Questions, Week 7

Neural Bases of Language

Submitted October 23, 2005

1 Short Answer

(1) Explain what Williams Syndrome is.
(2) How does the Hebrew Aphasic date refute the prediction from the English Aphasic data that function words are wiped out in aphasia?
(3) Explain three different hypothesis’ for Specific Language Impairment (SLI):
(4) Name and briefly describe the two tasks used to test the difference between function and content words (in Aphasia in Hebrew).
(5) How do open and closed class words differ in terms of phonology, acquisition, aphasia and laterality?
(6) Every day last week I walked my dog.
   Every day last week I walk my dog.
   Why would it be reasonable to expect either of these statements from a child under 3 years of age with no known language impairments?
(7) Give two pieces of evidence that have led to the conclusion that language deficits may be related to genetic factors.
(8) Give evidence for and explain how a deficit of rapid auditory perception can result in Specific Language Impairment(SLI).
(9) Identify and explain two developmental disorders with a genetic basis?
(10) What is the Optional Infinitives (OI) stage?
(11) According to M. Gopnik’s article “Language deficits and genetic factors,” there is a simple test to see whether a person has a productive rule for making inflected forms. Describe this test.
(12) Why is the finding of the FOXP2 gene by Vargha-Khadem et al. not necessarily evidence for Fodor’s theory of modularity? (Use the principles of the theory to define your answer.)
(13) what symptoms are typically associated with williams syndrome
(14) Why can we say with certainty that SLI symptoms can not be attributed to a more general auditory processing problem?
(15) What are the conditions associated with SLI and what percentage of the population is affected?
(16) In relation to content words, when are function words normally acquired?
(17) Why is all grammatical morphology considered “functional”?
(18) Various theories have been proposed to account for language deficits such as Specific Language Impairment (SLI). These theories include a breakdown of the “language faculty,” cognitive impairments, auditory or perceptual difficulties, etc. Which theory do you believe best explains such language impairments, and what research supports your claim?
(19) According to Fodor, what is a module?
(20) What is the difference between open and closed class words? Give examples of each.
(21) What does research from languages such as Hebrew show about aphasia that English data simply cannot show?
(22) What is Tallal’s non-linguistic hypothesis on Specific Language Impairment (SLI)? Describe one piece of evidence.

2 Multiple Choice

(23) The study of the aphasia patient speaking Hebrew shows that he had trouble with:
   a. Tense but not agreement
   b. Agreement, but not tense
   c. Both agreement and tense
   d. Neither agreement nor tense
(24) All of the following describe content words except
   a. They obey the minimal word constraint.
   b. They are open class words.
   c. They include all grammatical morphology.
   d. They provide the meaning for a sentence.
(25) Which of the following statements is not true about function words?
   a. They classify as open-class word.
   b. They are high in frequency and short in length.
   c. They are omitted in patients with Brocas Aphasia.
   d. They leave no room for innovation.
(26) Which of the following is NOT a function word?
   a. At
   b. My
   c. New
   d. When
(27) According to research of LAN, which type of sentence error would be detected earliest?
   a. “when the lights went off the room became red.”
   b. “the spoilt children throws.”
c. “when the lights went off the room became quiet.”
d. “the spoilt children eat.”

(28) Which of these statements about function words is false?
   a. Children acquire function words earlier than content words.
   b. Function words are a closed class.
   c. Function words do not conform to the minimal word constraint.
   d. In languages such as Hebrew, with root-pattern morphology, function words or morphemes are never attached to content words.

(29) Which piece of evidence is most problematic in providing support that content and function words are processed differently.
   a. In divided hemispheld studies, there is a LH advantage for function words only.
   b. The N280 effect present for closed class words.
   c. Function words are acquired later then content words.
   d. There is no comprehension deficits regarding functional morphology.

(30) An earlier latency in the N280 will be elicited by what type of word stimulus?
   a. Function words
   b. content words
   c. adjectives
   d. adverbs

(31) Which of the following are true regarding function words?
   a. they obey the minimal word constraint
   b. acquired earlier than content words
   c. they are usually missing in patients who have suffered damage to Broca’s area
   d. all of the above

(32) Which of the following is NOT true about function morphemes:
   a. They are acquired later than content morphemes
   b. They tend to be preserved in the speech of Broca’s aphasics
   c. They are part of a closed class of elements
   d. There is a left hemisphere advantage for them

