

# Questions, Week 5

Neural Bases of Language

Submitted October 9, 2005

## 1 Short Answer

- (1) When the word “bank” is used as a prime in the left hemisphere why is the target of “money” only primed 35ms after the onset of “bank”, as opposed to when bank is shown in the right hemisphere and both “money” and “river” are primed 35ms after onset?
- (2) How have the experiments conducted by Boatman et. al. (2005) utilizing “functional” lesions, supported the sound-meaning interface in the Hickok & Poppel model?
- (3) What was the surprising outcome of the SOA study presented in class that studied the right hemisphere’s contributions to lexical semantic priming?
- (4) Explain how presentation of higher frequency stimuli is qualitatively similar to priming in non-priming tasks.
- (5) The N400 is a complex waveform. Recent analysis has found that there are significant subcomponents of the N400. Can the characteristics of these attendant waveforms be used to discern other associative areas?
- (6) What are some of the characteristics of Conduction aphasia?
- (7) What may be an explanation for the fact that a semantic priming effect can be seen in the right hemisphere for non-frequent meanings of words with a stimulus onset time of 750 ms, but not for 35ms?
- (8) Dr. Mark Ashcraft, in his article entitled “A Personal Case History of Transient Anomia,” describes his experience with anomia and the effects it had on his linguistic capabilities. In the article, Ashcraft breaks down the internal mental processes involved with producing speech into three general steps. Define anomia, list the three steps, and explain which step anomia affects.
- (9) The cognitive processes involved in lexical access are activation, competition, and selection. Explain which of these processes are at work during the M350, and what the implications are thereof. (explain what the M350 is in your answer also)
- (10) What is anomia?
- (11) it is posulated that we process visual linguistic information faster when we perceive through what visual field, and why?
- (12) What is the “course coding hypothesis”?

- (13) Identify and explain the two properties that have an effect on lexical access.
- (14) How does the Coarse Coding Hypothesis support the results of the Noppeney & Price study (ie. that a secondary meaning target like “river” for the prime “bank” is LH-inhibited by a 750ms SOA while it remains active in the RH)?
- (15) Explain how TSA can be induced with electrical interference giving one example of a study in which this method would be used.
- (16) What is the “Coarse Coding Hypothesis (Beeman 1998)”?
- (17) Name three types of priming?
- (18) In the competition phase during lexical access, what happens to all the possible activated words? Lateral inhibition/suppression
- (19) Although MEG and EEG procedures both derive from the same neural currents, they differ in a number of ways. Describe these differences.
- (20) What do we think is a reason that “spinach” primes “spin” at 60 ms but not at 300 ms?
- (21) It has been suggested that the N400 decomposes into several functionally distinct subcomponents. Identify each subcomponent and its respective function.
- (22) Explain the reactions to nonwords with a high phonotactic probability to a low-level task versus the reactions to a high-level task. Explain your answer.
- (23) Explain how TSA could be induced by experimenters to create functional agnosia.
- (24) What is masked priming?

## 2 Multiple Choice

- (25) Which of these are attributes of words with a higher 'resting levels':
  - a. higher frequency
  - b. recently primed
  - c. lower frequency
  - d. both A and B (higher freq and recently primed)
- (26) If presenting a visual word stimulus in an attempt to create a long priming affect for more 'metaphorical' meanings what part of the visual field should the stimulus be shown to?
  - a. top center
  - b. far right
  - c. far left
  - d. bottom center
- (27) Which of the following statements is not true about the M350?
  - a. It is the first MEG component serving as a predictor of the behavioral frequency effect.
  - b. If it indexes lexical access, it is also predicted to show priming effects.
  - c. The activation may not be due to lexical access, rather the effect could be secondary.
  - d. None of the above.

