

Infant-Directed Speech and Social-Communicative Functioning

Marisa Filipe^{1,2}, Linda Watson³, Selene Vicente², & Sónia Frota¹

¹Lisbon Baby Lab, Centro de Linguística, Universidade de Lisboa, Portugal; ²Centro de Psicologia, Universidade do Porto, Portugal; ³University of North Carolina at Chapel Hill



Introduction

Children with autism spectrum disorders (ASD) are at high risk for severe impairments in broad aspects of language development (e.g., Lewis, Murdoch, & Woodyatt, 2007). Recently, early identification has become more promising due to scientific knowledge about early markers. Some of the main early markers of risk for ASD are prelinguistic. For example, at risk infants do not show the expected preferences for infant-directed speech (IDS) over other stimuli (e.g., Kuhl, Coffey-Corina, Padden, & Dawson, 2005). Specifically, IDS is a speech style used by adults when speaking to infants, and it is generally characterized as having higher pitch, larger pitch range, slower tempo, and increased rhythmic features than adult-directed speech. IDS may serve to enhance language learning, obtain and/or maintain attention, and communicate affective and contextual information (e.g., Fernald, 1992; Cristia 2013).

The present project examines electrophysiological responses to IDS in infants at-risk for ASD (i.e., younger siblings of children with ASD, given that around 20% of these children have been found to meet the criteria for ASD by their third year of life; Ozonoff et al., 2011), assessed at the age of 12 months, as a predictive marker of social-communication outcomes at ages 2 and 3, and of diagnosis.

Detailed Description

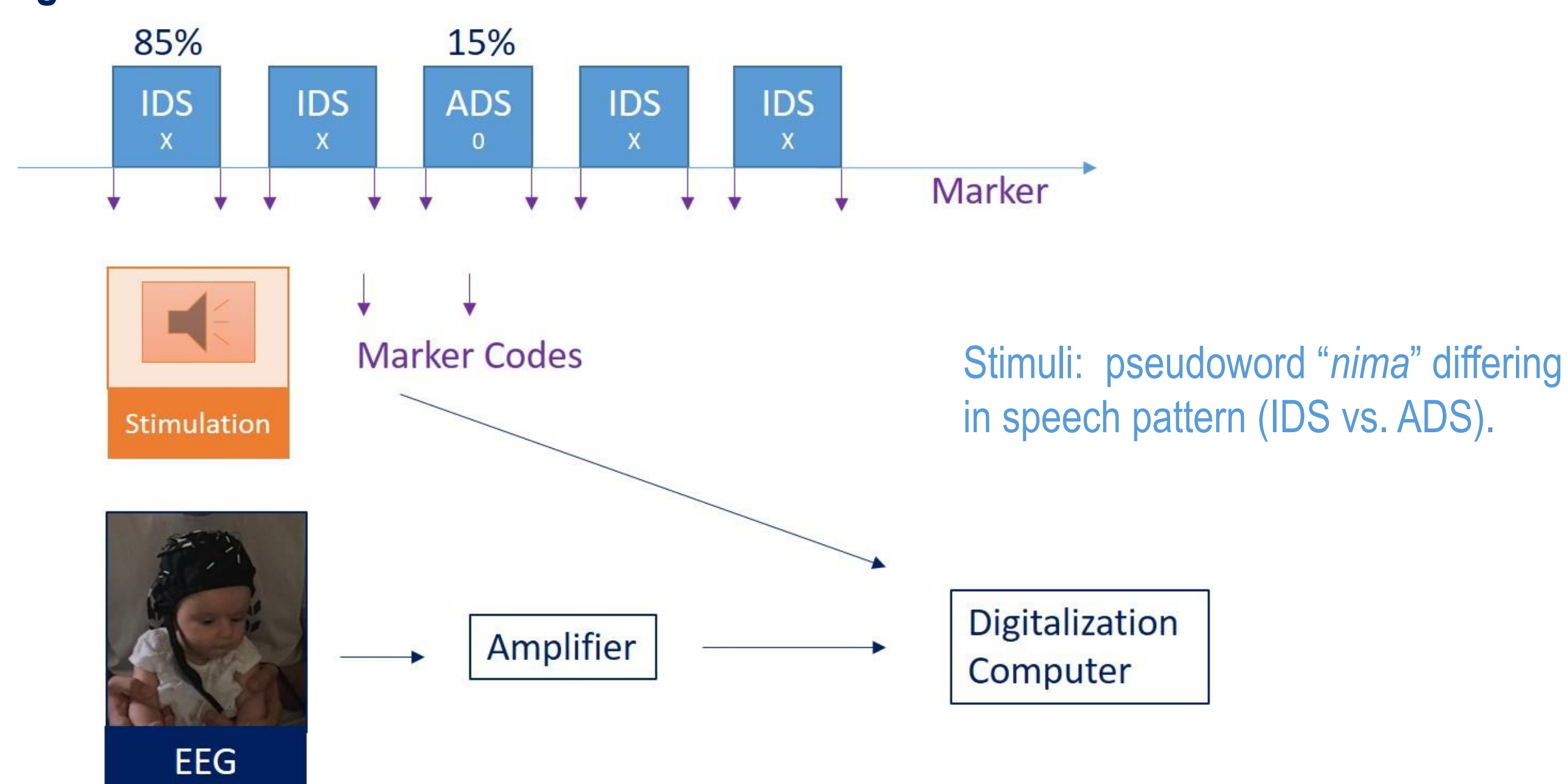
Participants: 75 infants aged 1 year at high risk for ASD and 30 infants of the same age with no known risk for ASD. Criteria for inclusion in the high risk group: (a) genetic risk (one first degree family member with ASD), and/or (b) a 10th percentile cutoff score for risk on the screening tool (Communication and Symbolic Behavior Scales), (c) and/or other risk factors: sex (male), low birth weight (<2500 g), or low 5' APGAR score.

