Cognition: Methods and Models

PSYC 2040

L6: Information Processing

Part 1

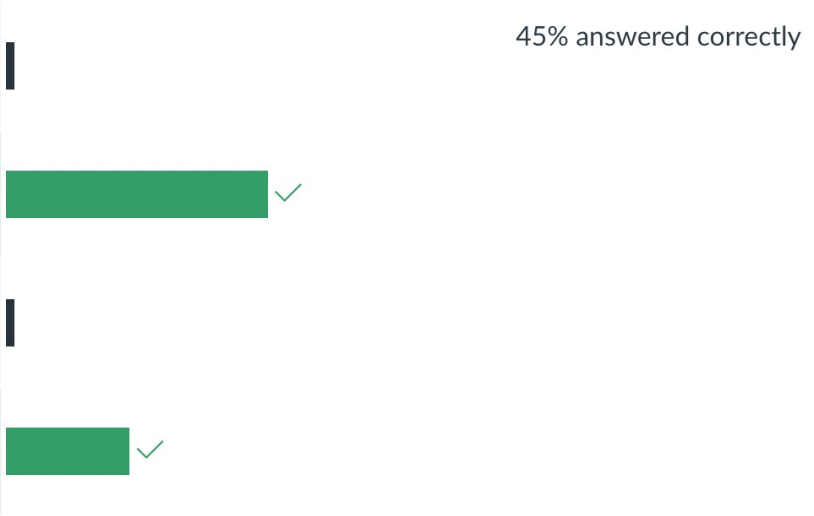
logistics: module restructuring

- modules have been reorganized L7 onwards
  - cognitive models is now L12; semantic memory will be part of language learning (L9)
  - after spring break, we will start with memory I (L7)
- Mar 7 is a review class for modules L0 – L6 (assessment 1 content)
- each week is now worth 6 points (instead of 5)
  - 13 modules x 6 = 78 possible points; max. 65 count towards final grade
  - Canvas will still be scored on 5 points, eventually scaled to 6
- Week 13 will include two modules
  - L10: Social Cognition
  - L11: Judgment and decision making
  - you can choose to do only one of the modules' (L10/L11) assignments
- assessment 2 has been moved to May 4 (L7-L12)

logistics: L5 quiz regrade

Tolman showed that hungry rats rewarded with food learned to navigate a maze with fewer errors than other groups of rats. What inference was drawn from this result? Select all that apply.

Rat behavior and maze-learning was not driven by cognitive factors such as being able to discriminate temporal intervals and which way to turn in the maze		0 %
Rat behavior and maze-learning was driven by motivational factors such as being hungry and having a purpose to obtain food from a known location	11 respondents	**100 %**
Rat behavior and maze-learning was not driven by motivational factors such as being hungry and having a purpose to obtain food from a known location		0 %
Rat behavior and maze-learning was driven by cognitive factors such as being able to discriminate temporal intervals and which way to turn in the maze	5 respondents	**45 %**



45% answered correctly

logistics: project milestone #3 (due Mar 5)

- finding 3 research articles + jointly written QALMRIs
- use your review article to guide your search
- might need to read ~10 abstracts to find the best 3 papers
- QALMRIs should be detailed enough for an outsider to know what the paper was about (independent/dependent variables, key results)
- show it to a friend/classmate and ask them what they learned
- submit a self/peer assessment

logistics: practice assessment

- practice assessment 1 is up on Canvas: Modules > Assessment
  - L0 (getting started) – L6 (information processing)
  - 30 multiple-choice + 10 short-answer questions
- answers will be released by the end of this week
- use the weekend to do the assessment in “exam” mode
- use review session + class time to ask questions!
- provide us with feedback on the timing/difficulty
  - https://forms.gle/pkcfEvxFC4EXntBX8
  - link also on Canvas > Assessments

recap: Feb 21/23, 2023

- what we covered:
  - precursors to behaviorism
  - flavors of behaviorism (Watson, Tolman, Skinner, Hull)
- your to-dos were:
  - *finish:* L5 quiz + writing assignments
  - *fill out*: class survey
  - *start finding*: project research articles (milestone #3)
  - *start:* L6 (information processing) chapter

today's agenda

- mid-semester survey results!
- the four R(evolution)s
- Donders' processing stages

