



# Introduction to PSY300 Cognitive Neuroscience

08/27/2024



# About Me

- My name is Dr. Brian Lord
- Completed my PhD this Spring 2024, working under Dr. John Allen and Dr. Jay Sanguinetti
- I research brain stimulation + meditation
- Broader interests in consciousness
- Previous archival work in remote viewing at the University of West Georgia
- Spent a few years as a musician (electronic music producer) in my 20s
- This is my first time teaching a big class
- Please give me feedback on how I am doing. I created an anonymous Qualtrics survey form for you to send in your comments at any time. It is in D2L under Content → Introduction → Course Feedback



# SEMA Lab



CENTER FOR CONSCIOUSNESS STUDIES  
**Science Enhanced  
Mindful Awareness  
Laboratory**

- We study meditation and transcranial focused ultrasound (a type of non-invasive brain stimulation)

AUGUST 26, 2024 | 2 MIN READ

## Ultrasound Brain Stimulation Boosts Mindfulness

Study participants felt time distortion, fewer negative thoughts and greater detachment from feelings with a noninvasive ultrasound intervention

BY LUCY TU



# What is cognitive neuroscience?

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- Cognitive -> *cognoscere* (Latin) “to get to know, to recognize”
  - *com* “together” + *gnosce* “to know”
- Neuroscience -> nervous system -> *neura* “sinew, string”
  - Secondary meaning “strength, vigor, energy” (nerves of steel)
- We are trying to reconcile mental processes and their consequences with the physical activity of the nervous system
- This is the foundational theory of modern psychology

# Converging Disciplines

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Psychology – cognitive, behavioral, clinical, experimental, educational

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Biology – cell, molecular, genetics, evolution, development, anatomy

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Chemistry – neurotransmitters, neural firing

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Physics – electromagnetism, thermodynamics, quantum

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Medicine – psychiatry, radiology, neurology, pharmacology

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Engineering – biomedical, electrical, sensors, robotics

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Law – forensic, policy, ethics

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Philosophy – metaphysics, epistemology, phenomenology, ethics

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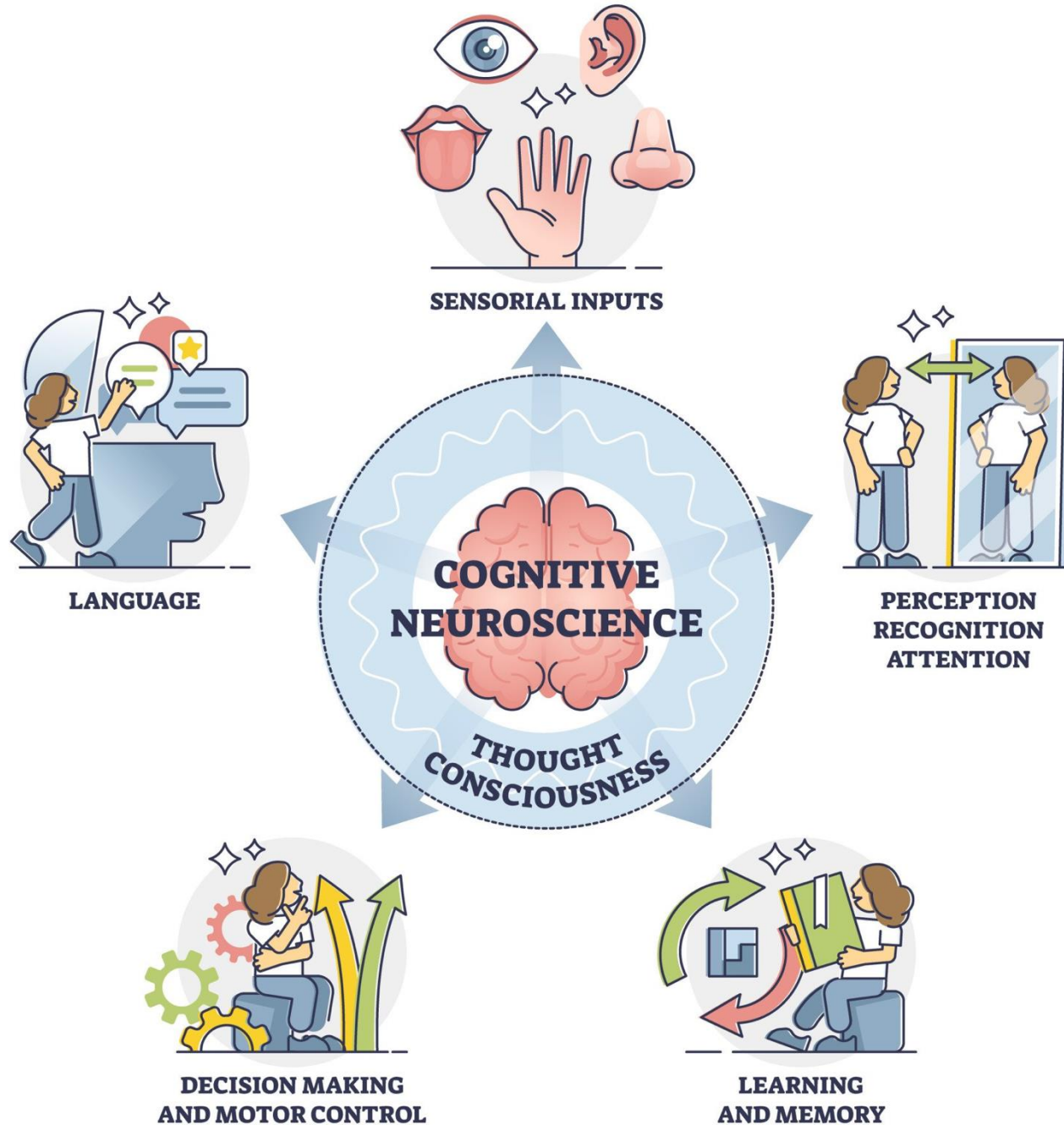
Social sciences – sociology, economics, anthropology, linguistics

