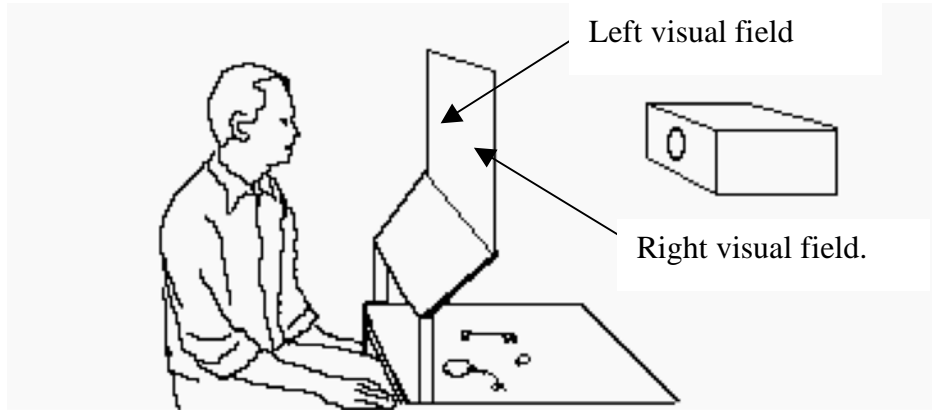


Discussion Questions for Language and the Brain

1. **Split brain experiment:** Here is a graphic from a cute demo of the behavior of a split-brain patient that you can actually run at

<https://pantherfile.uwm.edu/johnchay/www/sb.htm>



There are three objects on the table: a key, a ring, and a key chain. A word is flashed to the right or left visual field and the split brain subject is asked to pick up the item that that he saw named.

(1) RING is flashed to the right visual field: The subject feels around, picks up the ring, and says, "Here is the ring that you asked for."

(2) KEY is flashed to the left visual field: The subject feels around, picks up the key, and says, "I saw nothing. Why did I pick up this key?"

What explains this behavior?

(1) The right visual field is processed by the left hemisphere, the hemisphere where language data is stored and processed. The subject thus recognizes the word "ring", and can thus associate the word with the object (presumably the concept of ring is stored someplace in the brain and the word can associate with that concept).

(2) The left visual field is processed by the right hemisphere, which does not process language but which does process visual concepts. The right brain thus "recognizes" a picture of a key, and the subject can find the key based on that recognition, but the RIGHT brain does not associate the picture with the word "key" (a purely linguistic item). However, once the subject has picked up the ring, both halves of the brain have "access" to it and the left brain can name it.

2. **Dichotic listening and brain lateralization:** On the Linguistics 1 website, you can follow the "Discussion questions" link to try a dichotic listening experiment.

Try it!

3. **Lexical Decision Task (LDT) experiment:** You can do an online LDT experiment on the *neighborhood effect* at

<http://www.essex.ac.uk/psychology/experiments/lexical.html>

Neighborhood effect: This experiment predicts that reaction times will be quicker for words that have more “neighbors”—in this case, neighbors in terms of spelling similarity, e.g. the word *sell* has many neighbours such as *tell*, *well*, *bell*, *yell* and *sill* compared to *deny*, which only has the neighbours *defy* and *dent*.

Other predictors of faster reaction times in LDT experiments are

Frequency/commonness: Reaction times will be faster for frequent/common words.

Priming: Semantic priming (seeing/hearing *nurse* primes *doctor*) or orthographic priming (seeing *nurse* primes *purse*).

What might be the explanation(s) for such determinants of reactions times?

The assumed basis for PRIMING is “Automatic Spreading Activation”. There are all kinds of neural connections in the brain. That is, the brain is not just a static collection of words associated with a particular pronunciation, a particular meaning, or (in a literate culture) a particular spelling. The priming item will open those connections so that the brain is more ready to go off looking for “related” items rather than each priming item starting from scratch to make a search through the entire brain.

4. Here are three examples of aphasic patients attempting to describe “The Cookie Theft”. Examples (i) and (ii) come from a lecture on aphasia at <http://www.rachaelanne.co.uk/teaching/psych/>; example (iii) is from George A. Miller, *The Science of Words*, Scientific American Library Series.

- (i) *Well this is ... mother is away here working her work out o' here to get her better, but when she's looking, the two boys looking in the other part. One their small tile into here time here. She's working another time because she's getting to. So two boys work together and one is sneakin' around here, making his work an' his further funnas his time he had.*
- (ii) *Cookie jar ...fall over...chair...water...empty*
- (iii) *First of all this IS falling down, just about, and is gonna fall down and they're both getting something to eat . . . but the trouble is this is gonna let go and they're both gonna fall down . . . but already then . . . I can't see well enough but I believe that either she or wd have some food that's not good for you And she's to get some for her, too. . . and that you get it and you shouldn't get it there because they shouldn't go up there and get it unless you tell them that they could have it. And so this is falling down and for sure there's one they're going to have for food and, and didn't come out right, the uh, the stuff that's uh, good for, it's not good for you but it, but you love it, um mum mum (smack lips) . . . and that so they've . . . see that, I can't see whether it's in there or not.*

(a) What type of aphasia is represented in each example?

