Quiz #2
Name: ___________________________

Title: "Hyperscans" Show How Brains Sync as People Interact
Lead: Social neuroscientists ask what happens at the level of neurons when you tell someone a story or a group watches movies
Opening paragraphs: The vast majority of neuroscientific studies contain three elements: a person, a cognitive task and a high-tech machine capable of seeing inside the brain. That simple recipe can produce powerful science. Such studies now routinely yield images that a neuroscientist used to only dream about. They allow researchers to delineate the complex neural machinery that makes sense of sights and sounds, processes language and derives meaning from experience.

But something has been largely missing from these studies: other people. We humans are innately social, yet even social neuroscience, a field explicitly created to explore the neurobiology of human interaction, has not been as social as you would think. Just one example: no one has yet captured the rich complexity of two people's brain activity as they talk together. "We spend our lives having conversation with each other and forging these bonds," neuroscientist Thalia Wheatley of Dartmouth College says. "[Yet] we have very little understanding of how it is people actually connect. We know almost nothing about how minds couple." (From: https://www.scientificamerican.com/article/hyperscans-show-how-brains-sync-as-people-interact/)

1. Describe at least one principle of Science Communication that this headline, lead sentence, and opening paragraph(s) get right and one principle that they get wrong. [2 pt; SciComm]

+ It discuses a kind of "paradigm shift" – it sets up, here's what they did in the past, but here's how they're changing in the future
+ Does a pretty good job of actually summarizing a broad literature in relatable terms
- Is "hyperscans" necessary as part of the title? Is the article only about hyperscans? These opening paragraphs don't suggest so; suggests broader swath of literature
- Generally has some jargon, like neurons, hyperscans
- Although the paradigm shift is nice, it's assuming people care enough about the first image about boring cognitive tasks in the scanner. One question is: could we have started this by just mentioning that other people were missing from the scanner? Or is that loss of contrasting imagery crucial?
- It also gets some things wrong. The opening paragraph talks about an fMRI scanner, clearly, but then the lead sentence refers to neurons. MRI activity does not reflect neuronal activity.

+/- accepted various answers as long as they were justified by any of the SciComm principles we have discussed

2. "Perceiving machines" are used by the U.S. Postal service to "read" the addresses on letters and sort them quickly to their correct destinations. Sometimes, these machines cannot read an address, because the writing on the envelope is not sufficiently clear for the machine to match the writing to an example it has stored in memory. Human postal workers are much more successful at reading unclear addresses, most likely because of [1 pt; Perception/Attention]

A. Bottom-up processing
B. Top-down processing
    a. Basic idea in this question is that the machines can't read the addresses because the sensory input is too blurred. So, what's different about humans? If it's unclear for the machine, it's likely unclear (sensory-wise) for a human, BUT humans have many expectations about what addresses should look like and what streets are in their neighbors, etc. So your top-down expectations of what the unclear

handwriting could be allows you to perform better than the machine here.

C. Their in-depth understanding of principles of perception
D. Repeated practice at the task

3. Imagine that U.S. lawmakers are considering changing the driving laws and that you have been consulted as an attention expert. Given the principles of divided attention, in which of the following conditions would a person have the most difficulty with driving and therefore pose the biggest safety risk on the road? [1 pt; Attention]

A. When the driver has to drive work early in the morning
B. When the driver is stuck in stop-and-go traffic
C. When the driver has to park in a crowded parking garage
D. When the driver is driving an unfamiliar vehicle that is more difficult to operate
    a. The idea here is that whatever is the most difficult will result in the worst divided attention while driving. Here, driving an unfamiliar vehicle that's more difficult to operate adds undue burden on you while you're driving, which makes driving as a behavior less automatic and causes a greater division of your attentional resources.

4. With practice, people can become better at a task, which, over time, means performing the task is automatic. Previous research by Schneider and Shiffrin established that "automatic processing" happens without intention and only uses some of a person's cognitive resources. How the switch to "automatic" happens is still being researched, but this is why driving is often considered a (relatively) automatic behavior.

Now let's apply that concept to the papers on attention that you've read. [3 pts; Attention]

A) If you're driving and music is playing, what does the Middlebrooks et al. paper suggest would happen to your driving performance? Now, one limitation of the Middlebrooks paper was that folks were told to ignore the different types of music. What would happen to your cognitive or driving performance if you *couldn't* ignore the music—say, it was an audiobook you've wanted to listen to, and it captures your attention; what then?

