Homework 12

Week 13

1. In the article Sign Language in the Brain, the authors state: "contrary to all expectations, the sign-language abilities of lifelong deaf signers appear to be independent of their nonlinguistic spatial skills." Please provide evidence for this statement.

2. In ERP studies, which violation responses show practically no differences between language and music?
   a. P600, ERAN
   b. ERAN, N400
   c. P600, N400
   d. N400, ELAN

3. Do violations in sign language elicit a N400 effect that is the same as the responses found for language and/or music violations?
   *Bonus: I would show signers the same type of sentences that are shown to subjects who speak the language. Such as "I spread the warm bread with socks." I realize that signing has a different sentence structure. However, I think that after a sentence like this is comprehended, the subjects would elicit an N400 response that looked exactly like those elicited by subjects with spoken language. Sign language violations would therefore also be comparable to music violations.

How does music resemble language?
A. All cultures have music
B. It is innate
C. It is hierarchically organized
D. It contains elements similar to grammar, productivity, and universals
E. All of the above

Explain one of the three reasons Patel gives for how music is different from language.

Do primates that are closely related to humans have music?
Test to see if chimpanzees prefer consonant tones to dashing tones. If they prefer the consonant tones than they have music like humans. If they do, this would have a tremendous impact on the fact that music is not unique for humans.
Short Answer:

Briefly describe Gibson's Dependence Locality Theory (DLT) (Language) and Lerdahl's Tonal Pitch Space Theory (TPS) (Music) and explain at least one reason why they are similar.

Multiple Choice:

According to a 1996 study on a group of 23 deaf signers that was reported in "Sign Language in the Brain" by Hickok et al, which of the following statements is false?

a) Patients with left hemisphere damage made paraphasic errors or "slips of the hand"

b) Signing problems were caused by a more general problem in controlling voluntary hand and arm movements

c) Patients with left hemisphere damage had trouble comprehending isolated signs and signed sentences

d) All of the above

Research Question:

From the Koelsch et al article "Music, Language and Meaning: Brain Signatures of Semantic Processing," we learned that music can semantically prime a target word and that the sources of activity for both linguistic and musical semantic priming didn't statistically differ. From the Hickok et al article "Sign Language in teh Brain," we learned that language localizes mainly in the left hemisphere, and that the right hemisphere is involved in integration on a more global (i.e. discourse) level. That said, Does a musical discourse (i.e. a movement or an entire piece) elicit right hemisphere activity that is consistent with language on that level?

Hypothesis: if this is true, then an even stronger parallel can be drawn between language and music.

Setup: would require a test population of non-musicians and a pretest population of musicians, classically trained

The purpose of the pretest would be to identify and collect the general concept of each piece as given by the professionals. The test would present non-musicians with those same pieces, but after the piece they would be given a multiple-choice, in which they would have to select the choice that best fits the overall concept of the piece they heard previously.

Another way to go about it would be to play parts of a movement, and stop after each part, indicating for the non-musicians to write a story, one sentence at a time, integrating each new snipit of music.
1. Which of the following statements contributes to how music resembles language?
a) music is argued to be innate.
b) music is hierarchically organized
c) music has an analogue of grammatical categories and functions
d) music is universal

2. What is the difference between ELAN and ERAN?

3. Considering how processing for rhythm seems to be bilateral, how would a split brain patient process music, rhythm specifically?

**Multiple Choice:**
Which statement is false with respect to the ways in which music resembles language?

a) All cultures have music  
b) Music is not unique to humans  
c) Babies respond to music in the womb  
d) Most of musical intuition is not learned

**Short Answer Question:**
Name two ways in which music differs from language.

**Open Ended/Research Question:**
Because American Sign Language has no fixed word order and spoken English has strict rules about word order and which words may be used, can we locate the areas necessary in syntactical processing by translating meaningful word strings in ASL to English sentences in hearing individuals?

**BONUS:** This experiment would have to be accomplished with the use of fMRI. The test group for this experiment would be hearing of deaf individuals who spoke both ASL and English orally. Their brains would be scanned as they performed ASL tasks by interpreting a video-recorded conversation between two deaf individuals. Once the conversation ended, they would then have to translate the contents of the conversation in spoken English for an audience that does not read ASL. The areas of the brain activated for both tasks would likely prove to be necessary for syntactical processing

**Short Answer:**
Explain the cognitive similarities of music and language.

**Multiple Choice:**
The ERAN is elicited by:

a) word category violations  
b) musical violations
c) none of the above
d) both A and B

How do various brain lesions effect the ability to Sign?…testing more areas than we studied in class.

