LSci 51/CogS 56L: Acquisition of Language

Lecture 13

Lexical & morphological acquisition IV

Variation in “typical development”

Frank, Braginsky, Yurovsky & Marchman 2017

“Across languages and forms, it appears to be the norm that toddlers vary.”

Variation in “typical development”

Wordbank

An open database of children's vocabulary development

https://wordbank.stanford.edu

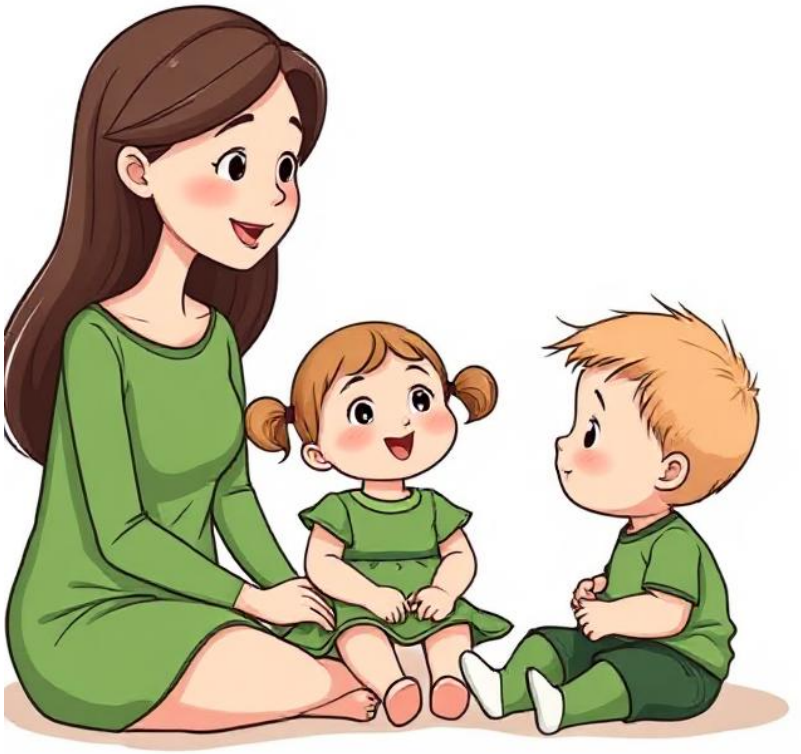
Frank, Braginsky, Yurovsky & Marchman 2017

Variation by gender: “…considerable and strikingly consistent cross-linguistic female advantage in early language production (replicating and extending Eriksson et al. 2012). A much smaller but still relatively consistent female advantage was reported in comprehension.”

Variation in “typical development”

https://www.sciencedaily.com/releases/2022/12/221201123011.htm

Female advantage in early language production replicated by Dailey & Bergelson (2022), who found that girls on average produced their first word at 12 months while boys on average did at 13 months. Their caretakers then talked to them more once they started talking.



Implication: Girls have extra time at the beginning of lexical acquisition to get more input. That’s why they seem to be ahead of boys when we check a little later on (like at 18 months).

Variation in “typical development”

Wordbank

An open database of children's vocabulary development

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Frank, Braginsky, Yurovsky & Marchman 2017

Variation by birth order: “…earlier-born children show larger vocabularies in production (though not in comprehension for the most part). This general finding is consistent with previous literature [like Laing & Bergelson 2017] reporting a first-born advantage for individual languages.”

Variation in “typical development”

Wordbank

An open database of children's vocabulary development

https://wordbank.stanford.edu

Frank, Braginsky, Yurovsky & Marchman 2017

Variation by birth order: “…across three different measures of input quality/quantity, disadvantages were found for infants with more siblings. Having a larger number of siblings (>1) diminished the quality of the input and led to slower overall lexical development [Laing & Bergelson 2017, Hippe & Ferjan Ramírez 2022, Laing & Bergelson 2024].”

Variation in “typical development”

Environmental effects: Background noise (a reality)

“…differences in vocabulary knowledge, verbal working memory abilities, and attention skills will likely influence children's ability to learn words in the presence of background noise.”