-If you're driving and music is playing, Middlebrooks: nothing would be wrong. In this study, they found no differences for people listening to unfamiliar or familiar music. As noted here, people in that study, however, were told to ignore the different types of music.

-What happens when you can't ignore the music? Basically, this is about all the deficits on multitasking that we discussed. From the Wechsler paper: you'd veer more, your speed would vary a lot, you wouldn't be driving that efficiently. Cognitively, you'd be impaired too, remembering various locations that you pass less, etc.

B) If you're driving and no one is around, and the next curve in the road isn't for some time, what does the Seli et al. paper (clock) suggest you may do until you reach the next curve? How would you test this?

-The basic finding in the Seli paper was that people strategically mind wander until then. The comment on driving being automatic is so that folks assume that it is an "easy task." So, you're doing an easy task, no need to pay attention until the next curve in the road, so you'll mind wander until then. Seli measures this with mind-wandering probes (self-report). I accepted answers about EEG/eye-tracking as measures of mind-wandering too, although we did not really discuss these as much in depth and what that would involve.

C) Are any of your hypotheses qualified by the population tested? For instance, would any of your hypotheses depend on certain demographic or psychological characteristics of who was driving?

This was a call back to the Wechsler paper: there, the older population performed much worse than the younger population when they were asked to multitask. Other possible answers could have also included things like working memory capacity, high media multitaskers – these weren't discussed as in depth as the Wechsler paper, though, but still these are individual differences that are known to impact multitasking.

D) "Life, Interrupted" discussed the idea of "deep work." Let's say that researchers are interested in understanding the different attentional states that might underlie "deep" vs. superficial work. What is one of the two paradigms that you learned about that researchers could use to investigate how people shift their attention between tasks? What behavior might you expect a participant to show?

Everyone got this question incorrect to some degree, so I scrapped the question. We did two demos on task-switching & dual-tasking (https://nbrosowsky.github.io/online-psychology-demos/task-switching/index.html, https://psych.hanover.edu/JavaTest/CLE/Cognition_js/exp/dualTask.html), and on the podcast, the host does a dual-tasking experiment when he visits the lab where they're doing neurostimulation work to see whether they can improve multi-tasking. In task-switching, you're slower and less accurate when a task switches from the previous trial than when it remains the same; in dual-tasking, the difficulty of the primary task will influence your performance on the secondary task. Any mention of the Wechsler paper – how participants were doing a reasoning task, memory task, or typing task – while driving, and then what behavior resulted (e.g., worse driving while multitasking) would have also been an acceptable answer.

5. Identify a problem with defining emotion by just one of the four criteria that comprise its main components. Draw on your readings, podcast, and class discussion to give an example of why that criterion cannot define emotion alone. [1 pt; Emotion]

Emotions can be defined by subjective experience, functional significance, physiological patterns, or facial expressions.

Examples of why any one of these could not give you the full picture:
-physiology: someone's heart could be pounding, but that tells you nothing about the emotion experienced (e.g., is it fear? Some kind of anticipation? General exertion?)
-Facial expressions: on the "Creation of Emotions" podcast, Lisa Feldman Barrett explicitly discusses how people can have different facial expressions to mean different emotions, like crying could be considered 'happy' or 'sad'
-Functional significance: would we ever be able to know whether disgust, fear, etc. have a purposeful role for us? Sometimes we experience emotions and if the only purpose was their functional significance, why would we have mood disorders?
-Subjective experience can't be enough. People aren't always accurate at reporting their emotions and may experience bias (see Kragel paper, figure from 2nd experiment showing almost all positive emotions). Also why Kragel wanted to see if you could use physiology to characterize states in the brain.

6. First describe what two different theories of emotion predict in terms of how an emotion is generated. Then describe how you might differentiate between these two theories, i.e., what might one theory predict that the other wouldn't? You can draw on your readings, the podcast, or class discussions for this question. [2 pts; Emotion]

Multiple different comparisons could be made here.
-Discrete emotion hypothesis
-Dimensional perspective on emotion
-James-Lange theory of emotion
-Cannon-Bard
-Schacter & Singer
-Psychological Constructionist view

James-Lange: we are fearful as a consequence of the bodily changes associated with an emotion, not the other way around. The emotion is a result of the brain interpreting the *feedback* from changes in bodily states.

