Homework 10

Week 11

1. How does Darwin's theory of Descent with Modification apply to Gary Marcus's hypothesis about why humans have language?

2. Processing which of the following sentences will behaviorally show a coercion cost?
   - A) The author began writing the book in his house.
   - B) Dutch trains are sour and very crowded.
   - C) The author began a book in his house.
   - D) Dutch trains are white and very crowded.

3. People with Williams Syndrome, according to the article Williams Syndrome and the Brain, "...may attend to components of images but fail to appreciate the overall pattern (the gestalt)". Does this type of neglect of the larger picture show up in reading comprehension as well?
   - Bonus: Upon asking people with Williams Syndrome to summarize what they have just read, I would hypothesize that while they may be capable of reiterating specific details, they would not be able to explain the purpose of the story or article they had just read. This would help to prove if the left hemisphere is lateralized for language in William's people, or if language is redistributed across the hemispheres.

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Do oscillations corresponding to semantic ill-formedness exhibit a change in activity when analyzed in multiple violation, mixed violation, and generally longer online processing activities? Do these particular oscillatory reactions correspond to semantic well-formedness in other perceptual modalities (Hagoort says that gamma oscillations are associated with feature binding within and across modalities)? Getting at Hagoort's conclusion that the oscillatory functions denote the brain "keeping a record of the integration problem", do same and similar violations effect oscillatory reactions? Also, do general long term memory recall tasks indicate the Gamma oscillations?

BONUS: Follow Hagoort's ERP paradigm, but extending sentence length to 2 sentences (or 3, then the control could be a well-formed prime as the second). Mix the violation types in the 2 of the sentences (i.e. [well-formed, sem. violation], [sem. violation, well-formed], [sem. violation, w.knowledge violation], [w.knowledge violation, sem. violation, etc.]). For the second question, could play familiar melodies with one out of key note and then with one unexpected in key note and analyze the ERP data. Could also simulate semantic well-formedness with video clips and analyze ERP data. For the 3rd question, test the exact
same violation and words on some subjects, same violation w/different words on others for both w.knowledge and sem. violations. For the fourth question, have a relative of a person come up with questions involving that persons past (unbeknownst to the subject), and record ERP effects.

Briefly explain the importance of data about oscillatory brain reactions, and what the data about theta and gamma oscillations suggest about the semantic and world knowledge integration:

Which of the following is least likely a genetically determined aspect of human language/language production:
1) The shape of the oral cavity and positioning of the larynx
2) Which language we speak
3) Understanding of complex syntactic structures
4) Ability to read words of a language

1. Which of the following statements is false regarding the N400?
   a) Low frequency words elicit larger N400s than high frequency words.
   b) Semantically unrelated related targets elicit smaller N400s than semantically related words.
   c) Phonologically related targets elicit smaller N400s than phonologically unrelated targets.
   d) Both pictures and words with different topographies elicit N400s.

2. What is the FOXP2 gene? How does it differ in humans and animals?

3. What is the relationship between the FOXP2 gene relate and humans who are clinically mute?

1) Perhaps something to do is to test whether FOXP2 has a role in how animals communicate with one another. Perhaps FOXP2 and the other genes that it works with have to do with general species communication. For examples animals that communicate through chemicals instead of sounds, perhaps FOXP2 has something to with sending, receiving or interpreting these chemical signals. The reason that this gene is found across the species may be because it is the gene which is necessary for members of a species to communicate, regardless of what form of communication they use.

2) Give three examples of the dissociation between language and cognition.

3) Cosmides and Tooby would agree with which of the following:
   a) comorbidity
   b) neural circuitry for language appears to overlap w/neural circuitry
c) separate domains exist to solve a particular problem  
d) language and cognition share modules

Multiple Choice:  
Choose the True statement.  
a) "Evo-Devo" refers to a synthesis of evolutionary, developmental, chemical and genetic theories  
b) Genes are the only thing that matters in speech production  
c) Environment is the only thing that matters in speech production  
d) The gene FOXP2 is tied to language

Short Answer:  
Explain and analyze the statement "descent with modification," that Gary Marcus used in his lecture on language citing both what it is in terms of evolution and how that relates to language.

Research Question:  
If you could manipulate the human genome so that you could eliminate only the FOXP2 gene from the genome of an individual would have all the other proteins/combinations in place sans FOXP2 could you teach the human language? What would be the limitations put on the human and how difficult would it be to overcome them- if this was possible at all.  
BONUS: Obviously this is an ethical problem, and one that researchers now are dealing with but if you could theoretically create a child without this gene you could rear them in a normal environment and determine the amount of syntax and semantic knowledge they would be able to posses. This experiment would first begin in the lab where chromosomes would be altered to create a child with no FOXP2. Further you could examine the most important conditions under which children learn language and determine the necessary and periphery functions of learning language.