- Gordon & Grieco-Calub 2023

The “word spurt”

Up to 50 words: about 8-11 words added every month, adding words is a slow process

After 50 words: about 22-37 words added every month, words often added after a single exposure

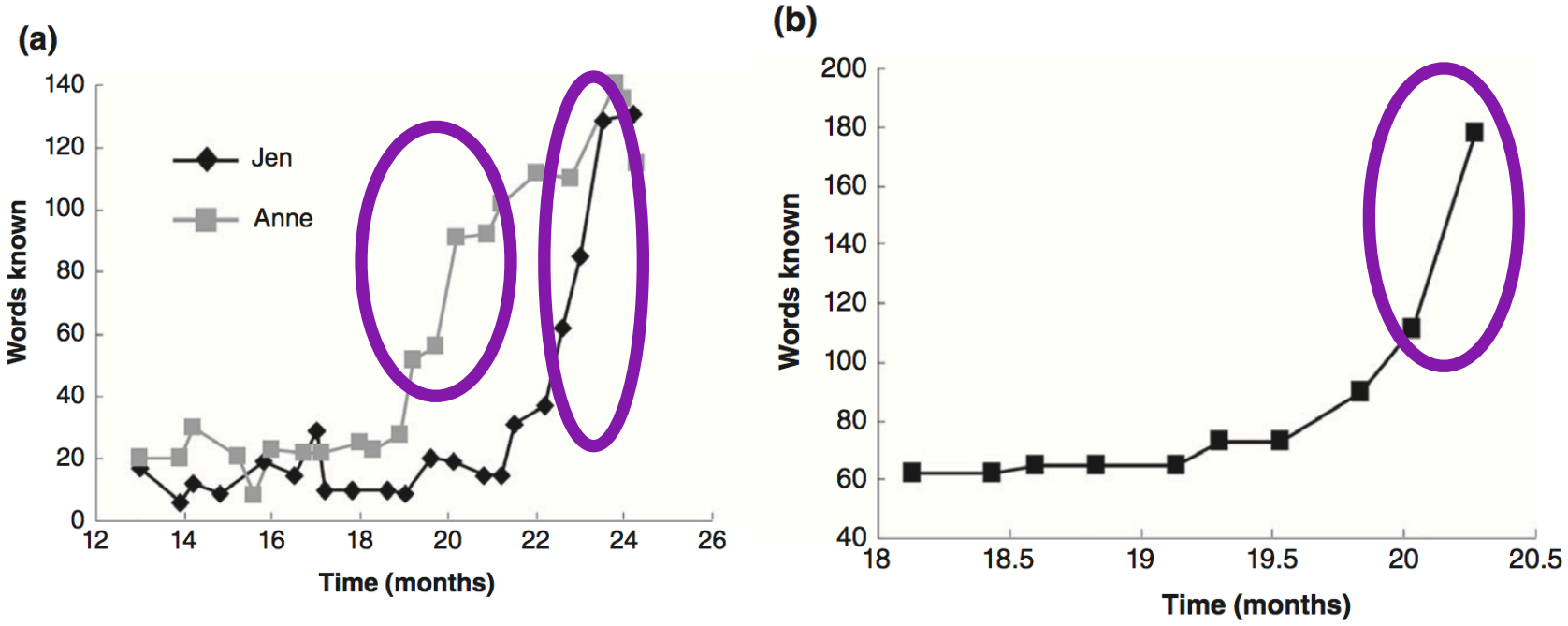
Called the “word spurt”, “word explosion”, “naming explosion”.

Occurs for most (but not all) children around 18 months.

