…Oh, Baby!! Infant Brain Development And Language Acquisition

Wednesday November 11 2015
Early On Conference
Traverse City, Michigan

Presentation Outline

- Provide information regarding new research in early brain development
- Demonstrate that infant brain development is tied to cognitive development and future academic success.
- Provide data regarding the connection between infant language development and the emotional climate that language is presented in.
- Make connections between current practice and research

The 60's and 70's

- Information for forming theories was gathered through observation.
- BF Skinner, Watson, Bruner and Piaget-
- Many of these past theories are obsolete based on what we have learned recently about the brain development.
- Then in the early 1980's the FDA approved a miracle…. and what we know began to change….

The miracle of the 1990's

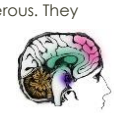



The cochlear implant

- Behind the ear and multi-channel
- Approved for adults in 1984.
- Approved for children in 1990
- Developed over 3+ decades.
- We can now get developmental data collected as a child's brain responds to sounds.

Brain Imaging

- New techniques also emerged in the 1980's and 1990's; EEG/ERP, MEG, PET
- This also had a remarkable effect on the quality and quantity of data that we collect from children
- The way that we now measure infant brain responses are less invasive and dangerous. They are also more precise.



Non-invasive Imaging with Infants

From the research of Patricia Kuhl

Optimal time for Language development is short!

- -From the research of Patricia Kuhl and Janet Werker:
- Babies begin to discriminate sounds at birth
- They recognize familiar voices
- They can discriminate rate and stress patterns in speech
- They recognize and prefer speech over non-speech sounds
- They segment out phonemic subsets (words)
- Speech activates specialized areas of the brain

- "The ability to discriminate 2 simple vowels at 6 months of age predicts language abilities and pre-reading skills such as rhyming at the age of 5 years."
  - -Patricia Kuhl Neuron 2011

First year language development:

- The first 12 months are critical and are called the 'set-up' period/stage. The brain is like a tape recorder-always on! –Kilgard (2006)and Kuhl (2010)
- The golden window for optimal language development closes at about 3 ½.
- Neural plasticity- 'the brains ability to shape and reshape itself' -H.Neville 2013
- Auditory centers are lost in the absence of input. — Merzenich via Carol Flexer 2010
- **Repetition is critical for language development**.

quotable….

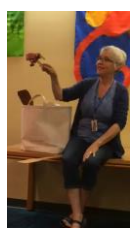
- "We are either accessing, stimulating and developing auditory brain centers or we are losing auditory centers" Merzenich/Flexer 2010
- In the absence of sound the brain will reorganize to make better used of the other major senses" Graeme (2007)
- "Literacy has its foundation in auditory neural development." Flexer 2010

We need rhythm…..☺

….repetition is critical for language development

- Repeated activation strengthens circuits- Think of a thread…
- At 4 years of age the brain undergoes a pruning phase. G. Cardon calls it 'synaptic pruning. At this point information that is not used frequently is lost.
- Primary language focus begins at @9 months- Werker/Curtin 2005
- Each month in the first year changes related to processing language are taking place as an infant continues to 'crack the code'.

We need repetition ☺




The first year of development summary:

- The role of the primary caregiver is critical. They need to communicate with their child continually with simple, short phrases and words.
- The infant brain is extremely responsive and changes rapidly in the first year of life as it responds to language information.
- The window for optimal language information acquisition narrows after 3.5 years of age

Language Development is Tied to Cognitive Development

- The Hart and Risley Study
- A watershed study and platform for many other studies.
- 1995- "Meaningful Differences in Everyday Experiences of Young American Children"
- 1999- "The Social World of Children Learning to Talk"

Hart/Risley

- Observations took place monthly for 2 ½ years.
- Each child was tested with the Standford-Binet at age 3 and with the PPVT-R and TOLD-2 at age 9-10
- All the children in this study had typically developing milestones and were all talking by age 3.
- The aptitudes and skills levels noted for children at the end of the study held consistent through the child's school experience

Hart/Risley continued…

- (PF)--2,100 words per hour addressed to the child, with twice as many affirmation statements.
- (MF)--1,200 words per hour were addressed to their children.
- (WF)--600 words per hour with 2 times more prohibitive statements than affirmations. That results in 13 million fewer words of 'language experience' than by the age of 4. (MF)

Hart/Risley

- Other studies were launched regarding:
- The **stark contrasts along socio-economic lines**
- The **direct correlation between amount of language presented in early development and subsequent aptitude in school** and on standardized tests.
- The **role of emotional climate** in language development.

