EMBODIED COGNITION

PSY 435

What is Embodied Cognition?

- The view that cognition needs to be considered in the context of the body.
- The mind cannot be considered abstractly.
- We have met embodied cognition in a number of places, most recently in mental imagery.
- This can mean a lot of different things….

Six Claims

1. Cognition is situated
2. Cognition is time pressured
3. We off-load cognitive work onto the environment
4. The environment is part of the cognitive system
5. Cognition is for action
6. Off-line cognition is bodily based

Cognition is situated

- Cognition takes places “on-line” in relationship to the environment.
- Cognition is always in relation to the task at hand.
- Considering evolution, cognition must have started real-time, since animals didn’t have the capacity for past/future thought.

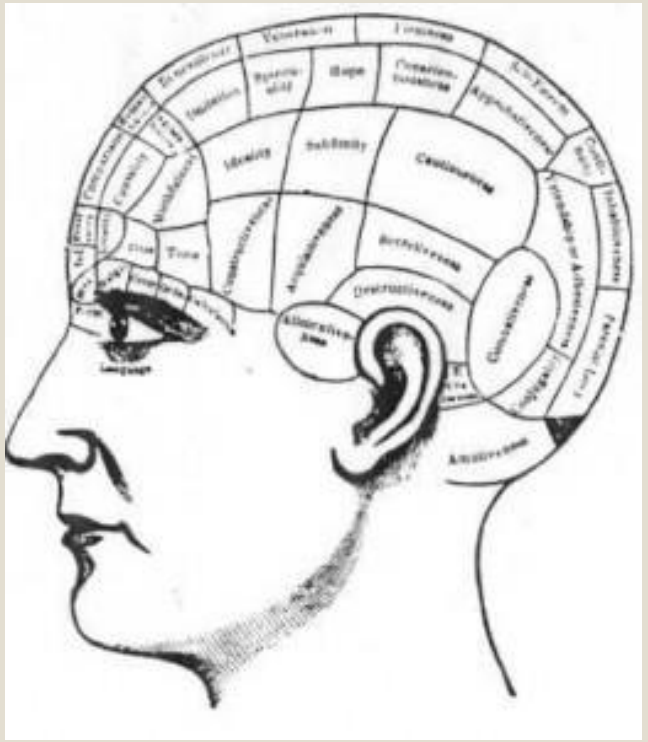
Example: Driving

- When driving, one is constantly in a situation in which our cognitive capabilities are put to the task of the environment.

Issues?

- This doesn't account for planning.
- We can think about things not immediately related to our present environments.
- Language involves creating and processing information not necessarily directly related to the environment.

I wonder what I will eat tomorrow?



Cognition is time pressured

- Cognition happens in real-time, in relationship to time constrained tasks.
- We must react fast without time to build up representations.
- Perceptual-motor coordination often is time constrained.

Example: Sports

- Most sports require quick cognitive decisions based on quickly changing perceptual information.
- These decisions then must also quickly be relayed to the motor systems to execute them.

Issues?

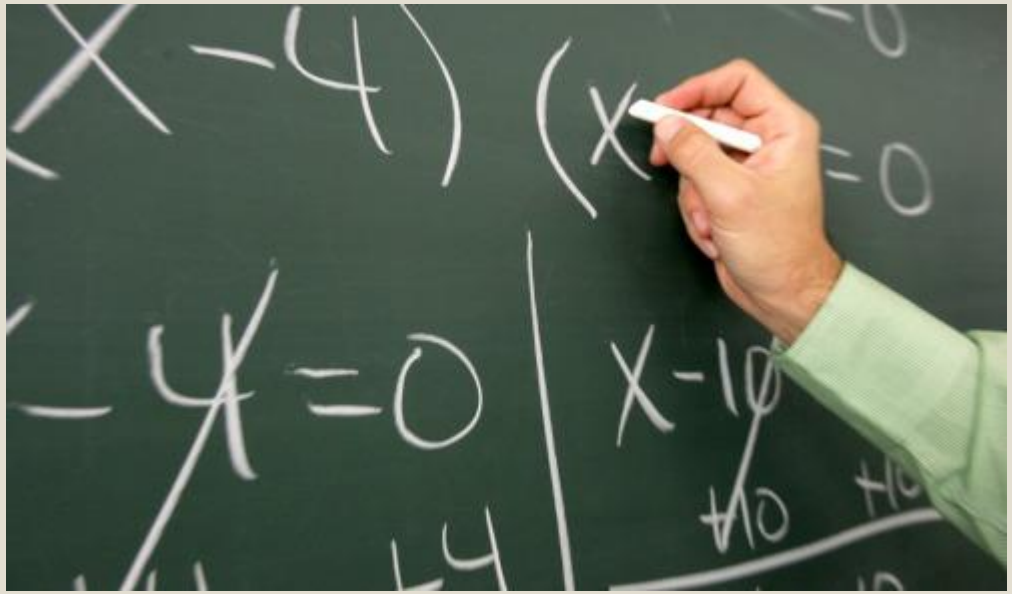
- Many mental capacities that we posses do not require time.
- Some of these are writing, building, etc.
- We often have time to plan and execute actions without immediate time constraints.