As discussed in class, which of the following words would elicit an N400 response when filled into the sentence: The Dutch trains are ___ and very crowded.  
a) sour  
b) white  
c) yellow  
d) a & b

What did the studies done with the KE family show and why is this important?  
If the Dutch studies were performed again, without the word "dutch" in the sentence presented, would the N400 still be elicted when the word white was filled in? The N400 is sensitive to plausibility, and the dutch people have a response when the trains are described as white because they know their trains are yellow. If the same sentence was
presented, without the inclusion of dutch trains would this effect the outcome. For example, "The trains are white and very crowded." Or to put in another place, where the people being studied may not be aware of the correct color of a train.

Multiple Choice:
Which of the following is NOT true of FOXP2?
A) It is a gene that has been tied to language.
B) FOXP2 is unique to humans.
C) Mutation of this gene can result in severe development disorders that disrupt speech and language skills.
D) FOXP2 is the product of descent with modification.

Short Answer:
What does the difference between these two sentences suggest: “The present queen of England is divorced” versus “The favorite palace of the present queen of England is divorced”? How is the distinction between linguistic meaning and world knowledge problematic?

Open Ended Question:
Do studies of Williams syndromes reveal cultural influences on its expression? That is, is it a culturally universal disorder? Would an Asian person with Williams syndrome show the same type of diagnosis (impaired reading and writing, musical talents and heightened musical sensitivity) as an American counterpart?

Multiple Choice:
As studied in the KE family, which of the following is NOT an effect of the mutated FOXP2 gene?

a) Grammatical impairment
b) Articulation difficulties
c) Orofacial dyspraxia
d) None of the above

Short Answer:
According to Gary Marcus ("The Birth of the Mind," Chapter 7 "The Evolution of Mental Genes") what are two ways in which language can potentially affect our thoughts?

Research Question:
In the Pylkkanen, Llinas and McElree experiment regarding complement coercion, it can be said that the coercion effect is a result of the
Verb-insertion, not Verb-choice, and is thus primarily syntactic. Does this depend on the subcategorization frame for each individual verb?

Setup: create variations of the original experiment to test verbs with different subcategorization frames.

began, V+ [__(VP)(DP)(AP)]
threw, V+ [__(DP)(AdvP)(PP)]

Is there a difference in coercion factor between:
The author began the book. (Coerced)
The author wrote the book. (control)
The author rang the book. (implausible)

and

The pitcher threw to the catcher. (coerced)
The pitcher threw the ball to the catcher. (control)
The pitcher covered the ball to the catcher. (implausible)

Which of the following is NOT true about the Fox P2 gene:
A form of it is found in all invertebrates
It concerns language exclusively
It appears to have mutated very little as evolution has progressed

In a study that seemed to support semantic integration, subjects we found to have a similar high amplitude N400 response to “Dutch trains are white” and “Dutch trains are sour” but not for “Dutch trains are yellow”. What would be the lexical-access hypothesis explanation of these results?

We looked at one study that tried to demonstrate that effects of coercion sentences are independent of ambiguity by providing a context sentence:
Context sentence: The student was reading all morning
Target: After a while he started a book ... I feel that the ambiguity still exists in this sentence to some extent because the two activities could possibly be separate, in a way similar to:
The student was reading all morning. After a while he started dinner. Clearly in this syntactically similar case we are referring to different activities, and as such in order to properly
examine coercion without ambiguity the context phrase must be modified. Would theesults be the same if
subjects were instead presented with:
Context: The student was reading all morning
Target: First he started a book …
For the rest the study could be kept exactly the same, but this time the results would carry
a bit more weight as
the ambiguity was clearly dispelled.

How does coercion cost work with more syntactically complex sentences?
Does the combination of semantic and syntactic difficulty create a
different effect?

According to Gary Marcus, why is it too simplistic to say that FOXP2 is
"the language gene"?
Several reasons: genes don't just work on their own; it's the
combination of their expressions that makes a difference in the way an
organism is formed and functions. Also, the FOXP2 gene is not unique to
humans, nor is its expression unique to the language parts of the brain.

What is a good explanation for why the sentences "The goat began the
book." & "The student began the book." seem to have the same level of
difficulty in language processing?
a. "goat" and "student" are both animate beings, so sentences where they
both perform actions should have the same level of difficulty.
b. the difficulty with the sentences is associated with positing a V
position between "began" and "the" rather than figuring out what verb
would sensically fill that position.
c. the N400 effect does not occur in "coerced" sentences.
d. none of the above.