Homework 12

Multiple Choice:

Q Signs are made of all of the following EXCEPT:

1) Orientation of hands
2) Facial expression of signer
3) Hand shapes
4) Movement of hands and arms

Short Answer:

Q: Arguments have been made that, like language, human perception of music is innate. What are some arguments to support this?

Research Question:

Is there a fundamental difference in language lateralization between signers who were born congenitally deaf, and those who began using sign language after an acquired hearing impairment later in life?

Multiple Choice:
Wernicke’s area is activated/involved in:
A) hearing individuals when they are speaking
B) deaf individuals when they are signing
C) comprehension of speech
D) comprehension of signs
E) A & B
F) C & D

Short Answer:

What is the semantic priming effect? Provide a sentence example that shows this effect.
Open-Ended Research:
Are there any similarities between the way sign language is processed in the brains of deaf individuals and the way music is processed in the brains of individuals with Williams syndrome? That is to say, are activation levels similar?

1) WL was a deaf, 76 year-old, right-handed stroke victim. His stroke caused a frontotemporoparietal lesion in the left hemisphere of his brain. Due to this damage, he suffered from a number of cognitive impairments. Summarize the cognitive deficits and explain how these deficits clarify the relationship between sign language and spoken language.

2) Which of the following is correct regarding the similarities and dissimilarities between language and music?
   a) They are similar in being hierarchically organized yet dissimilar because only language has grammatical categories such as nouns and verbs.
   b) They are similar because the complexity of both music and language are innate yet dissimilar because language is only found in humans while some form of musical ability can be found in various other species.
   c) They are similar in how both are universal across various cultures yet dissimilar because the syntactic predictions that are made in music are far stricter than those made in language.
   d) They are similar because both elicit an ERAN response yet dissimilar because you are able to judge the well-formedness of a unit of language but not a unit of music.

Research Question: How does the acoustic apparatus perceive language/speech sounds and musical sounds differently? In the realm of categorical perception of speech sounds, it was found that different variants of the same phoneme are perceived as being similar, while different phonemes sound very different. Although speech acoustic signals are perceived and processed differently than music, will similar results be found for musical signals? Are they also categorically perceived, and what is the breakdown of the categories along the continuum?

Multiple Choice:

Which of the following concerning sign language is correct?
   a. there is one universal sign language; signers from all over the world can understand each other.
   b. the neural organization of sign language has more in common
with that of spoken language than it does with the brain organization for visual-spatial processing.
c. spoken language has more iconicity than sign language.
d. none of the above.

Short Answer:

Identify two ways in which music resembles language and two ways in which music differs from language?

Open-ended Research Question:

Recent research suggests a specific point of convergence between syntactic processing in language and music. If this is true, does instruction and experience in music influence language abilities and vice versa? More specifically, by extension, does music training in childhood enhance the development of other cognitive abilities?

discuss one experiment involving music and language from either reading or lecture. Be sure to include what the experiment was, what the results were, and what conclusions were drawn

Which of the following is NOT a way that music resembles language
a) it has a grammar
b) it has universals
c) it has productivity
d) it has grammatical functions

OEQ: to compare normals and signers, it would be interesting to see what sort of brain responses are elicited for gestures in normals, such as waving, hailing a taxi, the peace sign, etc. It would be further interesting to compare such iconic gestures to abstract signs and see what the difference in activation were for sign language speakers viewing gestures, vs. their viewing sign language. this could be done through FMRI or MEG.
Which of the following is evidence that sign language more closely resembles normal language functioning than spatial cognition?

a) Left hemisphere damage causes similar problems for both spoken and sign languages
b) Brain imaging shows sign language to be bilateralized
c) WL, a deaf signer with severely impaired signing abilities, performed well on apacial cognition tasks.
d) both a and c

What does the P600 tell us about the relation between language and music?