We offload cognitive work onto the environment

- We make use of the environment for cognitive tasks.
- This is referred to as offloading.
- This often involves spatial manipulation.

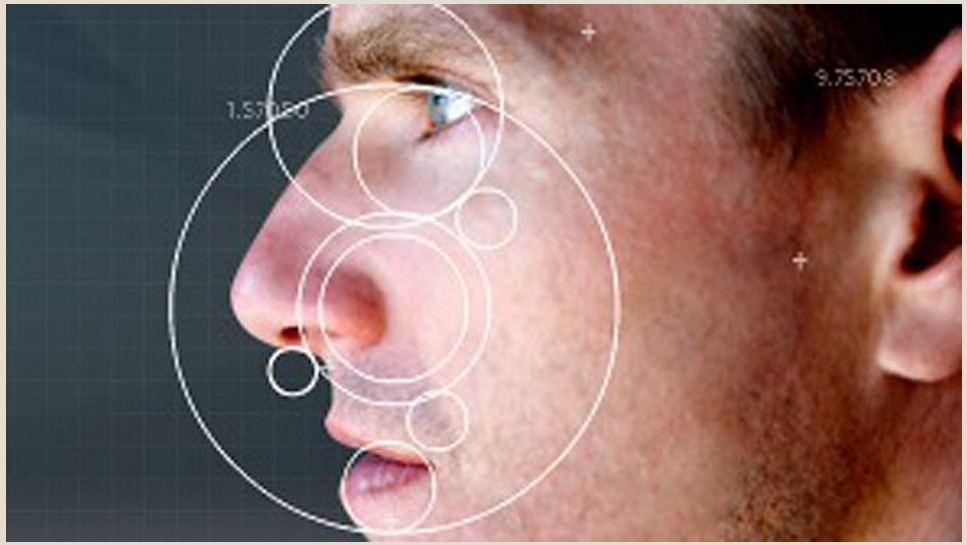
Example: Doing Math

- We manipulate and store symbols when doing math with paper and pencil.
- In this way we no longer need to keep all symbols in working memory at any given time.



Issues?

- Many kinds of cognition cannot be easily off-loaded onto the environment.
- For example, it is difficult to offload recognition of objects, including faces onto the environment.
- This extends to most cognitive tasks we don't have conscious control over.



