Foundations of Language 3B

1. Where did language come from?
   1. Theories:
      1. Language started as sound based (onomatopoeia) – but that doesn’t explain the wide variety of words that aren’t based on sounds
      2. Language is due to evolution – as part of our increased brain size and vocal chords (Chomsky)
         1. Has there been enough time for that evolution to occur since we gained vocal chords?
         2. Grammar doesn’t evolve – we either have it or we don’t (have to have to be a language remember)
         3. Grammar isn’t really something that saves your life – so there’s no reason for natural selection to choose it.
      3. However – all of these reasons have been counterargued now…having the ability to communicate is a large natural advantage for staying alive
      4. Protolanguage – the “language” between grunts and hand pointing and our current language
         1. This language arose about 1.6 million years ago with Homo erectus
         2. Have vocal sounds but no syntax
         3. Support for this in between language seen with pidgins, young kids, primates and sign language, and kids who did not have linguistic input as children.
   2. Across the archealogical record there is evidence of:
      1. Changes in broca’s area
      2. Changes in tongue and larynx – to become more fine motor control
      3. Changes in brain size
      4. Changes in intelligence
   3. Biology?
      1. Some recent evidence suggests the FOXP2 gene controls grammar – damage to that gene leads to language acquisition problems.
      2. The mutation in this area was about 100k years ago, which developed Brocas area
   4. Hands
      1. Did language evolution depend on gestures?
      2. When we ran out of hand gestures, we started talking to expand our dictionary of available terms
      3. Further support for this theory shows that our brains and great apes both have hemispheric specialization, and Brodmann’s 44 is increased in both
      4. Brodmann’s 44 is where Broca’s area is and both apes and humans show activation when using gestures
      5. Some species have left hemisphere dominance for sound production – but do not show a preference for gesture production.
         1. We gave up left handedness equality by being able to speak and gesture
         2. Therefore, we have a strong right handed dominance
   5. Many interaction theories
      1. Theories about how language and evolution interacted with the environment to solve goals of the time (need to communicate about where food is) to become what it is today
      2. Linguistic skills became necessary for the complex symbol processing that we do
      3. Language is the reconfiguration of many other systems to solve a goal
2. Animal Language – do animals have a language (take questions/answers/thoughts)
   1. Animal communication systems
      1. Communication – transmission of a signal that conveys information – often such that the sender benefits from the recipient’s response
      2. Signal – is the means that conveys the information (sound)
      3. Examples:
         1. Ants have smell signals (pheromones)
         2. Honey bees wiggle dance
         3. Primates use visual auditory tactile and olfactory signals
         4. Dolphins and whales
   2. Defining language
      1. Design features – Hockett’s list of features of a language – however that doesn’t cover written language (pg 56)
         1. Features of animal communication tend to match a lot of these characteristics – arbitrariness, semanticity, openness, etc.
         2. Our language is under voluntary control
         3. Our language is creative
         4. Syntax – five properties
            1. Language is a discrete combination system - Meanings are retained when information is combined
            2. Combinations are ordered for meaning
            3. Sentences are built around verbs
            4. There’s a distinction between content and function words
            5. Recursion
         5. Animal language seems to lack the richness of our language system
   3. Can you teach animals language?
      1. Obliviously we can teach animals something.
      2. Rico the dog learned over 200 object names and would bring them to the owner. He even know that when you said something he didn’t know before, it must be something new.
         1. However he lacked categorization that we always use (doll and ball are both toys).
         2. Alex – show alex videos!
         3. Most of this work is done with primates
   4. Ape research – cognitively they are not that different from us.
      1. Cognitive implications
         1. Language is not essential for many basic cognitive tasks
         2. Some non-cognitive processes for linguistic development
         3. Cognitive limitations are not the only reason apes do not have language
      2. Gua and Viki
         1. Kellogg and Kellogg research
         2. Both chimps were raised with children in an attempt to see if they would pick up language
         3. They were both unable to learn to speak
      3. Washoe
         1. Most research has focused on sign language or lexigram boards with symbols
         2. She was taught ASL and raised as a child (toilet training and everything!)
         3. Was able to learn over 200 signs, made overgeneralization errors like children (flower = flower smells), create new signs for things she did not know (duck = waterbird)
         4. Created basic syntactic sentences like kids (washoe sorry)
         5. Some sensitivity to word order
         6. Actually did teach some to offspring
      4. Sarah - Premack
         1. Premackese – symbols and shapes that could be manipulated for language
         2. She was able to create complex sentences and novel sentences with substitutions
      5. Nim Chimpsky!
         1. Taught basically ASL
         2. Short sentences showed word order, longer sentences showed repetition (go place, me eat banana banana eat)
      6. Savage-Rumbaugh and the bonobos – show pictures/video
         1. Lexigram board
         2. Burrito story
   5. Apes?
      1. Methodological criticisms – ASL is very symbolic and differs from these boards (give, hungry) so it may match natural gestures apes use.