Cannon-Bard: Physiological changes and subjective feeling are separate and independent; An emotional stimulus is first processed by the diencephalon (thalamus/hypothalamus/etc.), which then signals to the peripheral autonomic nervous system (eliciting behavior) and to the neocortex (eliciting feelings)

Discrete emotion vs. psychological constructionist is basically one slide:

If emotions are natural kinds

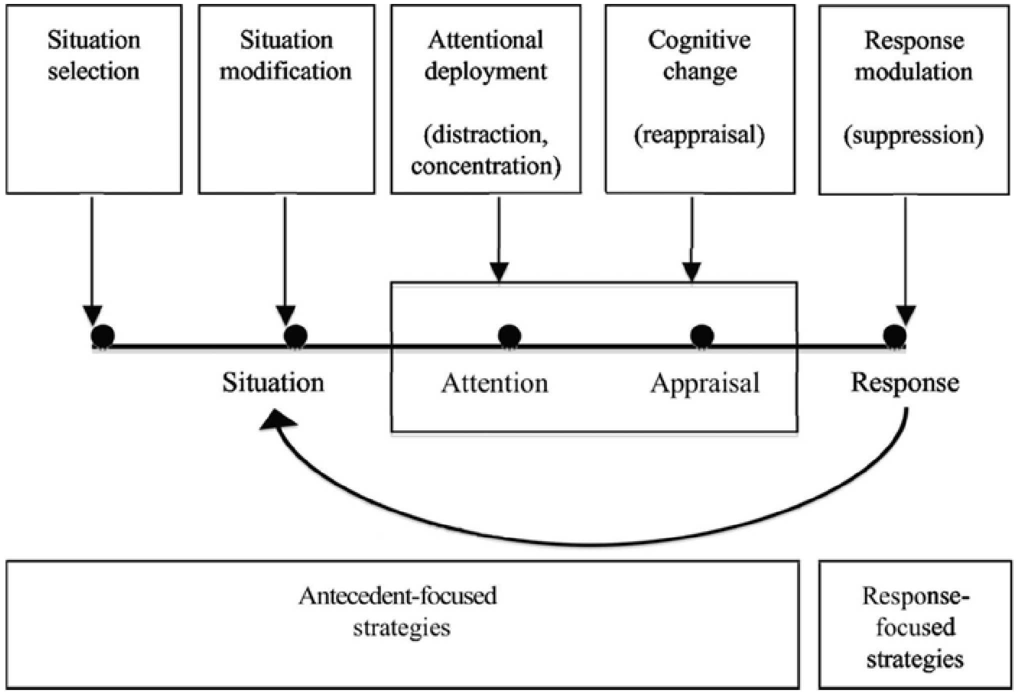
- All the features of an emotion will correlate highly in time and intensity
- A pattern for one emotion won't show up for another emotion
- These patterns will be similar across people

If emotions are constructed

- The kinds of features involved in emotion don't have to correlate
- A pattern for one emotion might be similar to another
- These patterns will be somewhat unique across people

Categorical theories regard each emotion as a separate entity and typically distinguish between a few 'basic emotions' (that are innate, pan-cultural, and evolutionarily old) and additional 'complex emotions' (that are learned, culturally shaped, evolutionarily new, e.g. 'pride'). Different categorical theories propose different numbers (and members) for the basic emotions, but most of them include anger, disgust, fear, happiness, sadness, and surprise. The universal nature of these emotions can be tested by whether people from different cultures recognize the facial expressions associated with these emotions. If a scientist approached research with a dimensional vs. categorical view of emotion, how do you think their research goals would change? Dimensional theorists are interested in uncovering neural correlates of valence and arousal, whereas categorical theorists might look for discrete neural correlates associated with each basic emotion.

7. Describe at least two possible strategies (with concrete examples and definitions) that the Gross model of emotion regulation suggests that someone could take in managing their emotions. [1 pt; Emotion]



8. Which of the below theories is best captured by the following statement: "The bodily response to an emotional stimulus precedes and informs our feelings about the stimulus"? [1 pt; Emotion]

A. Cannon-Bard Theory
B. Psychological Constructive Theory
C. James-Lange Theory
    a. In the James-Lange theory, you perceive a stimulus, feel arousal/physiological changes, and say those changes = my emotion
D. All of the above

9. Apply either sparse, population, or specificity coding to one of the topics that we have studied so far, giving specific examples either from class discussions or your readings as to why each behavioral result might be coded in the brain that way. [bonus point; Sensory Coding]

Specificity coding: representation of a specific stimulus by firing of specifically tuned neurons specialized to just respond to a specific stimulus

Population coding: representation of a particular object by the pattern of firing of a large number of neurons

Sparse coding: when a particular object is represented by a pattern of firing of only a small group of neurons, with the majority of neurons remaining silent

The textbook also gave a couple of examples. One is that for faces, it's probably sparse coding.