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Computer Science – AI, machine learning, computational modeling

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Statistics – the king of all modern science



# How to learn?

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It is actually inefficient to build a mental model from the ground up

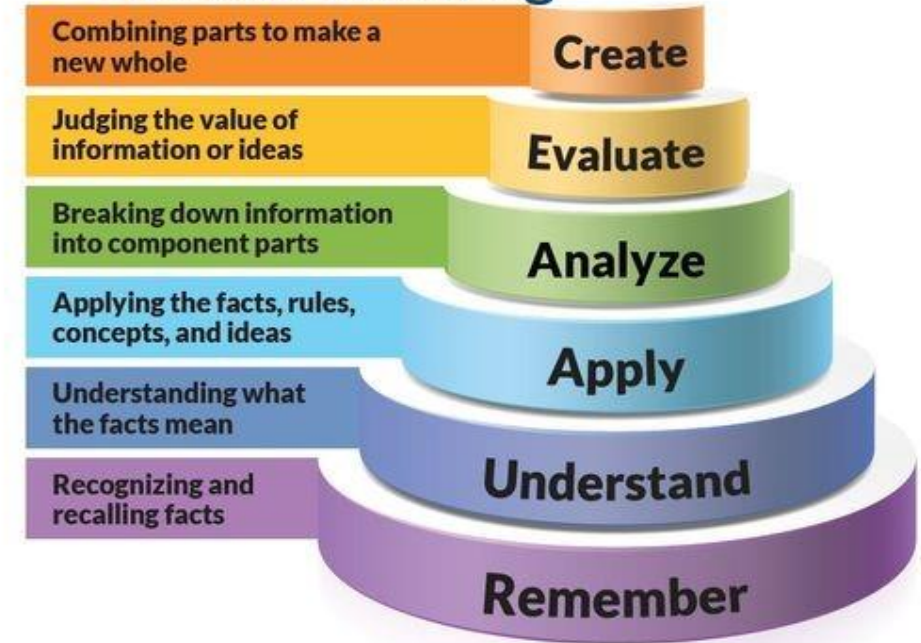
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If you have a general picture, however fuzzy, your mind will integrate the facts at the lower levels into that structure!

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I will try to provide you that big picture, so that as you encounter jargon in your reading, you can integrate it

## Bloom's Taxonomy Verbs for Critical Thinking



| 01                                                                                                                   | 02                                                                                                                     | 03                                                                                                             | 04                                                                                                                             | 05                                                                                                              | 06                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| KNOWLEDGE:                                                                                                           | UNDERSTAND:                                                                                                            | APPLY:                                                                                                         | ANALYZE:                                                                                                                       | EVALUATE:                                                                                                       | CREATE:                                                                                                           |
| Define,<br>Identify,<br>Describe,<br>Recognize,<br>Tell,<br>Explain,<br>Recite,<br>Memorize,<br>Illustrate,<br>Quote | Summarize,<br>Interpret,<br>Classify,<br>Compare,<br>Contrast,<br>Infer,<br>Relate,<br>Extract,<br>Paraphrase,<br>Cite | Solve,<br>Change,<br>Relate,<br>Complete,<br>Use,<br>Sketch,<br>Teach,<br>Articulate,<br>Discover,<br>Transfer | Contrast,<br>Connect,<br>Relate,<br>Devise,<br>Correlate,<br>Illustrate,<br>Distill,<br>Conclude,<br>Categorize,<br>Take Apart | Criticize,<br>Reframe,<br>Judge,<br>Defend,<br>Appraise,<br>Value,<br>Prioritize,<br>Plan,<br>Grade,<br>Reframe | Design,<br>Modify,<br>Role-Play,<br>Develop,<br>Rewrite,<br>Pivot,<br>Modify,<br>Collaborate,<br>Invent,<br>Write |