A word spurt

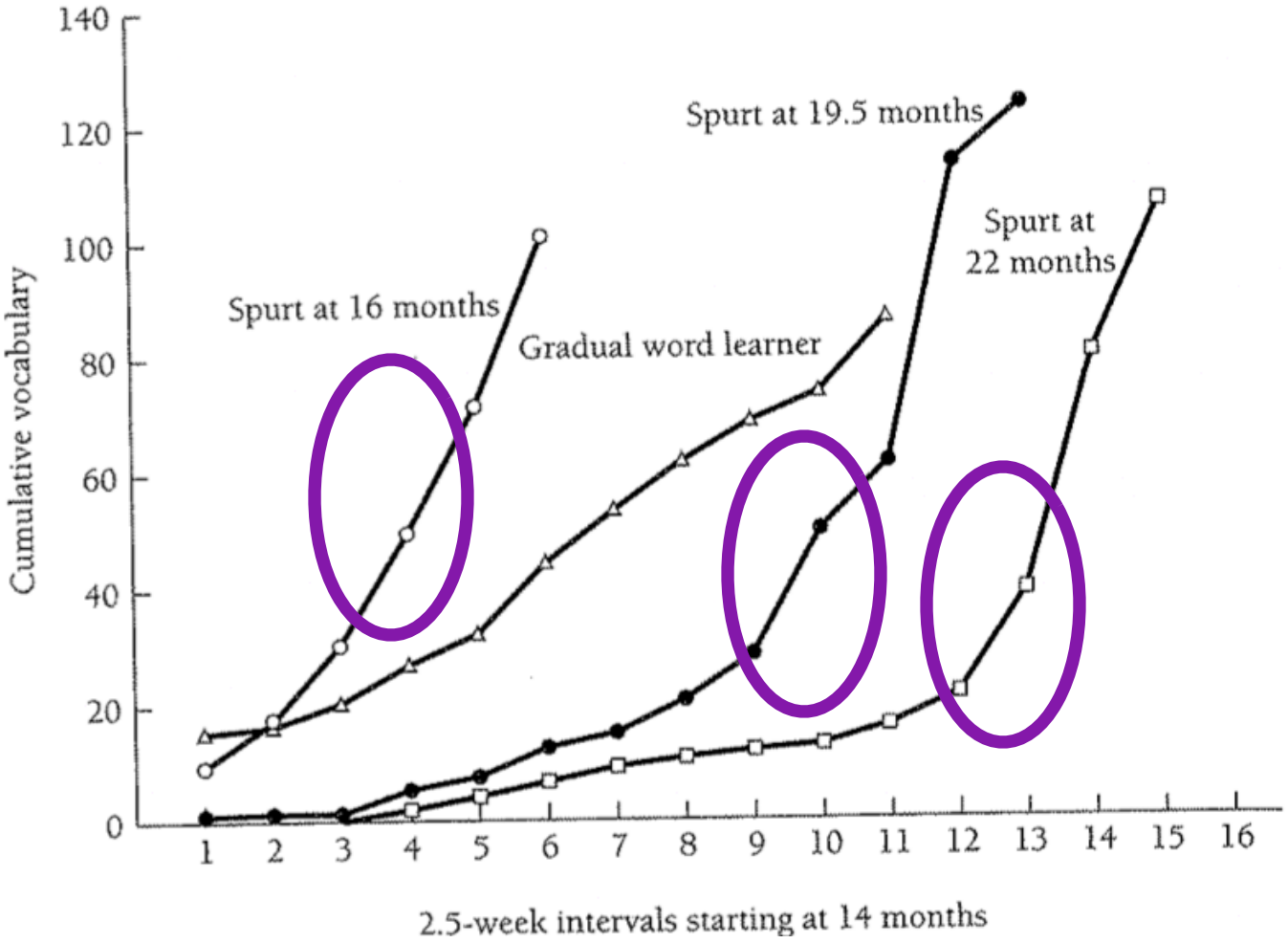
From Samuelson & McMurray 2017

"…a rapid acceleration of the pace at which toddlers add new words to their productive vocabulary…a nonlinear shift in vocabulary development." —> big slope of line.



from Plunkett 1993

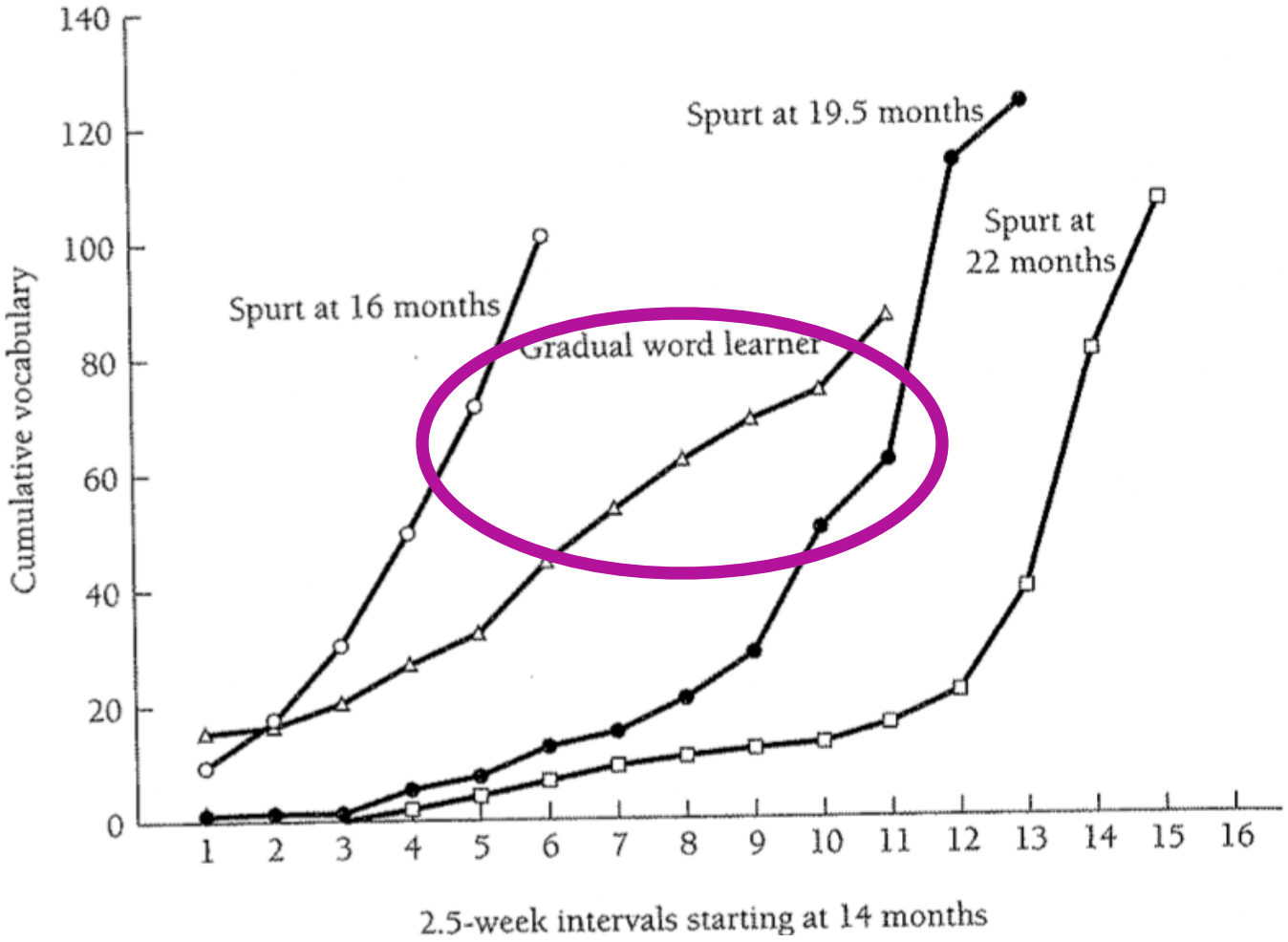
Does every child have a word spurt?



