Homework 9

Week 10

MC Q:
According to the study presented by Kutas and Hillyard, sentences with __________ will elicit the N400.

a) semantic inconsistencies
b) anomalies of grammar
c) Unpredictable type or size of print
d) all of the above

SA Q:
What was the outcome of the trace deletion studies discussed in class where subjects with Broca's Aphasia were presented with visual primers (related and unrelated) at either the point where a trace should exist or at a pre-gap site? What does this outcome support regarding Broca's Aphasia.

OERQ:
In class we discussed a study that presented sentences containing unlikely phrases such as the happy rock. The n400 was elicited during these phrases due to the un-plausibility of this phrase. Would the same thing happen in an instance where something such as a rock could be given human emotion, such as a children's story. Often in children's stories objects are allowed to speak and feel. I think it would be interesting to conduct a study where subjects are presented with a few lines preceding the "happy rock," making this more plausible under the circumstances (such as a children's book) to see if the n400 is effected.

1) The Lexical Access hypothesis is more plausible as the cause of the N400 response than the Semantic Integration hypothesis. Provide evidence for this statement.

2) In Friederici's model, which of the following responses is elicited around 200ms: due to the perception of grammatical category, before we understand the meaning of the sentence?

a) LAN
b) ELAN
c) P600
d) N400
3) At what age is the N400 first elicited?

Bonus: I am curious to know what age the N400 appears in children. My hypothesis would be that it would appear in children prior to when they began to read. I would assume any semantic incongruity would elicit the N400, since it is modality independent. It would also be important to know this information because if children can elicit this response very early in development than the N400 must not be based on the time we have been practicing English sentences (our repetition of some sentences... “I want coffee with milk and sugar”). It would seem to be based on our knowledge of the world and what is plausible.

For this study, I would take children of various ages and have them listen to sentences orally and read sentences (with older children) and see which children showed the N400. This would provide some insight into finding out when children begin to elicit N400 responses.

1) What is Frege’s “Principle of Compositionality”?

2) What is true about the N400?
   a- semantically related targets elicit smaller N400’s than semantically unrelated targets.
   b- Low frequency words elicit larger N400’s than high frequency words.
   c- Phonologically related targets elicit smaller N400s than phonologically unrelated targets.
   d- All of the above.

3) In lecture the N400 varies according to lexical access, semantic and phonological priming, and is responsive to words as well as pictures. Do these experimentally determined effects of the N400 affect dyslexics and persons with reading disabilities in the same way?

Multiple Choice:
Which of the following is Ferge’s Principle of Compositionality?
   a) The meaning of an expression is a function of the meaning of its parts.
   b) The meaning of an expression is a function of the meaning of its parts but not the way they are syntactically combined.
   c) The meaning of an expression is a function of the meaning of its parts and the way they are syntactically combined.
   d) The meaning of an expression is a function of the meaning of its syntax.

Short Answer Question:
Briefly site the findings on the relationship between the N400 and semantic/phonological priming respectively. Why is this an important finding?
**Research Question:**

What is the effect of Broca’s area on syntax in deaf persons who use ASL as their chosen method of communication?

*BONUS:* One way to create an experiment that will test this question is to perform an fMRI experiment (similar to those used to observe syntax in Broca’s aphasics) in which hearing and deaf persons were visually presented trials with syntactical and non-syntactical sentences (which they were asked to decide whether or not they were syntactical) as TMS created a functional lesion in Broca’s area and compare the activated regions in the two subject groups. By testing this we can see whether or not this region truly underlies the property of syntax in language or if it is phonologically specific.

---

**Explain Frege’s principle of compositionality.**

**What is a possible function of the N400?**

A. Semantic integration
B. Identification of a phonemes
C. Identification of word categories
D. Process of reanalysis and repair

**Research question:** what is the link between broca’s area and the left anterior temporal lobe in trace interpretation?

**Bonus:** Get two groups to compare to controls, one with broca's aphasia, and one with left anterior temporal lobe lesions. Using shocks to temporarily cause lesions in these areas, explore trace interpretations of subjects with broca's area lesions, left anterior temporal lobe lesions, and both. This could shed some light on what the function of Broca's area is.

---

**Multiple Choice:**

In general, words that are expected in a given context are ________________ more rapidly and accurately than the same stimuli presented alone or in a semantically inappropriate context

A) recognized
B) remembered
C) verbalized
D) All of the above

**Short Answer:**

Using an example, discuss the difference between a subject-cleft construction and an object-cleft construction. What does this explain about canonical positioning in English syntax?

**Open-Ended Research Question:**

Since no brain areas have been shown to be uniquely involved in syntax, could brain imaging of various syntactic language tasks show the interaction of different brain areas needed for syntax? Are there unique combinations within the brain network that are used for various aspects of syntax processing?
@LAN does NOT detect which of the following?
@case
@agreement
@gender
@syntactic errors

@What happens during the p600?