# Core Concepts according to the Society for Neuroscience

1. The brain is the body's most complex organ.
2. Neurons communicate using both electrical and chemical signals.
3. Genetically determined circuits are the foundation of the nervous system.
4. Life experiences change the nervous system.
5. Intelligence arises as the brain reasons, plans, and solves problems.
6. The brain makes it possible to communicate knowledge through language.
7. The human brain endows us with a natural curiosity to understand how the world works.
8. Fundamental discoveries promote healthy living and the treatment of disease.

Men and women's brains do work differently, scientists discover for first time

Story by Sarah Knapton • 5mo • 3 min read



One in five Americans believe AI is conscious, study finds

Story by Karol Kołtowski • 1w • 3 min read



Featured Neuroscience Psychology • July 17, 2024 • 5 min read

Mind-Bending: Psilocybin Reshapes Brain Networks for Weeks

'We Want To Give People Super Powers' Elon Musk Envisions Neuralink Brain Chip Transforming Lives Like Geordi La Forge From Star Trek

Story by Jeannine Mancini • 2d • 3 min read

Human intelligence: it's how your brain is wired rather than size that matters

4 December 2023

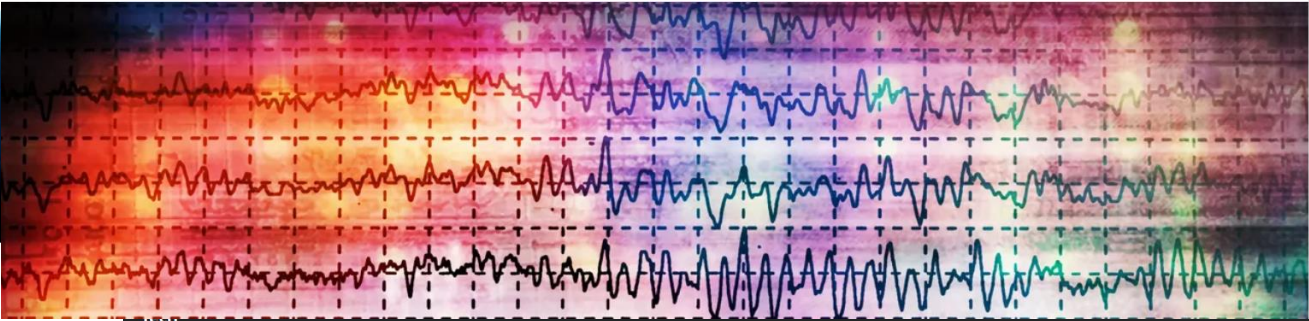
Share

Michael Marshall  
Features correspondent

Is 'brain fingerprinting' a breakthrough or a sham?

The controversial method claims to look inside a suspect's brain to see the details of a crime — but how much can it see?

By Russell Brandom on February 2, 2015 11:16 am



es be mapped

**THE TRUTH IS IN THERE** I test the brains of people who say they've had a UFO encounter – these are the symptoms they display