- (28) The following three steps have been postulated:  
Step 1: semantic retrieval which provides access to and awareness of the idea to be expressed  
Step 2: process of accessing the word or phrase that names the retrieved idea  
Step 3: articulation of the retrieved word name

Given the above, a person suffering from transient anomia would most likely experience a disruption in which of the following:

- a. Step 1
  - b. Step 2
  - c. Step 3
  - d. none of the above
- (29) When presented in a phonological priming task, (blank) frequency words show a delay while when a word/non-word higher level task is presented, (blank) frequency words show a delay.
- a. High, High
  - b. High, Low
  - c. Low, High
  - d. Low, Low
- (30) A person who recognizes something but cannot describe it verbally is experiencing an episode of:
- a. retrieval failure
  - b. tip-of-tongue (TOT) phenomenon
  - c. transient anomia
  - d. amnesia
- (31) Which of the following is dales of conduction aphasia
- a. Lesion in arcuate fasciculus
  - b. Intact auditory comprehension
  - c. Impaired repetition
  - d. Intact naming
- (32) What is true of a patient suffering from Anomia
- a. Lexicon to right anterior temporal lobe
  - b. Intact auditory comprehension
  - c. Inability to repeat
  - d. Naming intact
- (33) Which syndrome do these characteristics ; (LESION SITE: Arcuate fasciculus. CHARACTERISTICS: Auditory Comprehension:intact, Repetition: impaired, Naming: impaired, Reading: typically good (but trouble reading aloud), describe?
- a. Anomia
  - b. Conduction Aphasia

- c. transcortical Sensory Aphasia
  - d. Wernicke's Aphasia
- (34) Patient X suffered a trauma to the her middle temporal gyrus. Her doctor then conducted a series of informal exercises to conclude what deficits X might have. The doctor found that her repetition, naming and reading skills were in tact, however her auditory comprehension was severely impaired. From this finding what might condition might the doctor assume patient X has?
- a. Wernicke's aphasia
  - b. Anomia
  - c. Transcortical sensory aphasia
  - d. Conduction aphasia
- (35) Which language processing impairment supports the Hickok & Poeppel model that localizes the sound-meaning interface in the posterior inferior temporal lobe (pITL)?
- a. Transcortical Sensory Aphasia
  - b. Wernicke's Aphasia
  - c. Anomia
  - d. Conduction Aphasia
- (36) The following are characteristics of anomia except
- a. intact auditory comprehension
  - b. impaired ability to name
  - c. intact auditory comprehension
  - d. arcuate fasciculus is the lesion site
- (37) All people with phonological anomia would have difficulties with:
- a. Auditory comprehension.
  - b. Repetition.
  - c. Integration of semantic system and phonological lexicon.
  - d. Semantic retrieval.
- (38) what does ERP stand for
- a. Early Receptor Potential
  - b. Event Related Potential
  - c. Effective Refractory Period
  - d. Effective Radiated Power
- (39) Which of the following is not a characteristic of Wernicke's aphasia?
- a. Auditory comprehension intact
  - b. Repetition intact
  - c. Speech fluidity impaired
  - d. A & B
  - e. B & C

- (40) Which of the following was most important in terms of semantic priming occurring differently in the brain hemispheres (from the Burgess and Simpson “bank” priming study?)
- with left hemisphere presentation (shown to the right visual field) after 35 ms both money and river are primed
  - with left hemisphere presentation (shown to right visual field) after 750 ms, no priming for river
  - with right hem. presentation (shown to l. visual field) after 35 ms, priming for money, no priming for river
  - with right hem. presentation (shown to l. visual field) after 750 ms, priming for money and for river
- (41) A patient who suffers from anomia will most likely exhibit which of the following symptoms?
- intact repetition, intact auditory comprehension, impaired naming
  - impaired repetition, impaired auditory comprehension, impaired naming
  - impaired repetition, intact auditory comprehension, impaired naming
  - intact repetition, impaired auditory comprehension, intact naming
- (42) What recent evidence indicates that the M350 MEG component is associated with early lexical processing?
- The M350 can not predict behavioral frequency effects, indicating that it is too early in lexical processing to have such an effect.
  - Paradigms that facilitate lexical access and inhibit decision tasks show that M350 latencies are dependent on the decision tasks.
  - Paradigms that facilitate lexical access and inhibit decision tasks show that M350 latencies are dependant on lexical access.
  - The effects of lexical frequency on the M350 are downstream consequences of an earlier effect.
- (43) A word with 2 meanings but the same sound, like bank will have:
- 1 same lexical representation
  - 2 different lexical representations
  - 2 same lexical representations
- (44) In analyzing the N400 phenomenon, several peaks have been identified at various times after word-onset which can be isolated. They are:
- dipolar distribution with fields that appear over the left hemisphere
  - a peak at 170ms with bilateral occipito-temporal distribution followed by a recurring dipolar field over the temporal lobe
  - a 170ms peak with distribution to both occipital-temporal pathways followed by a dipolar, recurring field over the left hemisphere
  - a stimulation of Broca’s area followed by unilateral association with frontal lobe stimulation.
- (45) What can be said of high resting level words relative to low resting level words?