@What could we learn about language processing by studying people with various forms of memory loss? Would this help us understand better where memory comes into play during language processing. How do these people perform on Trace Deletion sentences with long distance gaps?

1) In regards to cross-modal priming, which of the following are correct:
   (i) Normal individuals show priming at both the gap site and the pregap site.
   (ii) Individuals with Wernicke's aphasia show priming at the gap site.
   (iii) Individuals with Broca's aphasia show priming at the pregap site.
   a) (i) and (ii)
   b) (ii)
   c) (i), (ii), and (iii)
   d) (iii)

2) Explain the semantic and lexical affects of the N400.

3) Research question: During which step of language processing is there a breakdown in processing in individuals with autism or other pervasive developmental disorders? You can test for N400 and M350 effects to find out at which step comprehension breaks down- in other words, is it a syntactic or a semantic deficit. To take it a step further, you can test to see whether they can represent and process traces.

Short Answer

What are the two theories for the function of the N400 and which one is favored as correct.

Multiple Choice

Which of the following would Broca Aphasics have trouble with

(A). Actives

(B) Subject Relatives
1) The Kutas paper did not explore whether the N400 is elicited for syntactic violations such or even parsing problems such as garden-path sentences. Reanalysis is a step that is usually involves with garden path sentences and if this is the job of whatever structure brings about the N400 then we should see activation. It would be interesting to see if studies done with syntactic violations would evoke the same response. Another aspect to see if the N400 is more a reaction to reprocessing or taking a second look when one is expecting something to logically follow. For example subjects could be given a very simple story with a very simple plot. They can then be tested by having to answer certain questions. They will be told they will see a sentence and then be asked a question. Some of the sentences will be actually lines from the story however parts of the sentences will be changed dramatically. We should see activation if the subjects recognize these sentences and a violation of what was expected happened causing reanalysis.

2) Describe the trace deletion hypothesis and its implications on Broca’s Aphasics?

2) In the crossmodal priming study discussed in class Broca’s a Aphasics showed priming for:
   a) gap-site, related and unrelated
   b) pre-gap-site related and unrelated
   c) both gap-site, related and unrelated and pre-gap-site related and unrelated
   d) neither gap-site, related and unrelated and pre-gap-site related and unrelated

Choose the correct statement about the left anterior temporal lobe:
   a) It is functional identical to Broca’s Area.
   b) It is responsible for syntactic processing only.
   c) It is likely the generator of the LAN and (E)LAN
   d) It is more activated by word lists than sentences.

How does Zurif’s explanation of failed trace interpretation differ from that of the Trace Deletion Hypothesis?
Does vocal inflection contribute to syntactic processing? If you were to continue the experiment performed by Osterhout, et.al., but present the stimulus auditorily, and say the word “defendant” with a higher pitch (unlike words at the end of a sentence that are said with a lower pitch). In the case where defendant was spoken with a higher pitch, one would think that the listener would expect there to more to the sentence after the word “defendant”. Thus would there still be a P600 effect elicited after presentation of the “The judge believed the defendant was lying” with the word defendant said with higher pitch intonation? Instead, would a P600 effect be elicited if we were to present the sentence “The judge believed the defendant” but with the same higher pitched intonation of defendant?

Multiple Choice: When presented with "The waitress, with the purple hair, (1) threw (2) the cake away" in a cross-modal lexical priming experiment focused on gap-filling, Broca's Aphasics:

a)Show priming at (1) but not at (2)
b)Show priming at (2) but not at (1)
c)Show priming at both (1) and (2)
d)Show no priming at all

Short Answer: How does the VP-internal subject hypothesis, according to Kitagawa and McNally in Zurif, Chapter 13, explain Broca's Aphasics' at-chance performance on object-relative sentences?

Research: In the experiment by Swinney et al of cross-modal lexical priming using subject-relative gap-filling, are there priming effects differences between when the clause in between the subject and the gap are related to the subject? In other words, is the priming effect due to the relative clause relatedness or to the trace?

Setup: variations of the original experiment, such as:
"The tailor, with the British accent, ___claimed to know the queen."
"The tailor, while eating a steak, ___claimed to know the queen."

Q: explain the results of the CMLP experiments where the point of the prime was varied in examples such as "the man liked the taolor, with the british accent, who PRIME: CLOTHES claimed to know the queen"

MC:
Which of the following would elicite an N400 effect:
A) He bought a new roll of toilet paper
b) He bought a new roll of toilet PAPER
c) He bought a new roll of toilet dresses
d) B and C

OEQ: Along the lines of the CLMP priming studies, I propose to study whether or not there is priming AFTER the gap site. For example, in "The man liked the tailor, with the British accent, who claimed to know the queen" could try priming between claimed and to, to see what sort of effects result. I think Wernicke's and normals would perform the same as before (prime at gap site) but I wonder what the Broca's results would be, since Broca's patients take longer to process sentences, especially complex ones, so even though they don't prime at the gap site or before it, they might "catch up" and be able to prime after it.