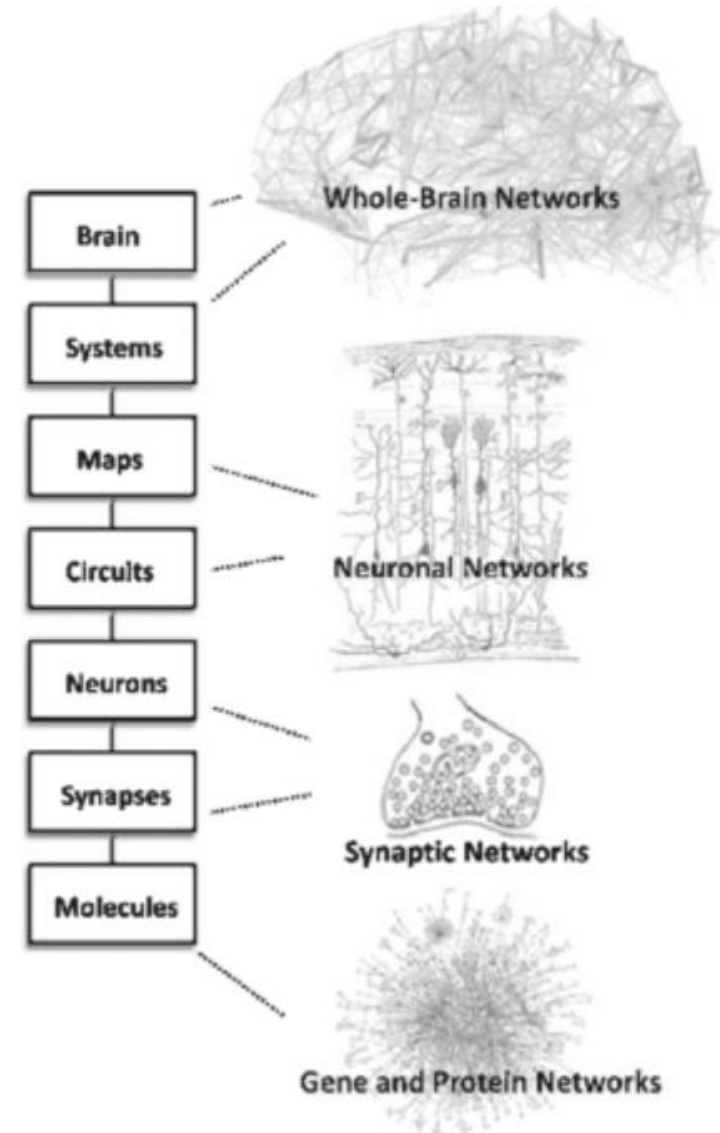
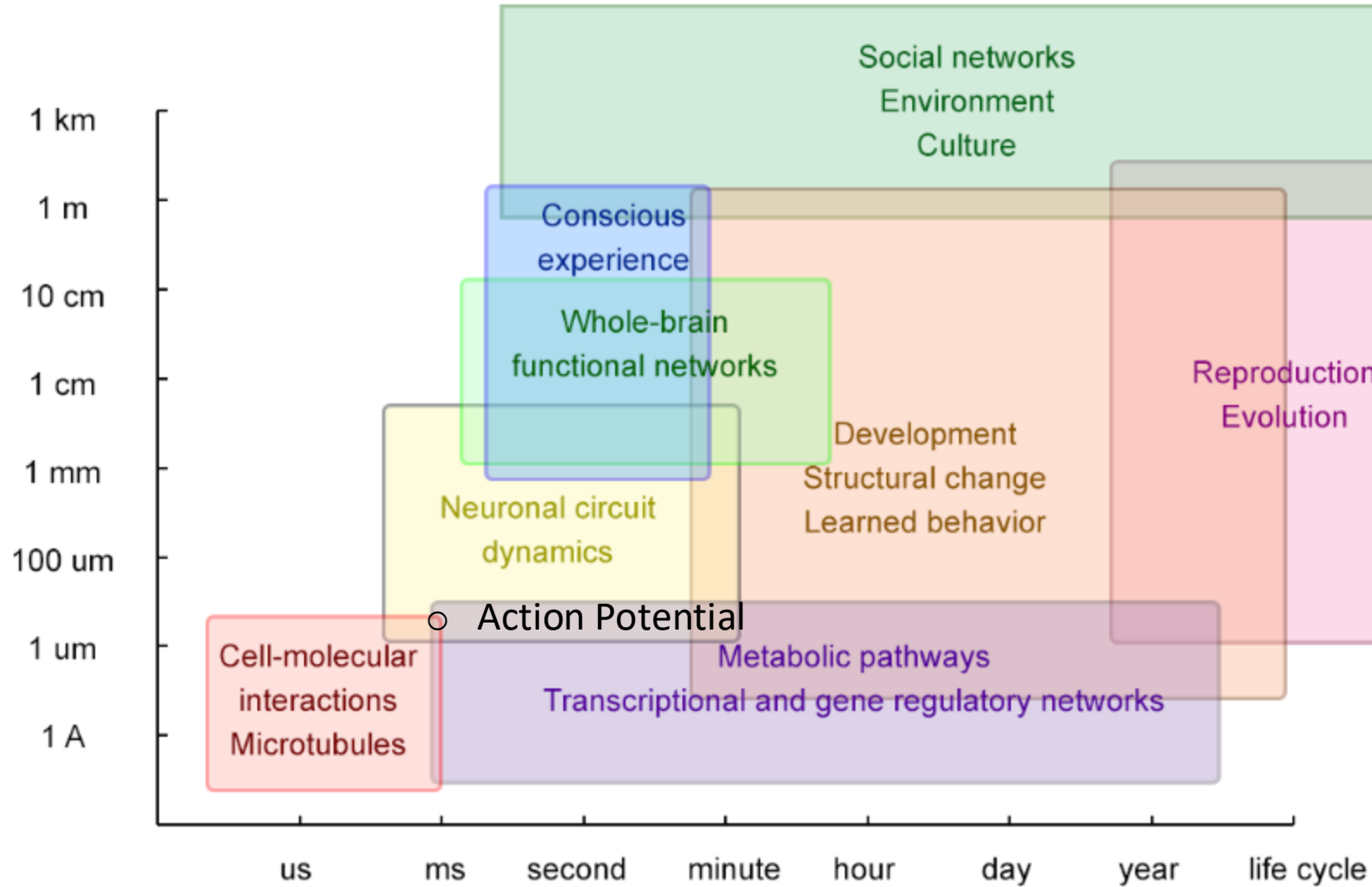
Danielle Cinone  
Published: 21:53 ET, Dec 10 2021 | Updated: 7:58 ET, Dec 11 2021