         1. Many of the examples are anecdotal and do not present the events around the time (water bird might be less interesting if she had been saying water shoe water banana all day)
         2. The data is reduced and doesn’t show all the repetitions
         3. Many events are just learning situational cues (behaviorism!)
      2. Interpretation
         1. Chimps do not spontaneously use symbols as a reference – must be taught
         2. Lack a syntactic structure
         3. Do not ask questions about language – which children do
   6. Kanzi
      1. Bonobo who has learned on the lexigram board
      2. Shows spontaneous use of symbols
      3. Sensitive to word order (syntax?)
      4. Around the language of a 2-3 year old
      5. Exposed early to language and always around people (may be the trick).
   7. Apes in general:
      1. Tend to sign about verbs and nouns
      2. Lots of repetition
      3. Usually to get food or another object
      4. The main issue with ape language is if they understand the meaning of the symbols/signs the same way we do
      5. We also cannot be sure of their ability to learn grammar – they can learn simple frames (complex conditioning) but not the hierarchical complicated grammar we use.
3. Biological Basis of Language
   1. Localization – we use lesion studies, fMRI, etc to study where exactly language occurs in the brain.
      1. Hemispheres – righties have language on the left side of their brain, left handed people it’s about half and half, this even holds up with people who sign.
      2. Aphasia – disorder of language including a deficit or loss of expressive or receptive aspects of language
      3. Syndrome – medical term for a cluster of symptoms that cohere as result of a single underlying cause
      4. Broca’s aphasia – slow laborious speech, difficulties in articulation (show video)
      5. Wernicke’s aphasia – poor comprehension and fluent often meaningless speech with clear word finding difficulties
      6. Wernicke-Geschwind model (pic page 70)
         1. When we hear information from the auditory cortex is sent to wernickes
         2. Sound images of object names are stored in wernicke’s area
         3. When we talk this information is on the arcuate fasciculus to broca’s
         4. At broca’s it’s translated into articulation rules for those sounds
         5. Which is then passed to the motor cortex
         6. If you break the arcuate fasciculus you get a disconnection between understanding and speaking, so you can’t repeat information
      7. New models
         1. Language isn’t all in the left, so newer models include the right hemisphere
         2. Tends to be involved in prosody
         3. Visual word recognition
      8. Ullman’s D/P model
      9. Declarative system is the mental lexicon (fact knowledge), which is mainly in the temporal lobe
      10. Procedural system is mental grammar based in the frontal lobes, cerebellum, and brocas
      11. Big distinction is between rules and words
      12. Also is not modules – uses some areas of the brain that also do other things
4. Gender and language
   1. Girls are good at language and boys are good at math…
      1. This finding may be due to many cultural and social issues
   2. Girls:
      1. Talk before boys on average about 1 month
      2. Better verbal and visual memories, better readers, and spellers
      3. Use both cortexes for language processing – may make girls better
   3. Boys
      1. Better lateralization, right ear dominance
5. Critical Periods
   1. Hypothesis
      1. Certain biological events can only happen in an early critical period
      2. Hemispheric specialization occurs and there’s lots of plasticity during that time.
      3. Certain linguistic events must happen to the child during that period for development to be normal
   2. Evidence
      1. Maturation of the brain from birth – it’s not set when you are born, lateralization occurs with age
      2. Plasticity after damage
         1. With both of these – it’s best to have brain damage in childhood because then you can recover
      3. Lateralization hypotheses
         1. Equipotentiality hypothesis – two hemispheres are similar at birth with language, so they can both get language
         2. Irreversible determinism (invariance hypothesis) – left is set aside at birth, but the right will take over if there is damage
         3. Emergentist account – is a combination of the two, the brain prefers the left hemisphere, but can be plastic if necessary
   3. Second language acquisition evidence
      1. Maturational state hypothesis – our ability to learn languages declines with age, which makes it hard to learn the second language.
      2. Exercise hypothesis – unless our capacity to learn languages is exercised then it is lost, which explains why people who know 3 languages find learning the next language even easier.
      3. Research:
         1. Adults actually do better learning a 2nd language, when time factors are evened out (probably due to more memory practice)
         2. However, children are better at sounding native because of phonological sound development
         3. The decline in ability is gradual and continuous, not a cutoff point
   4. What if you do not get linguistic input? The theory would say that you would not learn language or have a hard time with it.
