

Infant Directed Speech and Language Development in the First Years of Life

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Infant Directed Speech and Language Development in the First Years of Life

1. Early linguistic input: Infant Directed Speech
2. Characteristics of Infant Directed Speech that promote language acquisition
3. Risk factors that affect the qualities of Infant Directed Speech
4. Directions for future research and implications for practice



Language Development in the First Years of Life



- *At birth*
 - Infants can distinguish the rhythm of their native language (Nazzi et al., 1998)
- *First year of life*
 - Infants attune to the sounds of their native language (Werker & Tees, 1984)
- *Second year of life*
 - Infants start producing their first words (Fenson et al., 1994)
- *“The poverty of the stimulus”* – the nature of the adult language is such that infants cannot infer structure from what they hear (Chomsky, 1965)
- Is the linguistic input received early in life truly so poor?

Infant Directed Speech (IDS)

- IDS refers to the speech register that adults adopt when addressing young infants
- In comparison to Adult Directed Speech (ADS), IDS:
 - Shorter utterances; simplified grammatical structure; repetitions of lexical items; longer pauses
 - Smiles, widened eyes, raised eye-brows, exaggerated lip movements
 - High pitch and large pitch range
 - High affect and emotion
 - Exaggerated articulation of speech sounds




Infant Directed Speech

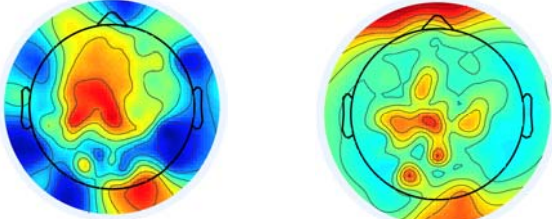
- Not only mothers use IDS, but also fathers, other caregivers, and older peers use IDS (O'Loughlin, 2014; Ward, 2015)
- Babies prefer to listen to IDS (Cooper & Aslin, 1990)
- Babies are attracted to the high emotional content and affect in IDS (Singh et al., 2002)
- Exposure to IDS can facilitate the process of learning:
 - Better intersensory integration from IDS than ADS (Kitamura et al., 2014; Kubicek et al., 2014)
 - More successful word learning in IDS than ADS (Ma et al., 2011; Zhangl & Mills, 2007)



Neural Processing of IDS



- 7-month-old infants listening to IDS vs. ADS
- EEG recordings show higher power activations in the mid-frequency range (theta 6.1HZ)



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Kalashnikova et al., in prep.

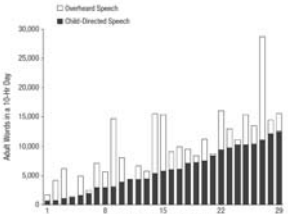
Variations in Quantity and Quality of IDS

- Not all infants receive the same quantity and quality of early linguistic input
- Factors exogenous and endogenous to the child can impact the quantity and quality of IDS
 - Family's SES
 - Maternal mental health status
 - Infants' linguistic and cognitive needs
 - Infant's sensory and cognitive abilities

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Quantity of IDS

- Amount of exposure to IDS varies according to the SES of the infants' families
- Predicts skills of language comprehension in real time and vocabulary size in monolingual and bilingual infants (Hurtado et al., 2008; Weisleder & Fernald, 2013)




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From Weisleder & Fernald, 2013

High Pitch in IDS


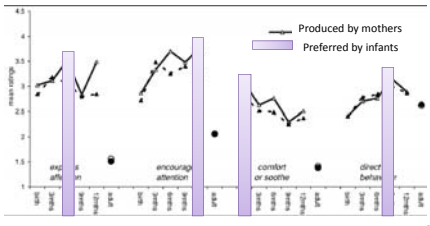
- Increases in pitch in maternal speech are modulated by feedback from the infant
- Mothers increased their pitch in IDS to 4-month-old infants when infants' responses were not congruent to mothers' speech (Smith & Trainor, 2008)



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Affective Content in IDS

- Positive vs. negative emotion
- Aims to comfort or soothe
- Aims to encourage attention
- Aims to express affection
- Aims to direct behaviour

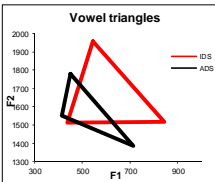



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From Burnham and Kitamura, 2003 & Kitamura & Lam, 2009