- (i) **Wernicke's aphasia**
- (ii) **Broca's aphasia**
- (iii) **Anomia**

(b) What are the characteristics of each type of aphasia that would distinguish it from a “normal” description of this picture?

(i) Wernicke's: Fluent speech with essentially intact grammatical structure, but only vaguely related to the events in the picture. The grammar generator seems to be working fine, but connecting it to the facts with words is a problem.

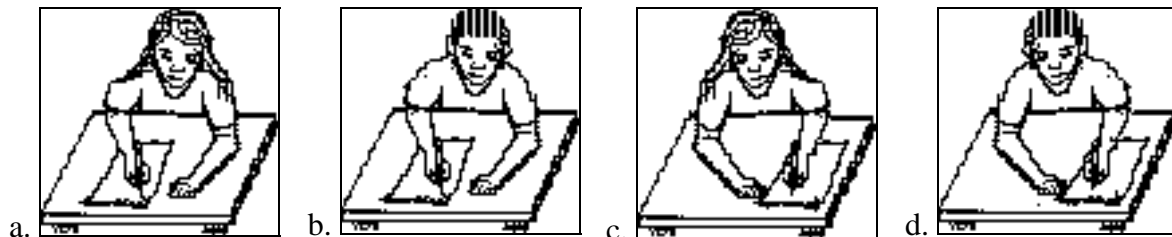
(ii) Broca's: Essentially no grammatical structure, just a list of words with no morphology or function words connecting them. However, compared to both (i) and (iii), it is quite content-ful and descriptive. All the words are “substantives”, i.e. specific nouns, verbs or adjectives.

(iii) Anomia: Fluent speech with essentially intact grammatical structure, and clearly relating to the events, but it seems “empty”. Compared to (ii), for example, the only content-ful word that the two utterances share is *fall over*.

(c) Examples (i) and (iii) are similar in certain respects. What distinguishes them, and, in particular, what seems to be missing in (iii)?

Both are fluent and grammatical, but (iii) seems much better keyed to attempting to describe the events in the picture. What is missing in (iii) is any “substantive” words, esp. nouns. In fact, the only noun in the passage is *food*, which itself is such a general word that it is uninformative. Example (ii) has a different type of problem with nouns, typical of Wernicke's aphasia, namely, inserting non-existent words in noun positions (*funnas*) or inserting irrelevant nouns (*tile*).

5. Which of the following people would be *least likely* to become aphasic due to trauma to the left side of the head?



Answer: "c", the left-handed female. Left-handers (more than right-handers) and females (more than males) seem to use the right brain for at least some analytic functions generally associated with left brain.

6. Below are some complex signs in American Sign Language with their translations in English. For each ASL sign and its English translation state whether the expression is

- root
- inflected word = (root + inflectional affix)
- derived word = (root + derivational affix)
- phrase (a combination of words formed by a rule like VP → V NP)

You can see videos of each of the signs on the Linguistics 1 site by following the “Discussion questions” link.

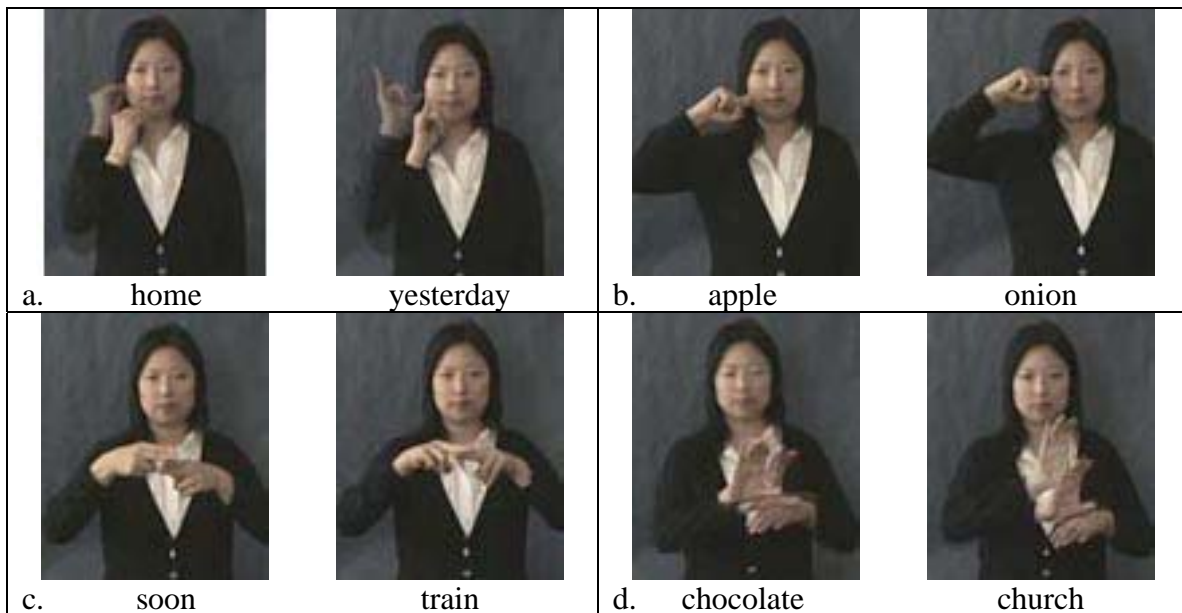
			<u>ASL</u> a. root b. root c. root	<u>English</u> a. root b. root c. root
a. eat	b. chocolate	c. morning		
			<u>ASL</u> d. phrase e. compound	<u>English</u> d. phrase e. compound (or root?)
d. eat chocolate	e. breakfast			
			<u>ASL</u> f. root g. derived word	<u>English</u> f. ('call') root ('give a name') phrase g. root
f. call, give a name to	g. name (of someone)			
			<u>ASL</u> h. root i. inflected word	<u>English</u> h. root i. phrase
h. look	i. look continuously			