The environment is part of the cognitive system

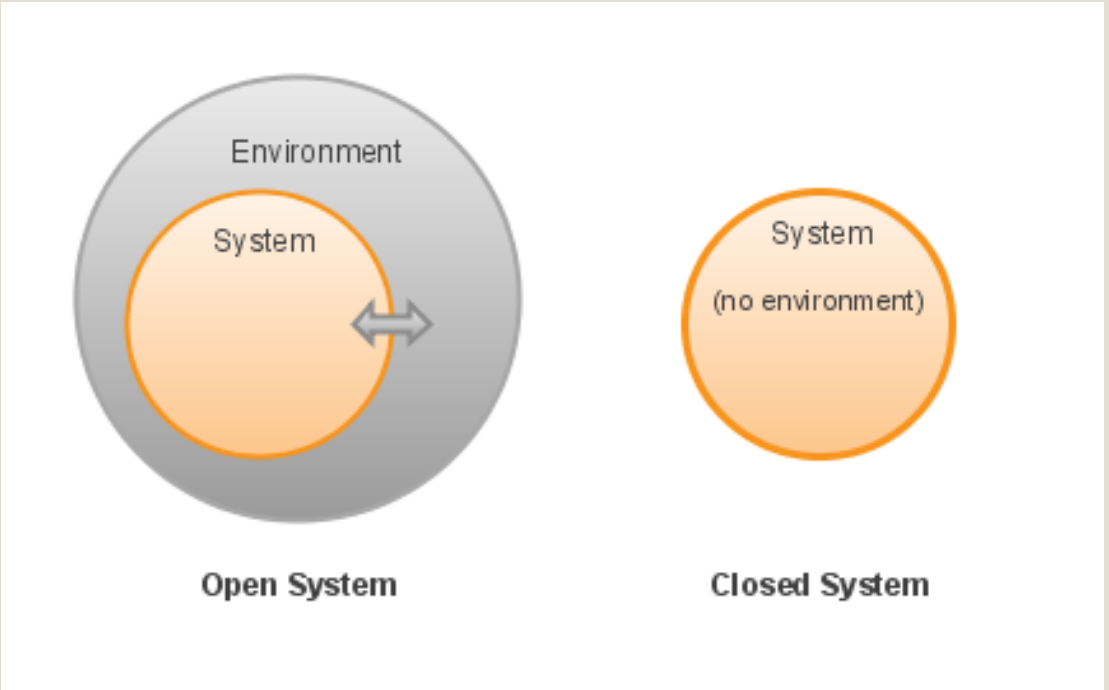
- Cognition is distributed across the entire system.
- By this we mean not just the brain, but also the environment and body.
- According to this view we can't think about cognition in isolation.

Example

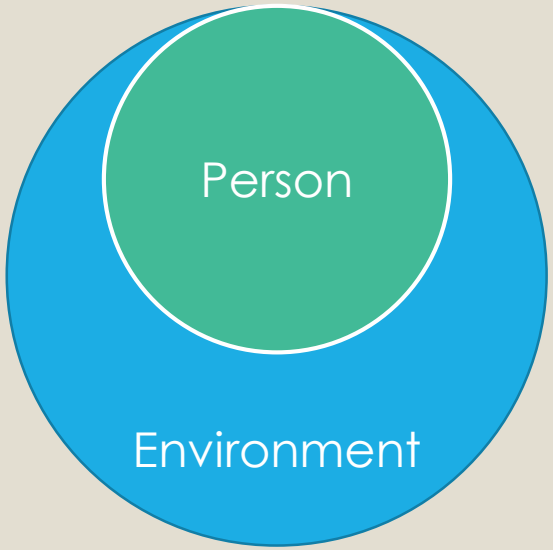
- The kind of environment you are in determines the kind of cognitive system that is being enacted.
- Cognition in a hunter-gathering context is fundamentally different from cognition in a classroom as a student.

Issues?

- But… is it really?
- There seems to be something the same in all cases: the human.
- We can just as easily think of humans as open systems that simply get different environmental input.
- Now the system for the hunter and student is the same, simply with different environmental constraints and input.