- a. They tend to be more frequent in the language (ANSWER)
  - b. They tend to be less frequent in the language
  - c. They are nouns
  - d. They are the newest additions to a subject's lexicon
- (46) Someone with Anomia, a type of aphasia discussed in class that is shown to be caused by a lesion in or around the left anterior temporal lobe, would have difficulty with which of the following tasks:
- a. Identifying a dog in a picture with only an auditory command to do so
  - b. Naming elements of a picture
  - c. repetition of words
- (47) Which statement is NOT an accurate portrayal of the linguistic deficit experienced by Ashcroft, as described in his article "A Personal Case History of Transient Anomia."
- a. During the seizure, Ashcroft was completely aware of the ideas he was trying to convey.
  - b. Ashcroft did not substitute general words such as "thing" or "stuff" in place of words he could not retrieve.
  - c. Although overt speech production was impaired, Ashcroft's stream of consciousness remained as inner, subvocal speech.
  - d. Ashcroft believes that, with the exception of a couple words, his inhibited retrieval was specific to what he calls "professional" words; "everyday" words were intact.
- (48) According to the article "A Personal Case History of Transient Anomia," by Mark H. Aschraft what is the major difficulty with language during an episode of transient anomia?
- a. inability to comprehend spoken speech
  - b. unable to produce any speech
  - c. inability to retrieve and use specific contact words and terms
  - d. impaired ability to read

### 3 Open-ended Research Question

- (49) Considering masked priming, is it possible to sway someone's responses to a question depending on certain feeling words that they had unconsciously been exposed to? For example if a subject is shown the word happy in such a short amount of time that they weren't aware of it and then given a question about, say, their life or school or something would they answer it more positively as opposed to if they had seen the word sad or depressed etc?
- (50) In the article "A Personal Case History of Transient Anomia," by Mark H. Aschraft, Aschraft says that after his episode of transient anomia his AVM (anterior left temporal lobe) was removed. How many different areas of the brain can be surgically removed and what greater consequences does this removal have on the brain's ability to process visual and auditory aspects of language?

We could study people with epilepsy who have had operations (parts removed) on their brains and see how these peoples' speech and reading skills have been effected.

- (51) How are words that are scrambled but end and start with the "right" letters still processed in our lexicon.

A method of testing would be to show a scrambled word and then see what words are primed by the stimuli. Are many words primed or is only the target word primed. We could test this idea when scrambled words are in isolation or in context. Then see if scrambled words will always prime the target word. Are the words understandable at all out of context? Testing the reaction times is also essential in the process being used to understand scrambled words.

- (52) Does the mental lexicon have a sort of categorical organization? For example, do we categorize the mental representation of words by semantic relatedness, frequency, encoding specificity, etc.? (The fact that Ashcroft's anomic episode was causing impaired retrieval of what seemed to be a category that he called "professional" words would support this hypothesis of categorical organization.)

- (53) Why are the primary and secondary associations activated with the longer SOA of 750ms and does this occur at other times as well? In the study discussed in class, we were shown that both were primed at 750 but only money was primed in the right hemisphere at 35ms. I would like to study other times around both of these to see when the switch occurs and perhaps this would give us more insight as to why both are primed with a shorter SOA in the left hemisphere but for the same thing to occur in the right hemisphere you need to allow more time.