(33) Open-class words (nouns, verbs, adjectives) differ from closed-class words (articles, prepositions, conjunctions) in that:
   a. Open-class words are the main bearers of meaning in language, whereas closed-class words provide the structural components of language
   b. Open-class words are primarily syntactical, whereas closed-class words provide semantic information
   c. Both are true
   d. None of the above

(34) In a completion task, which manipulation of “The girl dances” will a Hebrew-speaking aphasic have the most trouble with?
a. The girls (blank).
b. Yesterday, the girl (blank).
c. The girl (blank) on a stage.
d. All of the above

(35) which of the following is not characteristic of a module?
  a. not assembled from more primitive processes
  b. fixed neural architecture
  c. not domain domain specific
  d. fast, autonomous, mandatory

(36) The results of Brown et. al.’s study suggest that:
  a. The topography of the early and late negativity are equivalent, thus showing that O-
     class and C-class words are mediated by the same underlying process.
  b. The topography of the late negativity is quite different for O-class vs. C-class words,
     suggesting that distinct processes are in effect in the later epoch.
  c. Word frequency is the main determiner for the latency of the early negativity
  d. The N280 is an established component for semantic processing in visual word com-
     prehension.

(37) The words Bennifer and Metrosexual are examples of:
  a. Open class words
  b. Content words
  c. Closed class words
  d. Content and open class words

(38) Neville, Mills and Lawson proposed an N280 ERP component for which of the following:
  a. open-class items (content words)
  b. closed-class items (function words)
  c. word frequency effects
  d. none of the above

(39) What evidence or theory would seem to support the theory that SLI (specific language
impairment) is in fact an auditory processing deficit?
  a. Children with SLI do not always properly assign tense to verbs.
  b. SLI children who speak languages with functionally salient morphology make less
     mistakes than SLI affected children who speak languages that don’t.
  c. Children with SLI are stuck in the “optional infinitives” stage, well after normal chil-
     dren have overcome it.
  d. Children with SLI are unable to use or process functional morphology.

(40) Which of the following is not a current theory that might explain Specific Language Im-
pairment (SLI)?
  a. An auditory processing difficulty that results in the inability to distinguish the past-tense
     morpheme “-ed”
b. The inability to create a complex representation of words and apply rules that form correct syntactic forms.

c. Damage of the part of the frontal lobe that controls the ability to use and comprehend functional morphemes.

d. The extended optional infinitive hypothesis, which claims that children do not leave the optional infinitive stage.

(41) What is false about Specific Language Impairment?
   a. Affects about 7 females.
   b. A delay or deficit in the use of function morphemes.
   c. Developmental language disorder in the presence of neurological, sensori-motor, non-verbal cognitive or social emotional deficits.
   d. Diagnosis based on behavioral evaluation but is likely to have a genetic basis.

(42) As discussed in class, In sentence completion studies, the more (blank) a target, the (blank) the m400.
   a. probable, larger
   b. impossible, smaller
   c. impossible, larger
   d. none of the above are correct

(43) which of the following is NOT true of SLI
   a. it runs in families
   b. SLI patients have auditory processing difficulty
   c. it is seen through an omission of function morphemes, or delay in their use
   d. it has been localized in the brain

(44) Which one of the following words does not fall under the category of Content Words?
   a. “completely”
   b. “John”
   c. “no”
   d. “large”

3 Open-ended Research Question

(45) If SLI is influenced by an deficit in auditory processing, could there be a confounding variable dealing with this auditory deficit causing problems the child’s learning abilities? Bonus: Set up an experiment to see if there is a significant difference in the time it takes to leave the optional infinitives stage between SLI children that are taught language through normal speech and those taught sign language.

(46) In the Gopnik review individuals with SLI or some sort of genetic linguistic disorder were believed to lack the ability to neither construct normal representations for complex words nor to construct rules that would help them operate on these representations. To see if this is the case impaired participants could be administered a test in which they have to break
down complex words into their meaningful parts. For example teacup into tea and cup. If they are then this may shed some light on whether they are able to recognize complex words as a composition of meaningful morphemes. Gopnik stated that if this were to be true then his hypothesis would be incorrect.

(47) How might a split brain patient process function and content words?

(48) If a normal subject was played speech that was normal in every way except that it was missing all function words (similar to Broca’s aphasia), would you see more left hemisphere activity, as this portion of the brain is lateralized for function words, and as a result it may be active in attempting to “fill in” the missing portions? Is this the same effect as when you directly ask people to “fill in the missing word of the narrative?” This would test lateralization and give the experimenter some clue as to how concepts are processed, is it word by word or will the subject perceive a fluent story?