# Theme #1: Predictive Models

- The mind actively constructs models
  - The brain doesn't just receive information; it actively *builds models* of the world to predict and interpret patterns
- This is an *active, dynamic process*
  - The models are not passive; your mind continuously *updates and refines* them as new information comes in
- Models shape perception and action
  - Your sensory and motor systems are modeled by these models, guiding your actions and refining skills – “muscle memory”



# Theme #2: Scale





# Paradox: Mind vs Brain

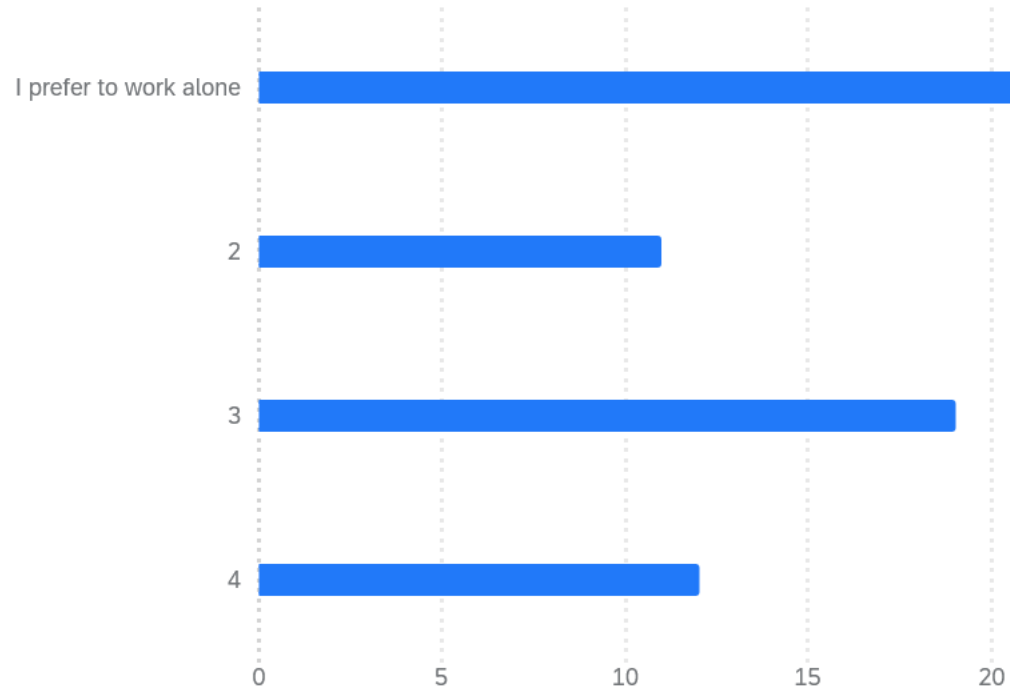
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- How do we bridge the gap between the subjective experience of the mind and the physical workings of the brain?
- The conventional view is to *reduce* the mind to the brain: the “astonishing hypothesis” that everything you think, feel, and experience is entirely due to the behavior of biological tissue
  - There is no known mechanism for how this happens; it is just a hypothesis
- What do you think? Does this perspective capture the full reality? Does that explain everything that is out there?

# Class Survey

I have group work planned, where you will be doing multiple assig...

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Do you want attendance to be mandatory? Mandatory attendance ...

65