Vowel Hyperarticulation

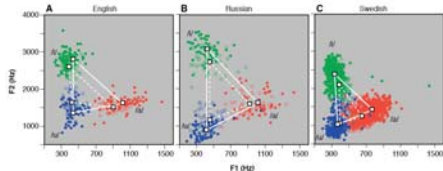
- Mothers systematically expand the acoustic space of vowels in IDS compared to ADS
 - Measured as the area of the triangle resulting from plotting F1 and F2 values for the corner vowels /i/, /u/, /a/ as coordinates in two-dimensional space
- Expanded or exaggerated vowel space is associated with clear speech (Bradlow et al., 1996)



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Vowel Hyperarticulation and Language Acquisition

- Mothers hyperarticulate vowels in IDS compared to ADS (Burnham et al., 2002; Kuhl et al., 1997)



From Kuhl et al., 1997



Vowel Hyperarticulation and Language Acquisition

- Mothers produce clearer speech in IDS, unconsciously facilitating the process of language acquisition (Kuhl, 2000)
- The degree of vowel hyperarticulation in IDS is correlated to:
 - Infants' speech perception ability (Liu et al., 2003)
 - Infants' familiar word recognition (Song et al., 2010)

• *What is the relation of vowel hyperarticulation in IDS to infants' language acquisition needs?*

• *Is vowel hyperarticulation an epiphenomenon of IDS?*

Vowel Hyperarticulation



Hyper-articulation					
Pitch					
Affect					
	Burnham et al., 2002	Uther et al., 2007	Burnham et al., 2010	Burnham et al., 2002	Xu et al., 2013



Infant Directed Speech: Quantity and Quality

- Qualities of maternal speech (pitch, affect, vowel hyperarticulation) are modified according to their infants' linguistic and cognitive needs
- Mothers and infants exchange information and feedback during their interactions that determine IDS qualities
- Can any factors (from the mother or the infant) affect or interrupt this exchange of information?



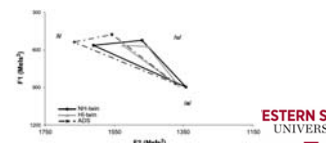
Maternal Depression

- Speech produced by depressed mothers and fathers lack the exaggerated prosodic and affective information (Kaplan et al., 2001; 2007)
- Depressive episodes early in the first year of life can influence infants' reliance on the qualities of IDS that encourage learning
- 12-month-old infants of depressed mothers showed significantly poorer ability to associate a face to IDS
- The attention-getting and arousal features of IDS are not exploited by these babies (Kaplan et al., 2012; Kaplan et al., 2015)



Hearing Impairment

- Hearing experience of the child determines the modifications in qualities in maternal speech (Bergeson et al., 2006; Koundarova et al., 2013)
 - Pitch height
 - Pitch range
 - Speech rate
- Mother speaking to twin sons: one normal hearing and one hearing impaired (Lam & Kitamura, 2010)
 - Hyperarticulated vowels in IDS to normal hearing but not to the hearing impaired infant



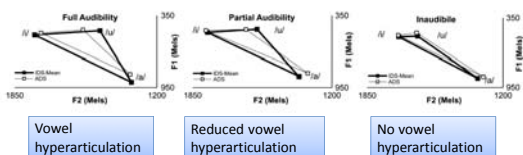
From Lam & Kitamura, 2010



Hearing Impairment

Induced hearing impairment: Double video set up

1. **Full audibility** – mother and infant can see and hear each other
2. **Partial audibility** – mother and infant can see each other but the infant can hear mother's voice at 50% volume
3. **Inaudible** – mother and infant can see each other but the infant cannot hear the mother



Vowel hyperarticulation

Reduced vowel hyperarticulation

No vowel hyperarticulation



From Lam & Kitamura, 2012

Family risk for dyslexia

- Dyslexia is manifested in severe deficits in reading and spelling skills independent of a child's intelligence and educational opportunities (Snowling, 2000)
- It is highly hereditary – 35 to 60% of infants born to a dyslexic parent also develop dyslexia later in life (Pennington & Leffly, 2001)
- Dyslexia is not restricted to the domain of reading and spelling, but it affects more general language skills



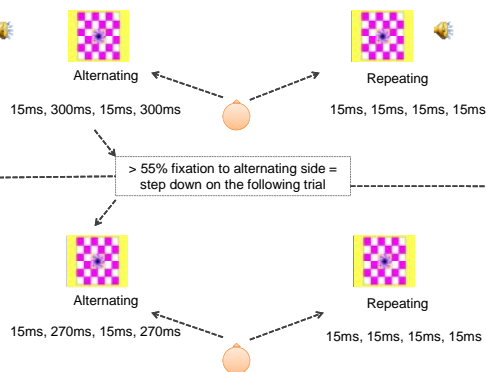
Family risk for dyslexia

- Deficits in auditory and speech perception in infancy:
 - Two- and six-month-old at-risk infants exhibit lower detection of changes in tone frequency, vowel duration, and consonant contrasts (Leppanen et al., 2002; Richardson et al., 2003; Van Zuijen et al., 2013)
 - Newborns at-risk for dyslexia already exhibit hemispheric differences in the processing of acoustic features, later associated with language and verbal memory skills (Guttorm et al., 2001; 2005; Leppanen et al., 1999; 2002)