Some seem to
(13 of 18)

Goldfield & Reznick 1990

Does every child have a word spurt?



Others don't
(5 of 18)

Goldfield & Reznick (1990)

Causes of the vocabulary spurt

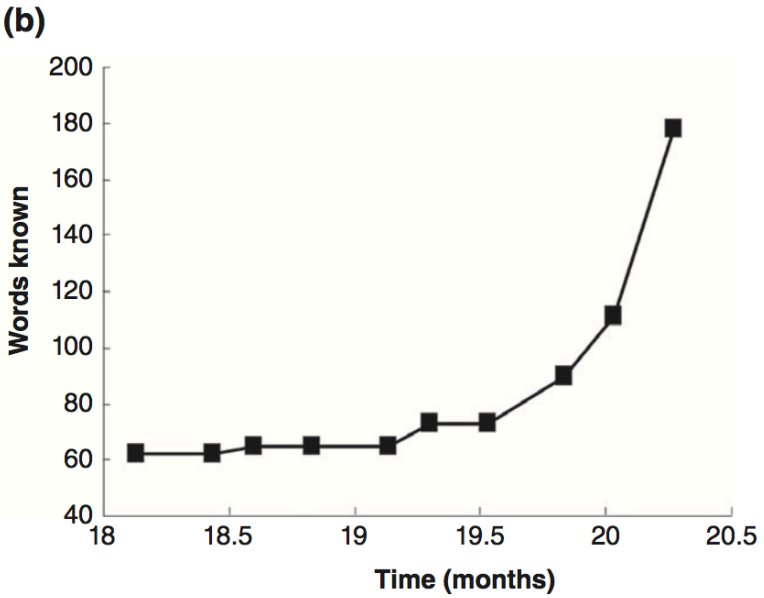
Samuelson & McMurray 2017:

"actually the necessary consequence of two basic facts about word learning:

(1) children learn multiple words at once, and

(2) those words vary in difficulty (with most words being moderately difficult)."

"the combination of these two things always produces an accelerating learning curve"

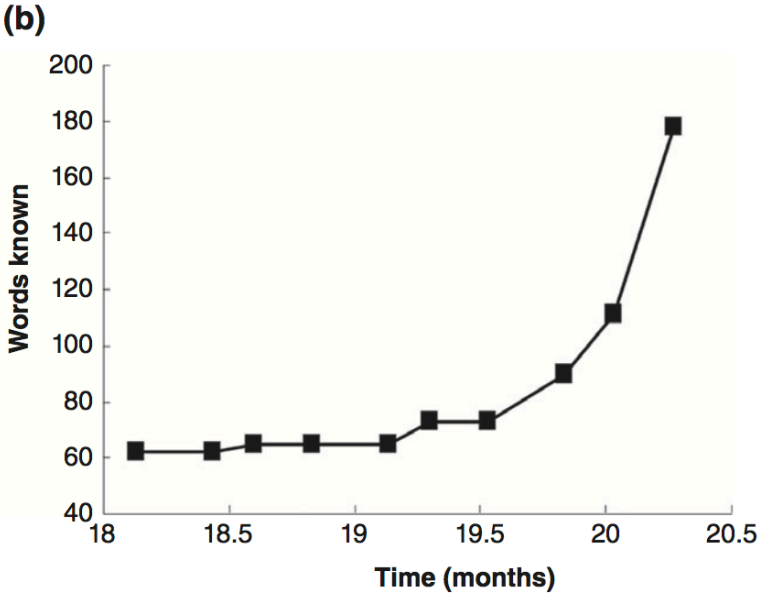


Causes of the vocabulary spurt

Abend, Kwiatkowski, Smith, Goldwater, & Steedman 2017:

One reason children can learn multiple words at once is syntactic bootstrapping — linguistic structure helps kids zero in on word meaning and generalize across utterances.