Open-ended research question: Does the compositional account hold for idiomatic expressions?

Let's say that in an experiment a subject is shown a dialog like this:
person A: "Is Harry ok?"
person B: "No, he kicked the flower yesterday."

Would the subject show a bigger N400 for flower when he/she expected to see bucket? How about for something more semantically close like can?

Multiple choice question: Broca's aphasics perform at chance on which of these syntactic constructions?
@actives
@subject relatives
@object clefts
@subject clefts

Short answer question: What is Frege's principle of compositionality?

How does the lexical activation theory explain the increased N400 response to anomalous sentences such as "He spread the warm bread with socks?"

An ELAN response is produced under which of the following circumstances?

-When a deviant stimulus is presented amidst a group of regulars.
-Only when there is a violation of a strong prediction for the end of a
sentence.
- Only there is a violation of grammaticality in a sentence presented in
  the auditory modality.
- When there is a violation of grammaticality in a sentence presented
  either in the auditory or visual modalities.

How would factors that inhibit semantic composition without affecting
plausibility affect the latency and size of the N400 response? Would
these cause changes larger than the ones caused by a change in
plausibility alone?

Do number/gender violations between an antecedent and a reflexive
pronoun in languages other than English elicit a LAN? (See Osterhout &
Mobley's experiments— they don't in English, but according to Gunter,
grammatical gender violation does elicit a LAN in languages like
German). I would hypothesize that they wouldn't, because the differences
seem also to be semantic (and/or based on context) in languages like
French, at least.

Why does it make sense that in the imaging data from a stimulus that
elicited an ELAN or a LAN, those elements would be followed by a P600?

According to the 'lexical access' view of the function of the N400, why
would the N400 component be elicited at the end of a sentence like: "The
boy kicked the round justice."

Because:
a. "round" and "justice" are not phonologically similar.
b. the agent and the theme are in non-canonical places in the sentence,
which can confuse the reader.
c. access to the word "justice" is delayed because the preceding word,
"round," creates an expectation for a physical object rather than an
abstract concept like "justice".
d. forming the intersection of the "roundness" and "justiceness" of the
sentence's direct object is difficult because nothing in the real world
is characterized by both properties.

The N400 response varies in what way in response to low frequency vs. high frequency
words?
There is a higher N400 response for high frequency words
There is a higher N400 response for low frequency words
The N400 response is of equal amplitude for high and low frequency words
There is no N400 response for lone words
Studies of linguistic gender violation were found to elicit a LAN effect in German, but failed to in English. Explain how this finding supports a syntactic (as opposed to semantic) role for the LAN response.

Is there a P600 response for sentences containing such semantic violations as “John saw the happy rock”?

**Reasoning/Bonus**: Although it seems that there is already a growing body of evidence refuting the semantic integration approach in favor of the lexical access view, it seems that it would be valuable to further explore the neural response to sentential semantic violations like the one above. Obviously the effects are not a result of initial composition, because until one processed the sentence to the end one would not realize the violation, however, the semantic integration approach could still be supported if there was evidence of reanalysis, as would be evidenced by a P600 response. If a P600 response were to be detected however, semantic integrationists would still need to further investigate the N400 response to these stimuli.

1) What kinds of ERPs get activated in the brain when presented with semantically incorrect words and with words that are larger than normal?

2) In which condition of the sentence-picture matching test did the patients with Broca’s aphasia performed poorly?

   - a) subject-cleft sentences
   - b) object-cleft sentences
   - c) agent-first sentences
   - d) All of the above, Broca’s aphasics can not understand speech of any kind

3) How would a patient with Broca’s aphasia perform in a test where his/her native language the agent-first sequence is the non-canonical sequence?

Which of the following word pairs are NOT examples of the term they have been presented with?

   - A) homonymy – (broken bat, baby bat)
   - B) polysemy- (green book, insightful book)
   - C) homonymy – (investment bank, sandy bank)
   - D) polysemy- (interesting novel, green book)
There are two general theories as to the function of the N400. What, briefly, is the N400, and what are the two main theories?

Research Question:
The N400 response is believed to be sensitive to tasks of semantic integration. Specifically, it is believed to play a role in semantic plausibility testing. For example, there is a greater N400 response generated by the semantically implausible pairing “the happy rock” than the more plausible pairing of “the heavy rock”. Can this “plausibility sensitivity” be experimentally isolated? Since being able to gauge plausibility is most likely a function of life experience, test groups of 5, 10, and 15 year old subjects might reveal different N400 responses to sentences of varying plausibility, (for example, a 5 year old, with native animistic beliefs might consider “happy rocks” to be more plausible).