1) Give an example of a sentence that would elicit an increased N400
amplitude, according to the N400 integration hypothesis.
"He spread the warm bread with socks."

2) Under the lexical access hypothesis of the N400, which of the
following sentences below show similar responses:
   I) "The dutch trains are yellow and very crowded."
   II) "The dutch trains are white and very crowded."
   III) "The dutch trains are sour and very crowded."
a) I & II
b) I & III
c) II & III
d) none of the above
3) Evidence shows that lexical semantic knowledge and general world knowledge are integrated at the same time frame during sentence interpretation, starting at approximately 300 ms after word onset. Will a bilingual speaker show the same effect?

Semantic anomalies elicit what kind of a response?
A. N400
B. M250
C. N350
D. Mismatch Negativity

What does the fact that similar N400 effects occurred for sentences with world knowledge violation and semantic violation shows us?

Does expectations have anything to do with the world knowledge violation N400 response?

To test this, have a control group and test them with world knowledge violations and semantic violations and measure their N400 response. Then take a second group and discretely make them visualize a work knowledge violation in their head (such as a pink cab). See if this has any effect on N400 response or response time. Be sure to take priming into account for this study.

1) If all standard Dutch trains are yellow, and a native Dutch person reads the prompt, “The Dutch trains are white and very crowded” instead of “The Dutch trains are yellow and very crowded”, this is called what type of violation?
   a- world knowledge violation
   b- semantic violation
   c- semantic world knowledge violation
   d- none of the above

2) What is the “complement coercion” and why is it costly?

3) According to the lecture, the N400 responds to both world knowledge violations and semantic violations in the same way. If this is so, does the MMN which responds also to deviations, respond to the two violations? And in the same manner?

Multiple Choice Question:
Which of the following is TRUE concerning the integration of word meaning and world knowledge in language comprehension:

a. it takes longer to discover that a sentence is untrue than to detect that it is semantically anomalous
b. it takes longer for the brain to retrieve and integrate world knowledge than word meanings
c. the brain retrieves and integrates word meaning and world knowledge at the same time
d. none of the above

Short Answer:

What is PAX6 and what role does it play in the study of FOXP2?

Open-ended Research Question:

What are the consequences of having disruptions in both copies of FOXP2? Does this tell us anything about its role in speech and language?

Short answer:

Name one piece of evidence that sentence meanings is not just memorized words? We can produce and understand sentences we've never heard before.

Multiple Choice

What's one difference between M350 and N400?

A. The m350 had a spike at 350ms
B. N400 takes too long to be effective for speech
C. M350 has negativity at the top of the head
D. M350 is only used for visual processing

Open Ended

WOuld there be an N400 component for mistakes made in different tones in tonal languages?
research q: what is the developmental progression of n400 coercion effects? at what age do they start to become detectable, and what does this say about the way semantic meaning is acquired/interpreted?

@multiple choice: semantic anomalies elicit ________ n400 amplitudes
@increased
@decreased
@left-shifted
@no effect on

short answer: define dissociation and co-morbidity

Is the hypothesis that only one gene is responsible for language plausible?

What is evidence against FOXP2 being THE language gene?
i. FOXP2 is not always expressed in people.
ii. FOXP2 is expressed in other non-linguistic parts of the body.
iii. FOXP2 is not unique to humans.
iv. KE family shows non-linguistic deficits

a. i & ii & iii
b. ii & iii & iv
c. iii & iv
d. i & iii & iv

It was shown in the Hagoort et al paper that world knowledge violations elicit responses in different cortical locations than semantic violations. This was taken as there being to loci of information storage, one sentential/semantic the other world knowledge. These effects were elicited by seeing where there was increased activation by semantic violations 'the dutch trains are sour and very crowded' and world knowledge violations 'the dutch trains are white and very crowded'. This semantic processing center must be dependent on the world knowledge site. A neuroanomical question to be studied would be to find the projections between the world knowledge site and the semantic knowledge site. This could be done by various means which are foreign to me but i believe they can be done as the projections between various locations have been mapped out.

1) Why do we get the same effect when processing the world knowledge and word meaning of a sentence?
2) Which of these statements is NOT true about the dissociation of language and other cognitive abilities?

a) Young children with relatively limited real-word knowledge who can neither read nor do arithmetic learn language perfectly well.
b) As children age, their overall cognitive abilities improve and their abilities to acquire language also improve.
c) People with certain disorders (e.g., Williams Syndrome) have intact linguistic abilities but severely impaired cognitive capacities.
d) Some people with rare forms of language impairment seem to have normal cognition but impaired language.