One reason these words vary in difficulty is that the syntactic structures associated with their linguistic context (which makes syntactic bootstrapping possible) are learned at different ages.



Causes of the vocabulary spurt

Frank, Lewis, & MacDonald 2016:

The impact of developing processing abilities

"difficulties *using* knowledge or representations that they nevertheless possess"

"any cognitive operation requires multiple steps, each of which require some time to complete and have some probability of failure…"

"…even the simplest word learning input for object referents involves following some kind of attentional cue (e.g., gaze or pointing) to a distal target and then processing some kind of link between a word and the target referent…"

Causes of the vocabulary spurt

Frank, Lewis, & MacDonald 2016:

The impact of developing processing abilities

"difficulties *using* knowledge or representations that they nevertheless possess"

These abilities "develop dramatically over the first two years and beyond", which leads to better ability to learn and use vocabulary.

Causes of the vocabulary spurt

Bakopoulou, Lorenz, Forbes, Tremlin, Bates, & Samuelson 2023:

Children develop helpful learning biases as they learn more words, which makes it easier to learn more words in the future.

Fast mapping with the shape bias:

Toddlers age 17 to 31 months who can say more words quickly look towards objects that were the same shape as a named object (helpful for noun learning).

https://www.sciencedaily.com/releases/2023/04/230418195432.htm

Things that help

On Newman, Rowe, & Bernstein Ratner (2015):

“Parents who repeat words more often to their infants have children with better language skills a year and a half later…A lot of recent focus has been on simply talking more to your child -- but how you talk to your child matters. It isn't just about the number of words.” - Rochelle Newman

https://www.sciencedaily.com/releases/2015/09/150921103539.htm

Things that help

Age two: The quantity of speech is the strongest predictor of vocabulary growth in the second year of life (Rowe 2012).

Age three: Diversity of vocabulary used by parents (Rowe 2012, Dong, Gu, & Vigliocco 2021) predicts vocabulary growth in the third year of life.

Age four: and the complexities associated with narratives and decontextualized speech predict vocabulary growth in the fourth year of life (Rowe 2012, Dong, Gu, & Vigliocco 2021).

Decontextualized speech: Things that aren't about the "here" and "now" of the current context.

Things that help

About quality

“Language input quality refers to the interactional, conceptual, and linguistic features of children’s language environments that promote language learning (Rowe & Snow, 2020). This can include features of the input that make word learning opportunities particularly informative (Hoff, 2006), or they may be features of supportive parent-child interactions more generally.” - Egan-Dailey & Bergelson 2025

Things that help

Adult scaffolding

Dong, Gu, & Vigliocco 2021:

"In displaced contexts, caregivers used longer utterances to provide more information, less sophisticated vocabulary and fragmented sentences to reduce processing difficulty, and more Yes/No questions to maintain children's attention."

Things that help

Adult scaffolding

Kennewig, Brieke, Gu, & Vigliocco 2021: “…caregivers made use of iconic prosody more when talking about unknown or displaced objects”

iconic prosody = changing the acoustic signal to reflect some aspect of meaning (e.g., increasing volume to reflect BIG)

Things that help

Adult scaffolding

Beech & Swingley 2024, prosody highlights high-quality input: "… phonetic clarity of words' first mentions significantly predicted referential clarity (how easy it was to guess the intended referent from visual information alone) at that moment….multimodal 'gems' offer special opportunities for early word learning."

Things that help

Wordplay & wordform variation

Moore & Bergelson 2024: “words which had more wordplay or wordform variability were understood and produced earlier…by 18 months…we found evidence of wordplay in every family to varying degrees, suggesting that wordplay is widespread in infants’ environments.”

Wordplay and word form variation example: pajamas-pjs-jamas-jammies

Things that help

http://www.economist.com/news/science-and-technology/21596923-how-babbling-babies-can-boost-their-brains-beginning-was-word#

(video: up through about 1:14)

Issues of developmentally-meaningful input differences

"It is also now clear from Dr Fernald's work that words spoken directly to a child, rather than those simply heard in the home, are what builds vocabulary…Telling parents is the first step: many who volunteered themselves and their children for study did not know they could help their babies do well simply by speaking to them."