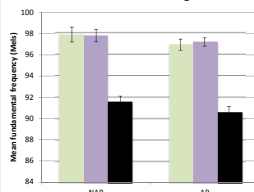


Do more subtle deficits in auditory perception also lead to adjustments in the characteristics of maternal speech?

- IDS to infants at- and not at-risk for dyslexia
- Interactions recorded at infants' ages 9- and 11-months
- Mothers and fathers completed a screening battery to detect indicators of dyslexia and confirm their diagnosis
- Infants also completed an auditory sensitivity task at 7- and 10-months of age.

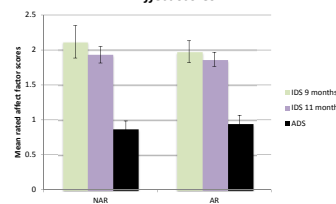


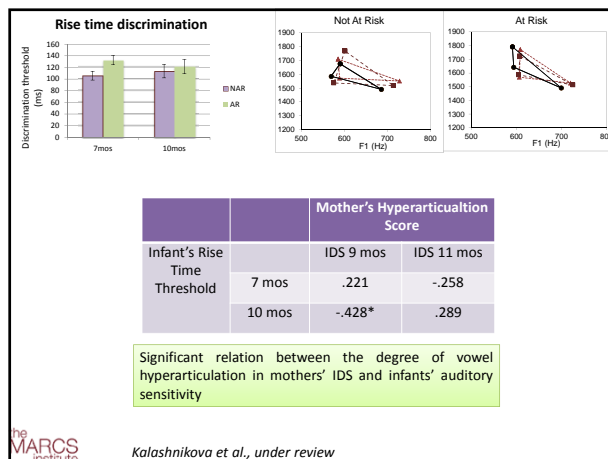
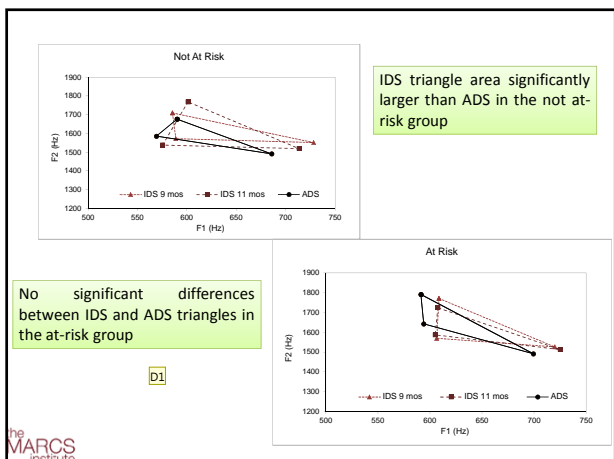
Pitch height



Mothers increase their pitch and affect in IDS compared to ADS
No differences between at-risk and not at-risk groups

Affect scores





IDS: What we know

- Adults unconsciously modify the qualities of their speech when addressing young infants
- The characteristics of IDS facilitate the process of language acquisition for the infant
- Mothers and infants exchange information and feedback that lead to adjustments in the qualities of their IDS making it more suitable for their infants' linguistic, emotional, and cognitive needs
- Qualities of IDS are affected by a sensory or cognitive impairment in the infant

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IDS: What we do not know

- What is the nature of feedback or communicative cues that are exchanged between the mother and her infant?
 - Visual, emotional cues, quality of the interaction
- Is the lack of hyperarticulation in mothers' speech to at-risk infants a strategy to compensate for other IDS adjustments?
 - Speech rhythm
 - Directing infant's attention to the interaction
 - Language specific enhancements
- What is the exact link between the acoustic and linguistic qualities of IDS and infants' linguistic development?

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Infant Directed Speech and Early Language Acquisition

- Encourage mother-infant interactions to promote early language acquisition
- Identification of possible compensatory strategies employed by mothers
- Specification of IDS qualities that can be optimised to facilitate language acquisition in each at-risk population

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Slide 25

D1 But the HyperA scores are not given here. Consider adding either a table or a graph
Denis, 10/06/2015