Hart/Risley conclusion

- "We discovered that the most important difference among families was not the relative advantages conferred by education and income but the amount of talking the parents did with their children."
- -The Social World of Children Learning to Talk

Brain Development is tied to Emotional Health

- What is 'social gating'?
  - - from Kuhl (2007)
- Social interaction changes the quantity and quality of a child's learning.
- Increased social engagement= increased learning

Kuhl article continued

- Kuhl suggests that a child uses three separate domains in the brain to effectively develop language-
  - computational, cognitive and social areas of the brain.
- She further asserts that this begins at the phoneme level in the earliest days of life.
- Face-to- face interaction is very important, it increases attention to and retention of information.

The Mandarin Study

- As reviewed by National Geographic!
- Groups of 9 month olds interacted with native Mandarin speakers I
- 1 group had face-to-face interaction- they retained the information and 'learned' the contrasts in the new language.
- 2 other groups were given the same information using television and audiotape--- Results? – **no learning-** there was no retention of information in either of the last 2 groups

The Oregon Head Start Study

- 141 preschoolers in 3 groups (one test group and 2 control groups) over 8 weeks
  targeted **attention skills** in preschoolers.
- Caregivers attended 2 hour weekly sessions- reinforced with weekly phone calls. The classes focused on **stress reduction** in the home and use of **positive reinforcement**
- Children attended sessions every week as well for 40 minutes

Neville/Pakullak study continued…

- Results in the parent training group were overwhelmingly positive.
- Children improved in both selective attention skills and overall cognitive achievement that held up over time.
- "Chronic stress is literally toxic to the developing brain, The same parts of the brain that are important for learning in early development are the same parts of the brain that help moderate the stress response"- Pakulak (2013)

Making some connections…

- This research gives credence to *service providers teaching and modeling* for the parent.
- Educating parents about the value of **frequent rich verbal engagement** of their child has documented long term benefits
- *Routines based goal writing* also makes sense for language development because children are going to listen best when they are engaged.
- With rich verbal engagement parents really can impact the trajectory for their child's educational future.
- There is an emotional component to language development and reduced stress improves learning.

Summary

- A baby's work is learning language the first year and they do it best in face-to-face interactions with caregivers that use warm, simple, rhythmic language to communicate frequently with their child.
- Lack of language input in the first year of life will often have significant long term effects on a child's abilities in academic tasks.
- Infants demonstrate better language learning when they have a positive emotional connection.

What to do?

- For some parents it is hard to continually communicate with their baby when they are not communicating yet with them.
- Consider discussing the importance of infant communication with families when you go into the home and see a new baby.

Your Baby's Brain…

From Birth:

- Discriminates sounds
- Prefers familiar voices… knows your voice!
- Prefers speech sounds over non-speech sounds
- Listens to speech even when resting
- Listens for patterns in speech

In the First Year:

- Babies take cues from your facial expressions and gestures
- Repetition of language is important for increasing language skills. This is how you strengthen the thread that connects information in your baby's brain.
- Babies respond to changes in voice pitch and patterns in words and sounds such as rhyming, rhythm games and songs. It helps them remember.

You can:

- Share lots of words with your baby every day through reading, talking, and singing, rhyming and playing.
- Make deposits in your baby's language memory bank- the more you put in the more you get out later. A large vocabulary is one of the best indicators of later academic success!

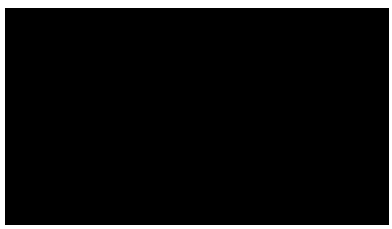
You are your babies travel guide on this learning adventure!

A baby's brain is ready and looking for clues that will unlock the mysteries of language

-from the research of P. Kuhl and J. Werker

speechsoundstories.com

We need love ☺



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