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES)

"On average, children from lower-SES families show slower vocabulary growth relative to their higher-SES peers, and these differences persist into the school years. From where do these differences arise? Research suggests that variation in parents' speech to children—as a function of SES—relates to children's language development."

Note: SES is often measured by maternal education level, and not by factors like race. Maternal race has *not* been shown to impact input quality (Vernon-Feagans, Bratsch-Hines, Reynolds, & Willoughby 2019)

https://www.sciencedaily.com/releases/2019/07/190718164854.htm

Effects of socio-economic status

SES is often measured by maternal education level

Why? One answer: The power of shared reading and the language in books

Kachergis, Loukatou, & Frank 2022:

> "…parents with higher SES tend to report reading more to their young children than parents with lower SES…the early language advantage shown by children of highly-educated mothers (and thus in higher-SES households; cf. Hoff, 2003) may in part be due to greater amounts of shared reading time."

> "In general, speech…contains relatively fewer function words and tends to score lower on measures of lexical diversity than books."

Effects of socio-economic status

From Wordbank: “…did observe some kind of college advantage for [early language] production in nearly every dataset that we examined.”

Effects of socio-economic status

Huang, Wang, Robertson, & Minhas 2022:

Differences by maternal education…if the mother is the main one caring for the child

"2-year-olds with working mothers do not differ in their ability to learn new words…the only difference exists in the infants cared for by their mothers of different education levels…if the mother is working (and therefore using nonmaternal care for their infants), infants' language development is on par with those in the other groups."

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES)

"For example, Hart and Risley revealed dramatic differences in the amount that parents talk to their young children as a function of SES. Their estimations suggest that by age 4, children from professional families hear a total of 45 million words on average [*from their mother]*, while children living in poverty hear 13 million words on average [*from their mother*]. This finding is often described as the '30 million word gap.' Importantly, quantitative differences in parents' language input have been shown to uniquely predict aspects of children's language development, such as vocabulary growth and speed in processing familiar words."

Effects of socio-economic status

Dailey & Bergelson 2022:

Differences by socio-economic status (SES)

"… a significant effect of SES on language input quantity. However, this effect was moderated by the type of language included in language quantity measures: studies that include only child-directed speech in their language measures find a large SES difference, while studies that include all speech in a child's environment find no effect of SES… we find that young children from low-SES homes heard less child-directed speech than children from mid- to high-SES homes, though this difference was much smaller than Hart & Risley's '30 Million Word Gap'."

Effects of language & culture

Bunce, Soderstrom, Bergelson, Rosemberg, Stein, Alam, Migdalek, and Casillas 2024:

Differences cross-linguistically in speech types

Looking across North American English (US & Canadian), United Kingdom English, Argentinian Spanish, Tseltal (Tenejapa, Mayan), and Yélî Dnye (Rossel Island, Papuan):

- “Consistently across groups, children also heard more adult-directed than target-child-directed speech”
- "women’s input predominates overall”

This is one reason why maternal background is a relevant factor for children’s lexical acquisition.

Effects of socio-economic status

https://www.sciencedaily.com/releases/2021/07/210719153506.htm

On Ellwood-Lowe, Foushee, & Srinivasan 2021:

The potential impact of financial insecurity

"…parents engaged in fewer conversational turns with their children at the month's end, a time that typically coincides with money being tight as parents await paychecks or other sources of income…If you are worried about putting food on the table tonight, or scraping together money for that medical bill, or figuring out where to enroll your child in school now that you have been evicted from your neighborhood, you may be less likely to narrate the color of the sky to your child as you ride together on the bus."

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES)

"Rowe found that SES was related to both quantity and quality measures, with more highly educated parents using more word tokens and word types, as well as more rare words and more of some types of decontextualized utterances…"

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES) in outcomes

"By 18 months, group-level differences in vocabulary knowledge and language processing efficiency (i.e., comprehension of language in real time) between lower-SES and higher-SES toddlers are already apparent."

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES) in outcomes

"By 24 months, there is a 6-month gap between SES groups in language processing efficiency, which has been shown to forecast later language learning. Thus, infants hearing more rich language from their caregivers early in life develop stronger language processing skills, which can affect their ability to learn new words more quickly, and this in turn seems to influence their ability to process future sentences containing those words."

