Neurosynth Activity

Neurosynth is a platform that synthesizes functional magnetic resonance imaging (fMRI) data from thousands of studies, essentially performing an automated meta-analysis. In this activity, you will use Neurosynth to enhance your understanding of functional neuroanatomy and to practice and distinguish between forward inference and reverse inference. You are welcome to work on this activity with your classmate(s).

This activity was adapted from:
Seraphin, S.B., & Stock, S. (2020). Non-disposable assignments for remote neuroscience laboratory teaching using analysis of human data. *The Journal of Undergraduate Neuroscience Education, 19*(1), A105-A112.

Part 1: Pain

1. Go to Neurosynth.org.
2. Click on Meta-analyses -> Terms.
3. Enter the functional term "pain" in the Search box.
4. Click on "pain." You should see an automated meta-analysis for 516 studies. If you click on "Studies," you'll see a list of the 516 studies that contributed to this meta-analysis.
5. In the "Maps" window, note the XYZ (MNI) coordinates for 4 different brain areas activated in the "pain" meta-analysis.
6. In a new browser window, go to BioImage Suite.
7. Click on Applications -> MNI2TAL. One at a time, enter each of the 4 sets of MNI coordinates you obtained from Neurosynth in the MNI boxes. You should enter them in X, Y, Z order. Hit "Go" to find the corresponding Brodmann's area and anatomical terms for each set of MNI coordinates. For example, if you looked up the MNI coordinates (X = -38, Y = 6, Z = -2), you'll see that this is in an area called the left insula, which is (Brodmann's area) BA 13. Complete the table below with four *different* brain areas.

Table 1. Regions activated in association with pain.

MNI coordinates				
X	Y	Z	Brodmann Area	Anatomical term
-38	6	-2	BA 13	Left insula

Part 2: Social Rejection

1. Open a new window, and go to Neurosynth.org
2. Click on Studies.
3. Enter the term "social rejection" in the Search box.
4. You should see a list of four studies. Clink on the link for each study to see a list of individual activation coordinates and a map of the activated regions.
5. For each study, identify 4 activated brain regions using the coordinates and BioImage Suite, similar to what you did in Part 1. Use this information to complete the table below.

Table 2. Regions activated in association with social rejection.

Study	MNI coordinates			Brodmann Area	Anatomical term
	X	Y	Z		
Sebastian et al. (2011)	3	24	-9	BA 32	Right dorsal anterior cingulate cortex
Gyurak et al. (2012)					
Slavich et al. (2010)					
Kross et al. (2011)					

Part 3: Observations

1. How do your findings from Part 1 compare with your findings from Part 2 of this assignment?

2. In Part 1, you engaged in a process called *forward inference*, where you reasoned from an experimental condition (pain stimulation) to the associated pattern of brain activity. In Part 2, you may have observed that some of the same brain regions that are activated under conditions of physical pain are also activated under conditions of social rejection. Reasoning that this pattern of brain activation indicates that someone is in pain is an example of *reverse inference*.

   A. Can we conclude that the participants in the social rejection studies were in pain based on their brain data? Why or why not?

   B. What is one potential problem with making reverse inferences?