Open Ended Research Question:
If music and language both activate a shared syntactic processing system, then presenting a complex linguistic syntactic task should take more time if simultaneously accompanied by a syntactically complex musical sequence.
BONUS: Have the subject wearing earphones that will play a syntactically complex musical sequence whenever the language task is given. The subject will be given a syntactically complex sentence such as “The man who the police officer pushed was wearing a black hat.” Then they will be asked to answer a question (while the music is still playing) such as “Who was wearing the black hat?” The control group will be given the same linguistic tasks, but will not be simultaneously listening to music. We will be measuring if it took the subjects who were listening to the music any longer to respond to the tasks than the control group.

Multiple choice:
Sign languages and spoken languages are believed to be processed similarly, and as such spoken language “mistakes” are thought to have sign language correlates. What then is the sign equivalent to a phonemic paraphasia i.e. “mouse” for “louse”? 

a) A handshape error
b) A location error
c) A reversed movement
d) All of the above

Short answer:
The sound-meaning connection for spoken languages has been found to be largely arbitrary.
While sign languages have inherently more iconicity than their spoken counterparts, it appears that the form-meaning interface is similarly arbitrary. Discuss evidence supporting this fact.

Open-ended research question:
We saw evidence to suggest that there is a special “speech mode” for processing language, as is evidenced by sine wave speech. Since is has been suggested that this mode allows humans to differentiate between environmental noise, and categorical speech sounds it would follow that if sign languages are indeed analogous to spoken languages, there is a special analogous “sign mode” also. Indeed, this would seem essential since a signer would need to differentiate between true signs and other body movement. Does this in fact exist? In order to test this, one would need to conduct a similar experiment to the one that was conducted using sine-wave speech. Obviously the major difficulty would be in designing a course-grained version of sign-language, a task which I am not qualified to perform. If this were verified it would draw closer our understanding of the parallels between sign and spoken speech, and further support a separate language (rather than spoken speech) processing modality.

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How do the processing requirements of tonal languages pattern in relation to our current knowledge about the overlapping areas that work in the processing of music and language? For example, would a tonal violation elicit an ERAN? Perhaps only if the violation was not just another word, but a non-word?

Give three similarities between language and music that would cause us to think that they may share some processing modules in the brain.

Which of these statements about ASL is true?
- a. In order to elicit phonological priming for ASL, the hand location of the prime and the target must be the same.
- b. ASL does not have derivational morphology.
- c. If you are good at pantomiming, you should be a good signer.
- d. Though seeing someone's mouth move has a definite impact in our understanding of spoken language, facial expression is not relevant to ASL

1) In which three ways does music differ from language?

2) Which statement about Sign Language morphology is not true on how the signs are made up of?
- a) Hand shapes
- b) The location around the body where the signs are made
- c) The movement of the legs and hips
- d) The orientation of the hands.
3) Would a signer with mild Broca’s aphasia have the same difficulties, for example, in terms of recognizing a clause in a sentence with object-cleft as a patient who only has a mild case of Broca’s aphasia? What would that tell us about the role of Broca's area in Sign Language?

) The grammatical function (subject, object) of ASL syntax is encoded by what (2 things?)

2) Which of the following is correct about sign language?
a) different sign languages such as ASL and BSL are mutually comprehensible
b) sign language has less iconicity than spoken language
c) sign language is not a loose collection of pantomime
d) being able to pantomime is the equivalent of signing

3) Can the influence of training/expertise in music, affect one's ability on language?

How do different world musical idioms affect human babies in the course of their development? Is there an increase in the ability to perceive "grammatical permutations" in a specific idiom vs. the habituated one (examples of grammatical permutations in western classical tradition are the fugue’s object or subject, the theme and variations, the rondo, etc., in eastern music are various combinations of taals [rhythms] and ragas [tones/harmonies] and the permutations thereof). BONUS: Play scales/melodies that are indicative of the instrumentation and harmony for babies of different ages [at different stages of development]. For similar subject variation, play simple, distinctive examples corresponding to specific world idioms [e.g. 2 part fugue or theme/variation {Western}, or a tintaal cycle {east Indian}, or gahu {west African}].

What are some examples of an analog to phonological contrast in sign language?

The following is true:
1) The comprehension/production of sign language is more localized to the right hemisphere, because it is primarily a visual-spatial ability.
2) A subject with a right hemisphere deficit will likely have problems with extended discourse
3) A subject with a sign language deficit would be unlikely to notice objects at his/her left periphery
4) A subject with left hemisphere damage would likely not have trouble with picture-naming tasks
Is spatial cognition intact in signers with right hemisphere damage?