      1. Feral children have no language at all, and find it difficult to learn even with intense training.
      2. Wild boy of Aveyron – found in the woods in the 1800s, never learned language, as well as other wolf and monkey children found in India and Burundi
      3. Genie – she was put in a closet from about 2 years old until about 14 years old, strapped to a potty chair.
         1. She had contact with humans, but only when fed and other family barked at her.
         2. No noise in the house, no tv.
         3. She was able to learn some language, but never morphology, and many parts of grammar. (2-3 year only language).
      4. Isabella – kept with her deaf mute mother for 6 years, no spoken language, gained full language abilities.
   5. Sensitive period hypothesis – we cannot accept the full version of critical periods because language can be learned and lateralization may be present at birth.
      1. So with sensitive periods – that time is best to learn something (usually syntax) but does not complete limit learning
   6. Why these periods?
      1. Nativist explanation – brain is preprogrammed to acquire language early in development
      2. Maturational explanation – advantages are lost as cognitive and neurological systems mature
         1. Actually an advantage that kids are “slow” because it allows them to take in smaller chunks (less is more)
6. Cognitive Basis of Language
   1. Piaget’s stages of development
      1. Sensorimotor period – behavior is organized around senses and motor systems, must learn object permanence (things are there even when you can’t see them)
      2. Pre-operational stage – egocentric though, which means that you can’t take another person’s point of view
      3. Concrete operational stage – can do the conservation task, can take other’s point of view.
      4. Formal operations stage – when you are able to reason abstractly
   2. Piaget’s mechanisms to development
      1. Assimilation – information is fit into existing cognitive structures
      2. Accommodation - cognitive structures are changed to allow for new information
   3. Cognitive hypothesis – language needs certain cognitive precursors to develop
      1. You have to get object permanence to be able to gain the vocabulary/dictionary
      2. Working memory and memory must develop
      3. Not a well supported theory because of lack of evidence
7. Social Basis of Language
   1. For language to develop naturally, a social interaction is necessary (i.e. you can’t just leave kids in front of the tv)
   2. Many believe grammar is implicitly reinforced by social interactions
   3. Turn taking
      1. We learn how to use the language in a social interaction
      2. Turn taking may begin at an early age – mothers and children do not tend to talk at the same time, gazes tend to be focused in the same direction (think about pointing something out)
   4. Attentional Frames theory – Tomasello
8. Blind and Deaf Language
   1. Visually impaired children cognitive development is slower than normal children
      1. Blind children tend to use more action words and less nouns
      2. Development of vocabulary is slower
      3. Phonological development is slower because we use mouth movements to help use distinguish different phonemes
      4. Syntactic development has more repetition than normal
      5. Less function words
      6. May not be due to cognitive or social deficit though…
   2. Hearing impaired
      1. Gain language at the same rate (sign) and tend to have similar cognitive developments
   3. These studies show that cognitive development may not be an influencing factor (may even support Chomsky), but that social interaction is an important factor
9. Language and Thought
   1. What exactly the relationship between language and thought? You can speak without thinking (yipes!) and think without speaking. People without speech can still think (even use language and write).
   2. Theories
      1. Piaget – cognitive development determines the course of language development
      2. Chomsky – language and cognition are completely separate entities
      3. Vygotsky – language and cognition originate independently but become interdependent
      4. Sapir-Whorf – language determines thought
   3. Vygotsky (page 89 picture)
      1. Speech and thought have different origins
      2. Pre-intellectual stage – words are not symbols for objects, they are sounds without thought (greyson uh oh)
      3. Early speech is egocentric to help interactions – these are thoughts and language merged
   4. Sapir-whorf hypothesis
      1. The form of our language determines the structure of our thought process
      2. Linguistic determinism – the form and characteristics of our language determine the way in which we think, remember and perceive
      3. Linguistic relativism – as many different languages will generate different cognitive structures
      4. Most people accept the weak version – language differences affect processing on certain tasks where linguistic coding is important
      5. Evidence
         1. Translations of languages “sound funny” – pomme de terre (apple of the earth – so do French people think about potatoes differently than us?)
         2. Whorfian hypothesis – some languages have more words for things than others (more words for snow in Inuit) so they must think differently about them than other languages – vocabulary differences tend to reflect different experiences (think about a job where you would have to “learn the lingo”)
         3. Grammar differences – gender markings in different languages, those markers are useful when determining sex but not things like pencil
   5. Indirect cognition language interaction
      1. Candle box problem – functional fixedness – our thoughts of something for what it’s meant to be used for can limit us
      2. The language we use influences the stereotypes we assume (English speakers assume English stereotypes)
      3. Number learning is much harder in English because of all the special terms we have for learning numbers
      4. Color terms were found to help memory, but not be biased by language – it’s not going to rewire your eyeballs!
      5. Some evidence that the coding of space (movement, where things are) and time that changes the way people think
   6. Overall, there is some support for the Sapir-Whorf hypothesis but not the strong version.
   7. There appears to be a very complex interaction between language and thought.