COMMENTS:

- a-c. These are all clearly ROOTS in both languages, that is, they could not be broken down into smaller meaningful parts. The *-ing* of English 'morning' probably was originally a suffix, but no one would think of it that way now. The video of the ASL sign for 'morning' suggests that it might also mean 'sunrise', in which case it would be a COMPOUND, but there is actually another sign for 'sunrise, dawn'.
- d. Both the ASL and English simply combine the word for 'eat' followed by the word for 'chocolate', that is this is a PHRASE derivable from the VP → V NP rule.
- e. Both ASL and English seem to be COMPOUNDS. The ASL sign clearly does not mean 'eat the morning'. The ASL sign might be interpreted as 'eating in the morning', that is, V + PP or Adv, but since here it is used as a noun, the interpretation as a compound seems preferable. The English word is originally a

- compound, but some speakers of English might, today, not recognize the breakdown into two roots.
- f. The ASL sign means ‘call’ in the sense of ‘we *call* her “Tabitha”’ (there is a different sign for ‘call’ as in ‘I *called* my friend’). English CALL is a root, though if the ASL sign were translated ‘give a name’, this English expression would be a PHRASE (VP → V NP). The ASL sign is probably best characterized as a ROOT (though see comments on (g) just below). The forward hand motion gives the sense of “present, give”, but the sign for this meaning does not resemble the ASL sign for ‘call, give a name’
 - g. The English noun ‘name’ is a ROOT, unrelated to ‘call’ in the sense of (f). The ASL sign, on the other hand, is related to the sign ‘call’ by hand shape, palm orientation, and, for the most part, hand position. The relation is one of DERIVATION since ‘call’ is a verb and ‘name’ is a noun, that is, there is a category change, which is one characteristic of derivation. It is a little difficult to know which is derived from the other! Both share hand shape and palm orientation but differ by movement. However, a common derivational pattern for forming nouns from verbs in ASL is to double the sign of the verb. Hence, the noun ‘name’ is assumed to be derived from the verb.
 - h. ‘Look’ is an undecomposable ROOT in both languages.
 - i. In English, ‘look continuously’ is a phrase derived from the rule VP → V AdvP. In ASL, however, ‘look continuously’ is based on ‘look’, with a repeated circular hand motion and a different facial expression. No additional signs are added. This is called an “aspectual” distinction (it presents a particular “aspect” to the looking). This type of modification is generally categorized as INFLECTIONAL in ASL studies. It does not change category (both (h) and (i) are verbs), and it is a modification that can be added to any verb, much like past or present tense endings can be added to any verb in English. Moreover, many spoken languages have verbal inflectional affixes showing aspectual distinctions such as this.

7. Here are some pairs of signs that illustrate *Duality of Patterning* in American Sign Language. You can see videos of the sign pairs under the “Discussion questions” link of the Linguistics 1 web site.



For each of the pairs of sign in a-e, what is the feature that distinguishes them?

- a. hand shape: 'home' is formed with a cupped hand and 'yesterday' in a circular shape with the little finger extended
- b. hand position: 'apple' is formed with the hand near the cheek and 'onion' near the temple
- c. palm orientation: 'soon' is formed with the palms toward the body, 'train' with the palms facing downward
- d. movement: 'chocolate' is formed with the top hand moving back and forth on the lower hand, 'church' with an up and down movement of the top hand

Why do pairs of signs like these demonstrate that ASL has *duality of patterning*?

Recall that *duality of patterning* refers to a property of a communication system whereby the system has a set of units that, in themselves have no meaning, but when combined in various combinations, they create the meaningful units of the language (words, sentences). In spoken language, the set of inherently meaningless units is the set of sounds that the language uses ([t], [s], [i], [w], etc.). In ASL, the set of inherently meaningless units are those that are contrasted in a-d. For example, the cupped hand of 'home' could be used with, say, a downward palm orientation, positioning near the chest, a forward and back movement, and the like to give signs with different meanings (or no meanings at all!, just as English could combine [p], [o], [f] to create "pofe", which could be a word, but doesn't happen to be).