- (54) Given that phonological primes yield either faster or slower reaction times in a priming task, why does a semantic prime only yield a faster RT?

REASONING/BONUS: Perhaps the reason for this lies in the fact that it seems in reading tasks it is necessary to first identify the phonological representations-a low level linguistic process-and then use these to identify the semantic representation-a high level linguistic process. This is to say that perhaps the phonological representations compete with one another to a larger degree than semantic ones because semantic representations are identified (at least in reading tasks) indirectly through the phonological representations. A potential project idea to investigate this might be to present visual pictorial stimuli rather than written words, for both phonological and semantic stimuli, and compare the results to a task in which corresponding stimuli are written. Stimuli presented should be selected to amplify expected differences in reaction time in the traditional written task (primes cause slowing in the phonological task but speed up in the semantic task). If the gap between phonological and semantic tasks is wider for written stimuli vs. pictorial stimuli, then perhaps the reasons for the difference in effect stem from the fact that phonological identification is low order, whereas semantic is high order.

- (55) Magnetoencephalograms record integration of disparate brain areas over time after word onset. The N400 complex has been analyzed to show several events at the temporal lobe, and at 170ms, a peak with bilateral occipito-temporal distribution. Would this distribution change for a subject blind since birth from prominently temporal-occipital to some other sense-involved area, say, some area of the parietal lobe involved with touch?

Repeat the same sentence spoken to the subject in the initial experiment to a subject blind since birth. Will analysis of the MEG output for this person who has learned the meaning of words by non-visual senses show a change at the 170ms point? It is at this time that the occipito-temporal pathway is involved in the traditional study of the N400 phenomenon. This could involve multiple experiments in which sentences are tailored towards specific sense-reactions, etc.

- (56) How does the right hemisphere processing of language differ from the left hemisphere processing and what do these differences tell us about lexical processing in the brain.
- (57) Is there an effect analogous to the M350 when stimuli are presented aurally? That is to say, do the same lexical frequency-dependent latencies that have been seen in the M350 component with visual lexical decision tasks exist with auditory input?  
BONUS: A paradigm similar to the one developed by Pykkänen and Marantz for tracking the time course of word recognition could be used, only with aural presentation of words and pseudo-words high phonotactic probability. A lexical decision task would likewise be used to see if results obtained would be similar to those in the original study.
- (58) Is lexical access possible without the contribution of phonological information? In other words, do the two domains function independently of one another or are they dependent on one another?
- (59) The Burgess and Simpson “bank” study of 1988 showed interesting results in terms of right hemisphere semantic priming occurring despite no such priming in the left hemisphere. I propose a study that would address an ambiguous prime such as bank in reverse. Thus, the primes would be primary and secondary meanings, such as river and money, and the target would be bank. This would investigate which meanings are primary and secondary by examining the amount of time it takes to react to each meaning, and whether the primary meaning activates bank faster than the secondary does. The setup would be identical to the Burgess and Simpson study, but with different primes and targets. Hopefully, the results would be interestingly divergent:) -bonus not sure if it qualifies for it, but though I’d try
- (60) A large body of work has already demonstrated that lexical access in English is affected by word frequency and by contextual priming, such as identity priming, (repetition), phonological priming, (similar sounds) and semantic priming (related meanings). The concept of “frequency”, however, seems vague and ill-defined. Is it possible to artificially increase the environmental “frequency” of an arbitrary list of vocabulary? To what degree can it be increased, and to what effect?
- (61) As I recall, the experiment we saw at the hospital tested for what sort of brain response (including location) was elicited when a subject processed a word starting with the prefix “-re” that therefore was a word independently without the “-re”, such as “research” as compared with a word that happened to start with “re” such as resilient or response. If this was not the aim of the experiment, and I misunderstood, then this is the research question I’d like answered. . . if it was, then this is my research question- when faced with nonwords which start with “re”, is the elicited brain activity more similar to the prefix “-re” activity, or the “words-that-happen-to-start-with-re” (and therefore not particularly special) response? This would suggest which response is sort of a default response to that sound, and I feel is an interesting question. . .