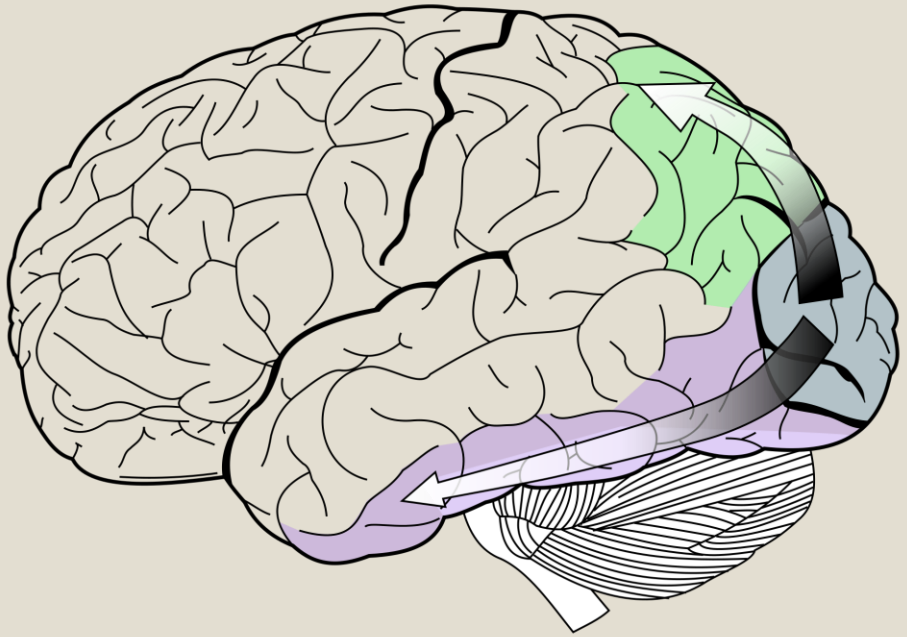


Systems in Cognition



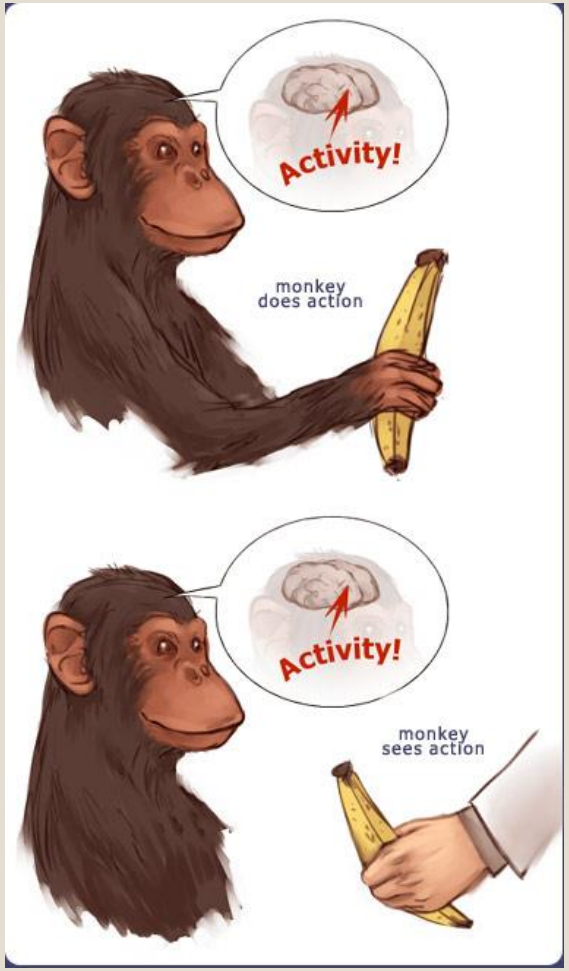
Cognition is for action

- Perception makes certain kinds of actions possible.
- The dorsal pathway is an example of the brain taking perceptual information and processing it for action.



Example: Mirror Neurons

- Our mirror neurons fire when we observe another undergoing an action or emotion.
- This is considered the basis for empathy, but it also functions in the motor system.
- Study has monkey observe person grasping hammer, and monkeys motor area for grasping activates.



Issues?

- Our brain is more than just the dorsal pathway…
- There is also the ventral stream which processing semantic information, that doesn't necessarily get turned into action.
- Perception for perceptions' sake (ie. Reading, art)
- Cognition can be for action… but sometimes action at a later time.

Off-line cognition is body based

- Sensorimotor system co-opted to run off-line (ie. When not engaged in a task)
- Cortical recruitment is how this takes place.

Examples

- Mental Imagery – We use visual areas to imagine images.
- Recalling episodic memories – We use visual, auditory, emotion areas of brain when recalling memories.
- Procedural knowledge – we use motor areas of brain when thinking about executing a skill.

Mental Practice

- Since imagining a skill involves motor cortex activation for that skill, research has been done on mental practice.
- Participants practiced piano either physically, mentally/physically, or just mentally.
- Results found that participants who practices physically and mentally performed just as well as those that practiced only physically.

Body-based Linguistics

- Image schema - an embodied pre-linguistic structure of experience that motivates conceptual metaphor mappings.
- Language metaphors are based on bodily spatial relationships.
- Example “Love is a journey”
- “we arrived at a crossroads," "we parted ways", "we hit the rocks" (as in a sea journey), "she's in the driver's seat", or, simply, "we're together".