Study Overview (see Figure 2):

- Phase 1: Participants' Assessment (12 months):

- **Screening tool:** Communication and Symbolic Behavior Scales Developmental Profile Infant/Toddler – Checklist;
- **Developmental level:** Griffiths Mental Development Scales - Revised;
- **Adaptive behavior:** Vineland Adaptive Behavior Scales;
- **Vocabulary:** MacArthur-Bates Communicative Development Inventory (CDI) - Short Form;
- **Social-Communicative Functioning:** Communication Play Protocol;
- **Event-Related Potentials (ERP) Test:** Passive-listening oddball paradigm.

Fig 1. Oddball Task



- Phase 2 & 3: Follow-up I (24 months) and II (36 months). Re-assessment of the dimensions mentioned in Phase 1.

- Phase 4: Diagnosis confirmation (36 months). For a confirmed diagnosis, participants at-risk for ASD should meet DSM-5 criteria for this disorder based on a clinical synthesis of all the information collected during the diagnostic assessment, and should meet criteria for ASD on at least one of two additional assessment tools that will be used in the diagnosis procedure: the Autism Diagnostic Interview-Revised (ADI-R) and the Autism Diagnostic Observation Schedule, 2nd edition (ADOS-2).

Fig 2. Study Overview



Hypothesis 1: IDS elicits different patterns of brain response (ERP measures: Mismatch negativity (MMN) and P3a component) in infants at-risk for ASD compared to typically developing peers (as a reflex of typical developing infants preference for IDS as opposed to adult-directed-speech, and children with ASD non-preference for IDS; Kuhl et al., 2005). Note: The groups (high risk and low risk group) will be evaluated for equivalence in age, gender, autism traits, developmental level, and adaptive behavior; any nonequivalence arising in the randomization process will be accounted for through the use of covariates in data analysis.

Hypothesis 2: ERP measures of MMN and P3a component in IDS processing will be positively correlated with and will predict measures of social-communication skills (i.e., developmental level, quantification of autistic traits, adaptive behavior, and vocabulary), as a reflex of the role played by IDS in early language learning, speech discrimination performance, and affective and social-communicative functioning (Kuhl, 2007).

Hypothesis 3: ERP measures of MMN and P3a component in IDS processing are predictive markers of ASD (as past research suggests that typically developing infants are predisposed to attend to IDS; Kuhl et al., 2005; the absence of this typical predisposition could be used as a sensitive marker of the development of autistic symptomatology).

In sum, this prospective longitudinal design will extend (1) the fundamental research on ERP measures of early language acquisition in typically developing infants and in children at-risk for ASD to the effects of IDS as a powerful social-communicative factor crucial to early language development, (2) the definition of early neuropsychological markers of risk for ASD, and (3) the understanding of early markers as predictors of later outcomes in language and social-communication skills. The findings may contribute to early identification, diagnosis, and intervention in children with ASD with important individual and social benefits.

References

Fernald, A. (1992). Human maternal vocalizations to infants as biologically relevant signals: An evolutionary perspective. In J. H. Barkow, L. Goswami, & J. Tooby (Eds.), *The adapted mind: Evolutionary psychology and the generation of culture* (pp. 391-428). Oxford: Oxford University Press.

Kuhl, P. K. (2007). Is speech learning 'gated' by the social brain? *Developmental Science*, 10, 110-120. doi:10.1111/j.1467-7687.2007.00572.x

Kuhl, P. K., Coffey-Corina, S., Padden, D., & Dawson, G. (2005). Links between social and linguistic processing of speech in preschool children with autism: Behavioral and electrophysiological measures. *Developmental Science*, 8, 1-12. doi:10.1111/j.1467-7687.2004.00384.x

Lewis, F., Murdoch, B., & Woodyatt, G. (2007). Communicative competence and metalinguistic ability: Performance by children and adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 37, 1525-1538. doi:10.1007/s10803-006-0265-0

Morgan, J. L., & Demuth, K. (1996). Signal to Syntax: an overview. In J. L. Morgan & K. Demuth (Eds.), *Signal to syntax: Bootstrapping from speech to grammar in early acquisition* (pp. 1-22). New York: Lawrence Erlbaum Associates.

Ozonoff, S., Young, G. S., Carter, A., Messinger, D., Yirmiya, N., Zwaigenbaum, L., Bryson, S., Carver, L. J., Constantino, J. N., Dobkins, K., Hutman, T., Iverson, J. M., Landa, R., Rogers, S. J., Sigman, M., & Stone, W. L. (2011). Recurrence risk for autism spectrum disorders: a baby siblings research consortium study. *Pediatrics*, 128(3), e488-495. doi:10.1542/peds.2010-2825.

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ADDRESS FOR CORRESPONDENCE: Marisa Filipe (marisafilipe@fpce.up.pt)