- (62) If a hearing person who knew sign language suffered from anomia, would they be able to access signs or gestures when they were at a loss to produce the verbal word?
- (63) My question concerns the account of the professor with transient anomia. I wonder if during his events if the words that he could not access in his mind could be accessed using priming tasks or by presenting the words to him either visually or orally would he be able to comprehend them as the words that he is trying to access or would those particular words be incomprehensible because he is trying to access them at the time. Perhaps this would give a clue as to whether lexical access when trying to come up with a word given no linguistic input is the same type of lexical access involved when recognizing a word as a word. Perhaps there are two separate systems that lead to anomia's ability to comprehend speech but not name words.
- (64) Does there exist a sort of "context priming" effect in lexical access for words that are often used in heavily familiar clusters (eg. clichés, proverbs, famous quotes, any ubiquitous phrases – and also possibly common antonym pairs like "light/dark")?  
 BONUS This would definitely necessitate native speakers as subjects for the experiment, and selection of the stimuli would have to be careful, in order to choose clusters that could be assumed to be very familiar to the subjects (this could also be achieved by preliminary testing of the subjects' familiarity with clusters). This means that clusters that are fairly contemporary or based in pop culture or slang would not be appropriate. Clusters would have to be phrases, etc, that have fully infiltrated the language and have been truly ubiquitous for a relatively long period of time. Contrasting stimuli would have to be of several sorts (eg. words that are totally unrelated, words that are somewhat synonymous, etc) in order to really determine if "context priming" is truly the reason behind the results, and also one would have to make sure that the word pairs (prime & target) would not be affected by other types of priming.
- (65) Are lexical decisions for grammatically correct non words faster than lexical decisions for non grammatical non words?  
 This question is similar to the frequency effect but has to do with recognizing both that the stimulus presented is not a word and then judging whether or not this non-word is grammatical or not. If the decisions are not faster it would show inhibition from non-words. BONUS: This experiment could be conducted by flashing a grammatically correct non-word or a grammatically incorrect non-word and measuring the average response time for both. An example of a grammatical non word might be something like: Suthering. While a non-grammatical non word would be something like: Gzdokimrne. The subjects would be shown these words and asked to decide (by pressing one of two buttons as fast as possible) whether or not the word was grammatically correct. The response time would then be measured and an average found.
- (66) In the Lexical Ambiguity Study, how the timecourse would change with different hemifield presentations was studied. It was shown that presenting words with dual meanings to the different hemifields had different timecourses, and primed different meaning representations. However, this study was done with more of a word to meaning connection. Would the results be different if sound to meaning was studied, (since the sound to meaning and the word to meaning primings are located in different areas of the brain)? So the subject

would be presented with ambiguous sounds originally instead of words.

- (67) Will a scrambled word prime a word?
- (68) Can an anomia patient repeat their professional jargon after hearing another person say it?
- (69) Are any other neural processes affected during an episode of transient anomia? Are there any long term effects?
- (70) In class on 10/4/05, we presented evidence i.e. rhyme priming for phonological priming. Does there exist priming in which an auditorially presented stimulus phonologically primes a visually presented target?
- (71) Do people with anomia show abnormalities at the M350? What does this tell us about the role of the M350?
- (72) How do you think the coarse coding hypothesis would be effected in a split brain patient?
- (73) Dr P in the chapter from Sack's book has a problem identifying things. This deficit could be caused by many different problems in the Dr P's entire cognitive system, but it seems very likely that it can be a problem of his linguistic engine that ascribes meaning to words and things. The N400 response has been broken down to several sub-components by using MEG, some of which are pre-lexical and others are post, if there is a problem in Dr P's linguistic system it seems as if it would be shown in the N400 as it seems to include the moment where things get their meaning. This could be found by using an MEG study by manipulating the phonotactic and similarity frequencies.