Effects of socio-economic status

Maguire, Schneider, Middleton, Ralph, Lopez, Ackerman, & Abel 2018: Differences by socio-economic status (SES) in outcomes for syntactic bootstrapping for grade-school age children (ages 8-15)

"…children of lower socioeconomic status are not as effective at using known vocabulary to build a robust picture or concept of the incoming language and use that to identify the meaning of an unknown word."

https://www.sciencedaily.com/releases/2017/11/171130122802.htm

Effects of socio-economic status

Lebreton, Trueswell, & Alex de Carvalho 2021: Differences by socio-economic status (SES) in outcomes for revising syntactic structure guesses (how morphemes fit together) for grade-school age children (ages 8-12)

"…children from higher-SES backgrounds revise mispredictions better than their lower-SES peers"

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences by socio-economic status (SES) on input

"Specifically, children at the lower end of the SES spectrum tend to receive significantly less high-quantity and high-quality language experience, which affects their development of vocabulary, grammar, and language processing."

Effects of socio-economic status

Bates & Pearl 2019, 2021

But sometimes *not* differences in input quality across SES for more sophisticated knowledge, like the building blocks of *wh*-questions

Who did Lily think the pretty kitty was for?

Who did Lily think the kitty for was pretty?

"We find that the [building blocks] in low-SES children's complex syntactic input are quantitatively and qualitatively similar to those of high-SES children…Our results suggest that the linguistic evidence for more complex syntactic knowledge…may not differ by SES. "

Effects of socio-economic status

Schwab & Lew-Williams 2016:

Differences *within* socio-economic status (SES)

"…within this low-SES sample, measures of the quality of mother–child communication more strongly predicted children's expressive language abilities one year later than did the total number of words spoken by mothers…"

"…children from low-SES families whose mothers spoke to them using more complex language at 18 months were significantly faster in a real-time comprehension task at 24 months."

Effects of socio-economic status

Rowe, Leech, & Cabrera 2017:

Differences *within* socio-economic status (SES)

Speech samples from "low-income, African-American fathers and their 24-month-old children"

"the overall quantity of father talk did not relate to children's vocabulary or reasoning skills…fathers' use of wh-questions (but not other questions) related to both…a challenging type of input, which elicits a verbal response from the child that likely helps build vocabulary and foster verbal reasoning abilities."

Things that help

Romeo, Leonard, Robinson, West, Mackey, Rowe, & Gabrieli 2018:

The importance of interactive input

"…conversation between an adult and a child appears to change the child's brain, and that this back-and-forth conversation is actually more critical to language development than the word gap. In…children between the ages of 4 and 6….differences in the number of "conversational turns" accounted for a large portion of the differences in brain physiology and language skills that they found among the children. This finding applied to children regardless of parental income or education."

https://www.sciencedaily.com/releases/2018/02/180214145833.htm

Things that help

Romeo, Segaran, Leonard, Robinson, West, Mackey, Yendiki, Rowe, & Gabrieli 2018:

The importance of interactive input

"In their neuroimaging study of 40 four- to six-year-old children and their parents of diverse socioeconomic backgrounds…found that greater conversational turn-taking (measured over a weekend with an in-home audio recording device) was related to stronger connections between Wernicke's area and Broca's area -- brain regions critical for the comprehension and production of speech…"

https://www.sciencedaily.com/releases/2018/08/180813133422.htm

Things that help

Perry, Prince, Valtierra, Rivero-Fernandez, Ullery, Katz, Laursen, & Messinger 2018:

The importance of interactive input for 2- and 3-year-olds

"…how important it was to see those conversational turns with teachers, that back-and-forth conversation with the child is very beneficial."

https://www.sciencedaily.com/releases/2018/07/180723142948.htm

Things that help

https://www.sciencedaily.com/releases/2022/02/220207083421.htm

Kartushina et al. 2022, Bergmann et al. 2022: The impact of Covid-19 lockdowns & the importance of interactive input for 8- to 36-month-olds, looking at 1742 children across 13 countries and 12 languages

"Children who had less passive screen exposure and whose caregivers read more to them showed larger gains in vocabulary development during lockdown, after controlling for SES and other caregiver-child activities."

Things that help

Things that secure children's attention
and allow socially contingent interactions
(Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

"Screen time" interactions

https://www.sciencedaily.com/releases/2016/07/160715115023.htm

"…children paid attention and responded to their on-screen partners, but **only children who experienced interactive video chat** responded in sync with the partner, such as clapping to imitate after the partner had clapped."

Things that help

Things that secure children's attention and allow socially contingent interactions (Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

"Screen time" interactions

https://www.sciencedaily.com/releases/2016/07/160715115023.htm

"…learning new words and patterns… occurred from video chat only when children talked to an on-screen 'partner' **who responded to them in real time**."

Things that help

Things that secure children's attention and allow socially contingent interactions (Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

"Screen time" interactions

https://www.sciencedaily.com/releases/2016/07/160715115023.htm

"….starting at about **17 months**, children begin to get something out of live video interaction with real people"

- Lauren J. Myers

Lauren J. Myers, Rachel B. LeWitt, Renee E. Gallo, Nicole M. Maselli. 2016. **Baby FaceTime: can toddlers learn from online video chat?** *Developmental Science.*

Things that help

Things that secure children's attention and allow socially contingent interactions (Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

"Screen time" interactions

https://www.sciencedaily.com/releases/2018/10/181016132000.htm

At **9 months**, infants can learn some sound information from a screen when they learn with another 9-month-old present.