Which one of these is NOT a way in which music resembles language?
a) Music is hierarchically organized
b) Music has analogues for grammatical categories
c) All cultures have music
d) No other species has music (as far as we know)

How are grammatical functions like subject and object encoded in ASL syntax?

1) Perhaps a study can be done where musicians read music where there are “grammatical errors” at the end of phrases or garden path phrases and see whether there is any P600 elicitation when they have to reanalyze the phrase. Eye tracking may also be useful. By looking at these two measures we may be able to gain insight into whether music and its alleged syntactic structure is processed in a similar way as language is.

2) How does sign language data support the modularity of language theory?

3) In the Koelsch et al paper the N400:
a) was elicited for semantically unrelated sentences but not for semantically unrelated musical excerpts
b) was elicited for semantically unrelated musical excerpts but not for semantically unrelated sentences
c) was not elicited for semantically unrelated sentences or semantically unrelated musical excerpts.
d) was elicited for semantically unrelated sentences and for semantically unrelated musical excerpts

@Signers with damage to their LH had the most difficulty in comprehending which sign strings?
@A. single signs
@B. Simple sentences
@C. Complex sentences
@D. Performance was equal in all cases

@Which areas are both activated by native ASL speakers and native English speakers when processing signs?

@Research. The lexicon in spoken language is thought to reside in a specific location in the temporal lobe. In normal language use these lexical entries are entered using phonological information but signers do not have this ability. Could there be two different stores of representation due to the modality in which it is stored. By studying
people who had hearing and encoded certain words into their auditory lexicon and then lost their hearing and encoded fresh words into their 'lexicon' with no auditory representation. By using a combination of MEG and very precise fMRI we can see where in a specific subject their phonological representations are activated and then see if there is a separate 'sign storage' representation of the information.

Imaging studies show that sign language processing is more bilateral than spoken languages, however, there has been shown to be a dissociation between deficits in discourse-length abilities and abilities such having to do morphology or phonology. With this in mind, would one see lateralized coarse coding effects for more distant meanings in the lexical access of deaf-signers as has been shown for speakers of spoken language?

In deaf life long signers, lesions in the right hemisphere of the brain would cause which of the following sort of deficits?

Both performance on spatial tasks and signing in individuals with such lesions would be severely impaired.

Performance on spatial tasks would be impaired, but signing ability would be spared.

Signing ability would be impaired, but performance on spatial tasks would be spared.

Performance on only certain spatial tasks would be impaired, and some signs would be replaced by pantomimed gestures.

1) How does the ERAN differ or compare to the ERAN?

2) How does music differ from language?
   a) There is no analogue of grammatical categories in music (Nouns, Verbs, etc).
   b) There are no analogues of grammatical function in music (Subj.,Obj.,etc.)
   c) Much of the complexity of musical intuition isn't learned.
   d) a and b

3) Is the component which is responsible for making Tamarin monkeys
prefer feeding chirps to Tamarin distress calls the same as the component in humans that is responsible for making humans prefer consonant sounds to dissonant ones? And if so, are they elicited at the same times?

@ Which of the following is NOT true of music?
  a) it is universal  
  b) babies do not respond to it while in the womb  
  c) babies squirm and turn when they hear dissonant tones  
  d) there is a hierarchy of tension and relaxation

@ How is music similar to language according to the Patel article?

@ What types of properties of sounds do tamarin babies respond to in the womb, such as heartbeat, pitch etc?

Which of the following make up a sign?
  a) hand shape  
  b) the movement of the hands and the arms  
  c) the orientation of the hands  
  d) all of the above

Despite the differences between sign and spoken language what is the same?

research q: are the cortical substrates for music processing significantly different (non-identical with) those for language processing? if so, what pathways are responsible for processing information conveying sounds that are not language, such as heartbeats, noise-sound identification (such as identifying components of a background noise, like car horns) etc... another question i have is to what extent are the emotional pathways that are pertinent to language overlap with the emotional pathways pertinent to music

Name two important visual aspects of producing sign language?

Multiple Choice:

Which would have the LEAST effect on Sign Language Signers

A. Damage to Broca's area
B. Damage to Wernicke's Area

C. Lesion in the arcuate fasciculus

D. Damage to the visual-spatial area of brain

Open Ended

Can a bilingual signer, pick up a third languages sign language system as well as bilingual people pick up a third language?