BONUS: This experiment could be conducted as an fMRI experiment in which the individual is primed by listening to speech, such as “John... restaurant... pizza... hour... later... home... sleep.” We would then compare the location and amount of activation shown to a trial in which the subjects were directly asked to mentally “fill in the blank” regarding function words. For example, “John... restaurant... hour later... home... sleep. The results would determine whether or not we naturally use the left hemisphere to tie together the meaning of speech without function words.

(49) If in a repeating sentence task the person with SLI mixed up infinite and finite sentences does this show an impairment in how they heard the sentence or when they hear the sentence and want to repeat it, are infinite and finite being activated equally and therefore they have to choose between either. In the debate between the “Optional Infinitive Stage” vs. auditory impairment of SLI subjects could infinite and finite be in competition with each other and it is up to chance which word is chosen in a repetition task and therefore there hearing is intact? —My hypothesis

**Bonus: This task could study reaction times. One task would be to listen to the sentence: “The boy ran home”. If the person repeated “the boy run home”, to judge where the problem lies, reaction time should be measured. You would have to test sentences with alternating endings and words that are irregular. Words such as sing and sang should be tested because they are different but do not have different endings. I think this test would be interesting because their is also a component of imitation being studied. When we hear something and repeat it, is this because we can just generate it automatically or do we have to access currently stored representations?

(50) Are there other grammatical errors characteristics of children under the age of three that are roughly equivalent to the OIS in scope that people with SLI also do not “outgrow”?

(51) According to Gopnik, language-impaired subjects “cannot build complex representations for words or the rules that operate on them.” He proposed that the spontaneous use (correctly) of a word in its past tense form, is due to the subjects single representation of that word as the action in the past tense. (walked= to move in the past tense as opposed to walk= move + ed= past tense). Although if this is true, why wouldn’t they be able to compensate and process the past tense of all verbs in this way. It is clear that these subjects can not consciously and freely generate the past tense form of a verb, given appropriate context.
While these subjects might not be able to freely construct past tense forms, I do not believe that it implies that they have no internal representation of what past tense is, (granted it is probably different than the “tree-like” models we uphold for normals.) However, to further challenge Gopnik’s conclusion, I propose the following study to see if language-impaired subjects have a model for past tense, more similar to an Island of Reliability, whose impairment prohibits free recall of the appropriate word form; in which one should still remain proficient if asked to recognize the correct form.

Two groups, language-impaired and control, will be subjected to a sequence of sentences in which they must choose what they believe is the correct past tense form of a pseudo word. This sentence will be proceeded by a sentence containing the present tense form of a pseudo word. For example “Now, the children blig. Yesterday the children blig/bligged/blug/blagged.” Trials will include pseudo-words that resemble real words that end in -ed (walk/walked) and words with internal change (sing/sang, drive/drove, dig/dug). If the subjects of the language-impaired group showed no pattern across trials, or consistently chose the words ending in -ed (maybe schooling enforced -ed as a compensation method), this would support Gopnik’s conclusion. However, if the choices of the language-impaired subjects mirrored the Island of Reliability affect we expect to see in control subjects, they would be exhibiting more ability than Gopnik’s theory could support. And maybe they have a representation for past tense that is not as “ruled” and consciously accessible as the model we propose for normals. (This in turn would also cause us to rethink that model as well.)

Members of the family KE have a mutation in the gene FOXP2. KE family members also show some non-linguistic abnormalities (inability to copy facial expressions, decreases volume of the Caudate Nucleus, a motor control site not generally thought of as dealing with language comprehension). SLI is also thought of being genetically controlled as it is more prevalent in monozygotic twins than in dizygotics. The mutation of FOXP2 in the KE family is correlated with these non-linguistic abnormalities. If FOXP2 is really a language specific gene then a mutation in FOXP2 or a gene that follows from FOXP2 should be found in those affected by SLI outside of the KE family. If a correlation can be found then it can be said that FOXP2 is a ‘language gene’ but if not then another genetic cause must be found to cause the genetic predictability of SLI.

According to recent research, a mutation in the FOXP2 gene is likely cause of a developmental disorder commonly associated with the KE family. Given the pattern of inheritance within the family, however, it seems difficult to attribute the disorder to a single mutation. Is it possible that the disorder is linked with a mutation in more than a single gene? Alternatively, is it possible that FOXP2 is a transcription factor that affects the expression of various other genes? If so, what implications does this have and what does this elucidate about language and its relationship to brain structure and function?

