic) is less than 15 articles. This underrepresentation underscores the need for further attention in the research literature on child language acquisition.

## Purpose and Study Aims

The purpose of this quantitative study was to describe the typical characteristics of the linguistic input of Lebanese mothers of children between two to five years of age at home during 5-minute interactions across three contexts:(a) playing with toys; (b) reading books; and (c) a naturalistic interaction of the parent's choice. The independent variable of linguistic input was defined as the language that caregivers produced that was directed to their children. The collected data will be shared on the Child Language Data Exchange System (CHILDES) online repository(MacWhinney, 2000).

## Method

To be included in this study, parents met the following criteria: (a) Mothers of Typically developing children under the age of 5 years (b) Bilingual speakers of Lebanese Arabic and English. Children who met the following inclusion criteria were selected to participate in the study: (a) typically developing, (b) no parental concern regarding the child's development, (c) no hearing loss or official diagnosis of a language or developmental delay,(d) not receiving any special education services, and (e) bilingual speakers of Lebanese Arabic and English. All the activities occurred at the family's home. A camera recording was used to record the sessions. The order of the data collection activities was counterbalanced in order to reduce potential experimental threats due to the order. The data collection activities were: a) assessment of the children's language skills, b) naturalistic interactions between the caregiver and child, c) caregiver reading books to the child, d) caregiver playing with the child using toys provided by the experimenter, and e) parents filling out a demographic survey and parent report measures. The collected language samples were transcribed and analyzed using Computerized Language Analysis (CLAN, MacWhinney, 2000).

## Coding Procedures

The transcribed samples were coded for the following features: (a) quantity of CDS measured in Words per minute,(b) lexical diversity using Number of Different Words (NDW), (c) pragmatic functions of CDS coded using the theKuchirko et al. (2019) coding scheme of language functions. Parental inputs were coded as referential language, regulatory language, or vocalization prompts.

## Results

Ten mother-child dyads were recruited in this study, 6 males (60%) and 4 females (40%), with a mean child age of 39.7 months (SD = 14.46). All the mothers reported having a college degree (N=10) with a range of education levels including a bachelor's degree (50%) and a graduate degree (50%). The results of a repeated measures ANOVA indicated that mothers used significantly more linguistically diverse words $F(2, 18) = 12.44$, $p < .001$, partial?2 = 0.580, and more words per minute $F(2, 18) = 11.00$, $p < .001$, partial ?2 = 0.550 during the book context compared to toy context and the parent-selected activity. Additionally, mothers used labels and attention directives more frequently in the book context than during naturalistic interactions and play. Whereas they used action directives more frequently in the naturalistic interaction and play context than in books. These findings highlight the importance of examining CDS across different cultures and constitute a contribution to the literature on CDS in Arabic. Additionally, the findings have both research and clinical implications that will be discussed.

Significance

The following study provides a unique contribution as it is the first exploration of the typical features of the linguistic input Lebanese mothers use with their preschoolers across various communication contexts. These findings have several theoretical, clinical, research, and policy implications.