@ Who is able to prime the sentence, "The man liked the tailor, with the British accent, who claimed to know the queen"?
@ Priming occurs at the gap site (not the pre-gap site) by normals and as well by those with Wernicke's aphasia.

@ Which of the following sentences exhibit the most robust reaction from the N400 component?
@ "He spread the warm bread with BUTTER."
@ "He spread the warm bread with butter."
@ "He spread the warm bread with socks."
@ "He spread the warm bread with margarine."

@ Will the perception of unforeseen, irregular, music notes, such that rap music has, illicit an N400?

_____and _____ aphasics showed priming at the gap site but not at the pregap site.

a) Normals, Wernicke's
b) Wernick, Normal's
c) Wernicke's, Broca's
d) Normals, Broca's

What are 2 characteristic's of the N400?

It is elicited for all words (regardless of context), and shows lexical frequency and priming effects in a way consistent with the hypothesis that it indexes some aspect of lexical access.
Research Question:
What does the N400 tell us about language processing in terms of patients with Broca's aphasia?

Short Answer question:
"The man bought herself a brand new car."

Would the above English sentence elicit a LAN response? Why or why not?

Multiple Choice question:
Which of the following is true in relation to crossmodal priming?
a. Normals showed priming at the pregap site but not at the gap site.
b. Broca's aphasics did not show priming at both the pregap and gap site.
c. Wernicke's aphasics showed priming at the pregap site but not at the gap site.
d. None of the above.

Open-ended research question:
There may be sentences that contain a word that has two meanings, and where one the meanings is semantically inappropriate. In this context, is the N400 affected in any specific way by semantic ambiguity?

Using techniques similar to the Pylkkanen study, is it possible to compare semantic/phonological priming of compositionally alike morphemes (rake, raked) with morphemes that are more semantically divergent (refrigerate, refrigerator). Is it possible to form a gradient for semantic divergence (from the previous to: lunch break, circuit breaker). How would these data integrate with the polysemy data?

What is some evidence against TDH? What is an alternate theory of Broca's aphasics' behavior.
Which of the following not true about the N400?
A) The duration of the M350 is shorter than that of the N400
B) N400 is elicited for all words
C) Low frequency words elicit a larger N400 than hi-frequency words
D) Semantically related targets elicit larger N400s than semantically unrelated targets

research q: what, if any, is the behavioral correlation for subjects whose brains do not elicit p600 responses? Is there any detectable language impairment at all?

@multiple choice: the elan has been found to be localized in:
@the left anterior temporal lobe
@the right anterior temporal lobe
@either left or bilateral anterior temporal lobe(s), depending on the study
@the occipital lobe

@short answer: name one process thought to occur at around 600ms after verbal stimulus presentation
@ syntactic reanalysis

1. Which of the following statements is false regarding LAN?
   a) There is left anterior negativity at 300-500ms.
   b) It is elicited by visual stimulus presentation.
   c) It is elicited by subject verb agreement violations.
   d) It is elicited by number and gender violations between an antecedent and a reflexive pronoun.

2. Explain the relationship between P600 and Broca Aphasics.

3. How would a person with Broca's Aphasia perform on trace interpretation tasks if he/she also had a case of pure word deafness?

Who is able to prime the sentence, "The man liked the tailor, with the British accent, who claimed to know the queen"?

Which of the following sentences exhibit the most robust reaction from the N400 component?
   a) "He spread the warm bread with BUTTER."
   b) "He spread the warm bread with butter."
   c) "He spread the warm bread with socks."
   d) "He spread the warm bread with margarine."
Will the perception of unforeseen, irregular, music notes, such that rap music has, illicit an N400

---

N400 data shows that while reading a sentence...
a) First the brain retrieves word meanings and then world knowledge.
b) First the brain retrieves world knowledge and then processes word meanings.
c) The brain retrieves world knowledge before the N400.
d) The brain retrieves and integrates word meanings and world knowledge at the same time.

(Q) What did the fMRI data show regarding brain activity for sentence and word processing?

---

Which of the following statements are true in regard to cross modal priming?
a) Normals and Wernicke's show priming at the gap site but not at the pre-gap site.
b) Only Normals show priming at the gap site
c) Broca's do not show priming at the gap site or the pre-gap site
d) a and c

What is Grodzinsky's explanation of the trace deletion hypothesis and how it applies to Broca's aphasics?

Would children show a LAN response for correct forms of irregular words because they are over generalizing and haven't learned the used past tense? For example if a child believes that the past tense of go is goed would they show a LAN response for went because according to what they 'know' it is wrong?