The Gopnik study discusses that whereas “controls take longer to process grammatically complex words like ‘walked’ or ‘zashed’ than simple words like ‘walk’ or ‘zash” the [SLI] subject process both simple and complex words at the same rate. Complex words are commonly differentiated from simple words in that they are composed of multiple morphemes. That said, how do SLI patients perform on opaque vs. transparent inflectional past tenses? REASONING/BONUS: If, as Gopnik suggests, SLI patients do not see inflected words as being made up of subparts put together using grammatical rules, but rather analyze all
complex words as simple words, then there should be no significant difference in production of the past tense of opaque forms such as “sing-sang” then transparent forms like “walk-walked”. This could be investigated by asking SLI subjects to form the past tense of present tense forms for both transparent and opaque forms, and comparing their latency times with those of controls. Answering this question would shed more light on the past tense debate, and whether or not all past tense forms indeed require composition. It has been shown that SLI patients have trouble with transparent inflectional rules, and this should apply to irregulars as well if they are indeed compositional.

(55) A major issue in all studies involves the “nature-nurture” debate. Studies have pointed to genetic factors leading to language deficits, as shown in family studies. If a person with a genetic vulnerability to language deficits is placed in a different setting with intensive training, could this person overcome their “predisposed” vulnerability?

(56) According to Leonard’s hypothesis that languages with less salient functional morphemes would produce more problems, would there be indeed more problems with a dialect of English such as African American English, which loses most of its inflection in the normal case, but maintains inflection in the emphatic case (i.e. “She eat,” vs. SAE “She eats” and Emphatic “She DO eat”)? Would this mean that there are more or less speakers of African American English with the defective FOXP2 gene than speakers of Standard American English? Or would it simply be further evidence for Leonard’s theory? In essence, are there speakers of AAE with SLI, and if so what can that tell us about the disease and the cross-linguistic viability of Leonard’s theory?

(57) Given that children with SLI tend to only use infinitive forms, to what extent is their ability to produce irregular forms affected, and do they show comprehension deficits with irregular forms?

(58) How would the ERP profile of an SLI patient compare to an unaffected patient? Would the suggested indicative components of O-class vs. C-class words show less contrast [in a written word comprehension experiment, like Brown et. al.’s single word prose presentation]? Is it reasonable to assume that less contrast supports the King, Kutas ’95 hypothesis, or does this give reason for further support of the existence of a “rule-computation module”? If SLI is not sex linked why is there a predominance in males?

(59) Would there be a difference in the N280 component proposed by Neville, Mills, and Lawson between Broca’s aphasics and healthy subjects?

(60) Aphasic speech in languages in which you can not utter bare stems has been studied; does aphasia affect the use of case markers in scrambling languages?

(61) Individuals who stutter (at least in English) have a greater problem saying content words as opposed to function words. It has been hypothesized that individuals suffer from a stuttering disorder due to a multitude of factors, among which is not only a handicap in motor functioning but also neurological problems. An study could be conducted to determine why people who stutter have a greater difficulty in pronouncing content words- whether it is due to frequency, phonological structure, lexical category, or a neurological reason. The results could help support the theory that the difference between content and function words is at the neurological level.
According to Rice and Wexler, SLI children are stuck in the “Optional Infinitive Stage”. When a child with SLI is presented with the sentence, “the boy run to the store”, he/she perceives this as correct, because the word “run” is infinitive. However, if you were to replace the infinitive verb with the finite form of “runs” would the child still perceive this as correct, and what additional information does the finite form add to the sentence (how would he/she interpret the sentence now?) Also, in what situations does the SLI child use finites vs. infinites?

In class we discussed that function words are acquired later than content words. Why is this the case and does it have a connection to the fact that we are generally able to piece together telegraphic speech that leaves out the function words. Also, does this affect the fact that it is harder for us to add new words to the category of function words compared to content. I would also be interested to know if this is the same through different languages that are set up similar to English.

There has been a lot of research done on SLI patients, and many theories proposed. However, there seems to be a dearth of research on bilinguals with SLI. I think this research would be fascinating, to see if the SLI patients omitted the same thing in both languages, or had one language intact, or some variety along this spectrum. This could help show where in the brain the lexicon stores phonological and semantic forms, and whether or not there is just one big bin for these things in bilinguals, or whether they are stored separately.

To what extent do music and language have similar systems in the brain of a person with William’s Syndrome?