Sarah Roseberry Lytle, Adrian Garcia-Sierra, Patricia K. Kuhl. **Two are better than one: Infant language learning from video improves in the presence of peers.** *Proceedings of the National Academy of Sciences*, 2018; 115 (40): 9859 DOI: 10.1073/pnas.1611621115.

Things that help

Things that secure children's attention
and allow socially contingent interactions
(Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

"Screen time" interactions

https://www.sciencedaily.com/releases/2018/10/181016132000.htm

"What this study introduces for the first time is that part of the reason we learn better when we learn collaboratively is that a social partner increases arousal, and arousal in turn increases learning. Social partners not only provide information by showing us how to do things, but also provide motivation for learning."

- Patricia Kuhl

Things that help

Things that secure children's attention
and allow socially contingent interactions
(Glick, Saiyed, Kutlesa, Onishi, & Nadig 2022)

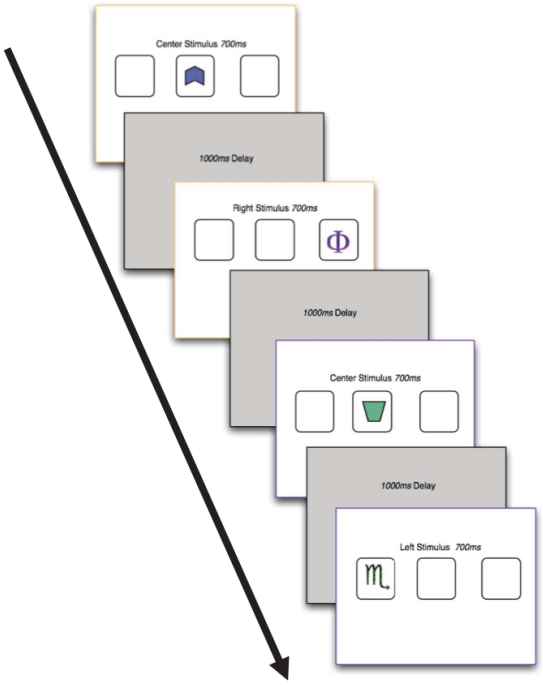
"Screen time" interactions

…but "non-interactive language acquisition from television does occur in some autistic children" — Kissine 2020

Factors that may matter

Ellis, Robledo Gonzales, & Deák 2013:

6-month-old capacity to respond to novel but predictable events robustly predicted both receptive and productive vocabulary at 22 months.



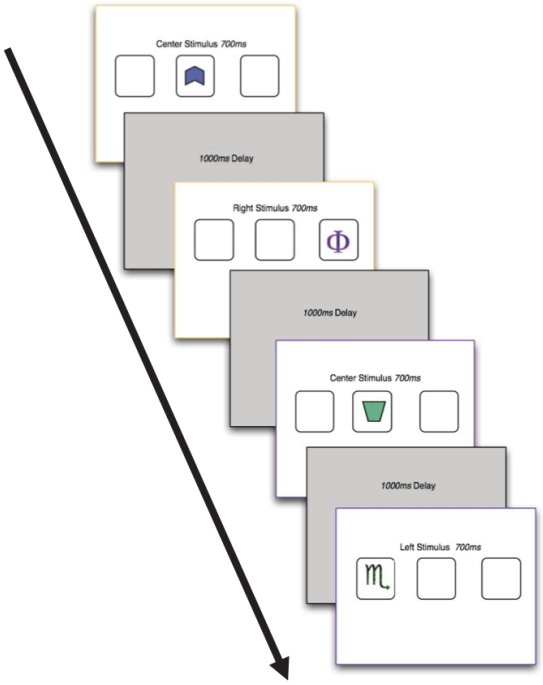
What this means: This domain-general ability to track probabilities (sometimes called statistical learning) matters for early word learning.

Factors that may matter

Eghbalzad, Deocampo, & Conway 2016, 2021:

SL = statistical learning

"For children with high SL ability, SES had a weaker effect on language compared to children with low SL ability, suggesting that having good SL abilities could help ameliorate the disadvantages associated with being raised in a family with lower SES when it comes to language learning.



Recap: Children's lexical development

There's a lot of variation in children's development.

Some of this variation seems to be caused by the environment (such as birth order, where the input comes from, input quantity, how interactive the input is).

Some of the variation seems to be due to child-internal factors (such as processing skills, statistical learning abilities).

Questions?

You should be able to do all of HW4, and all of the review questions for morphological and lexical acquisition.