3) If we were to genetically manipulate a Chimpanzee’s FOXP2 gene, would we be able to make the chimpanzee produce language?

While reading a sentence the brain:

a) retrieves and integrates word meaning
b) retrieves world knowledge
c) retrieves and integrates word meaning and world knowledge at the same time
d) retrieves and integrates word meaning before world knowledge

What was the overall conclusion of the Integration of Word Meaning and World Knowledge in Language Comprehension article?

In a person who is mentally disconnected from the world because of a psychosis show the same integration of world knowledge and word meaning?

Which of the following is NOT true about the ventromedial prefrontal cortex?

A) potential interfacing area between language and higher cognitive skills
B) contains primary taste and olfactory cortices
C) thought thought to generate the AMF
D) believed to be involved in decision making

Question: In the study by Hagoort et al, EEG was examined for brains performing the integration of both semantic and world knowledge. What did this study find, and what, briefly, is one explanation from the semantic integration perspective?

Research Question:

Does level of ambiguity affect the N400 response elicited by world-knowledge violations as examined by the Hagoort et al study?
@Fitting things together that are not ideal pairs like in the example "the author began the book" is ____________?
@Compliment Coercion
@Cloze Probability
@Integration hypothesis
@Priming

Describe one problem with the swiss army knife theory?
One problem lies in separating things that biologically could be described as very similar. On a molecular level, cells in different parts of the body are relatively similar.

What kind of language deficits could be found in people who are diagnosed with having motor deficits? What kind of challenges do children with motor deficits experience when acquiring language?

If a subject is shown a sentence like “the author began the book”, what is the name of the manipulation being used?
a) ambiguation
b) coercion
c) garden-pathing
d) constraint

Besides language deficits, what other problem has been associated with the FOXP2 gene?

1) Which of the following statements about the FOXP2 gene is incorrect?
a) The gene, which is thought to affect language abilities, is specific to the human species due to our unique ability to use spoken language.
b) A mutation in FOXP2 causes difficulties in articulation as well as an impairment in the grammatical formation of sentences.
c) The gene not only affects the development of language, but also the development of other areas such as the lungs and the heart.
d) The disorder involving a disruption in the FOXP2 gene is confined to the central nervous system.

2) An EEG and fMRI study was conducted utilizing the following stimuli:
The Dutch trains were yellow. (CONTROL)
The Dutch trains were white. (PRAGMATIC)
The Dutch trains were sour. (SEMANTIC)
Explain the purpose of the study and the

3) RESEARCH QUESTION: A study can be conducted on different types of semantic information to find out where the integration of specific
types of semantic information are localized in the brain. More specifically, the different types of semantic information to be tested is telic versus atelic sentences. Is the location site of semantic processing a function of a semantic violation in the verb usage, in the pronoun usage (telic. v atelic), or both?

Stimuli that can be presented:
He finished the book in 5 minutes. (control)
He finished the book for 5 minutes.
He finished reading the book in 5 minutes. (control)
He finished reading the book for 5 minutes.
He finished eating the book in 5 minutes.
He finished eating the book for 5 minutes.

which of the following elicit identical N400 effects to "the dutch trains are white and very crowded"

a) the dutch trains are yellow and very crowded
b) the dutch trains are sour and very crowded
c) a and b
d) neither a nor b

what is cloze probability and how does it play a role in the lexical access hypothesis of the N400?

oeq:
-is there such a thing as doubly mediated priming. i propose to study whether or not there can be two degrees of separation between a prime and a target. In the context of the dutch train example, this would entail something along the lines of white priming yellow, yellow priming lemon, and then lemon priming sour. this would be important in establishing what sorts of effects can be expected in terms of cloze probability, as well as in terms of phonological and semantic priming properties in general. this could be tested through both masked and unmasked priming paradigms, checking reaction time in lexical task decisions to the target.

What theory accounts for the fact that “Lion” primes the target word “Stripe”?

What is one reason that complement coercion (i.e. The professor began the book) is thought to be so costly in terms of processing effort?

The sentence is ambiguous, one does not know what the professor is
doing with the book.

"Inserting" the verb (the professor began reading the book) takes extra effort.

The neural correlates of coercion costs are exactly like those of implausible sentences.

Complement coercion is only ‘costly’ if the implied verb is not dispreffered (i.e. the writer began (reading) the book.

If children with William’s syndrome tend to think of infrequent items in the lexicon when asked to generate words (for example, naming animals), would they show the same ‘coarse coding’ effects seen in the Burgess & Simpson semantic priming experiments? Would the “subordinate meaning” of ambiguous words still remain primed longer than the dominant one?

BONUS: One could use the same paradigm used by Burgess & Simpson semantic priming of homophones.