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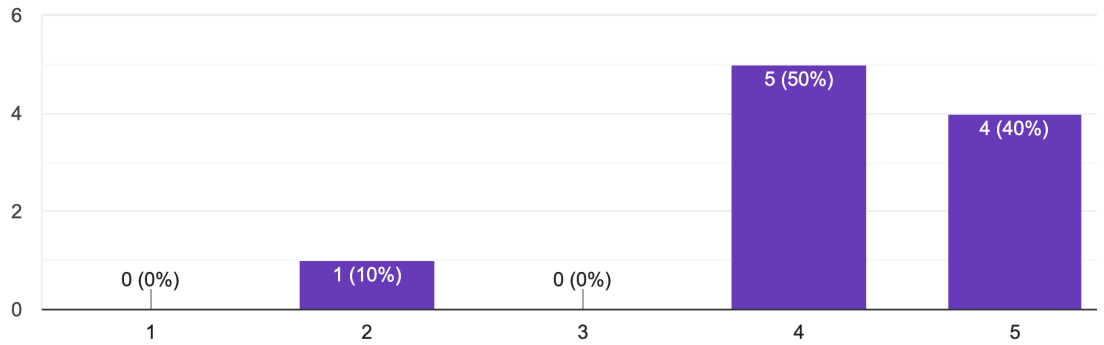
mid-semester survey: one word!

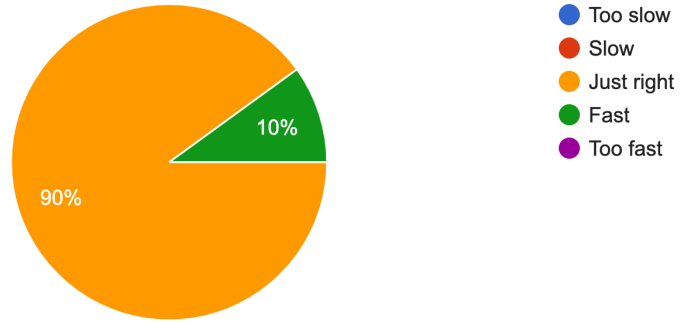
My understanding of the course content has improved since the start of the semester.

10 responses



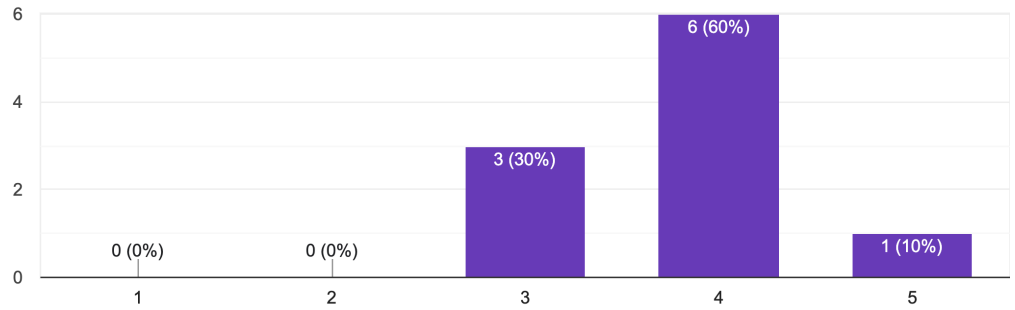
I find the pace of the course to be:

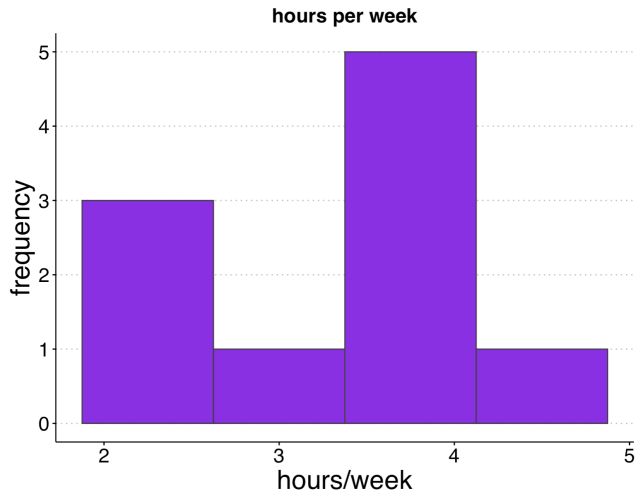
10 responses



Please rate the level of effort you are putting into the course:

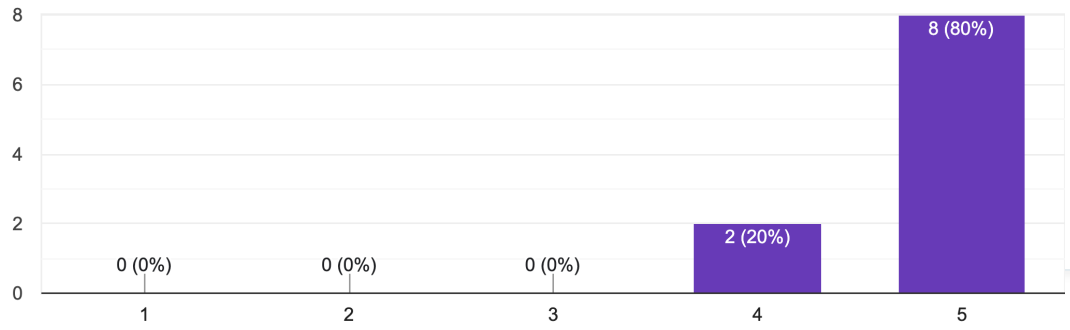
10 responses





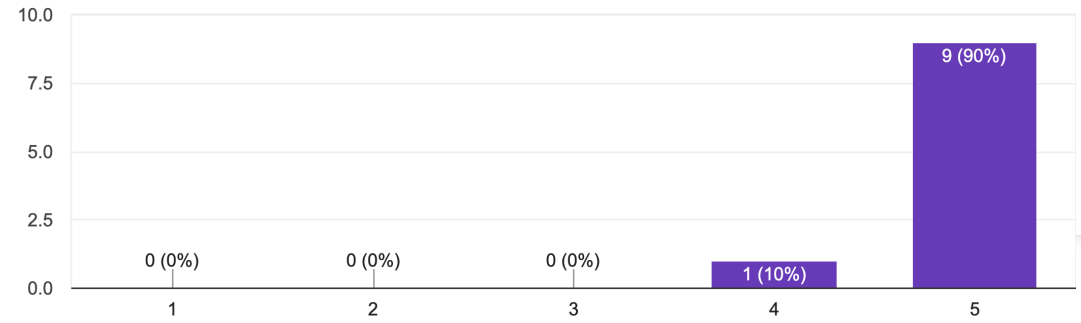
Please rate the level of effort you think the instructor is putting into the course:

10 responses



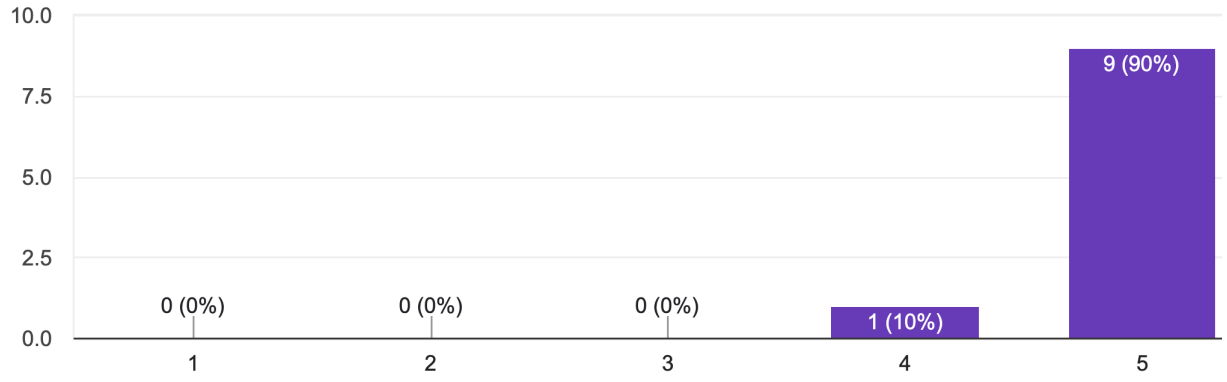
To what extent do you feel that the instructor is able to communicate concepts and ideas effectively in the course?

10 responses



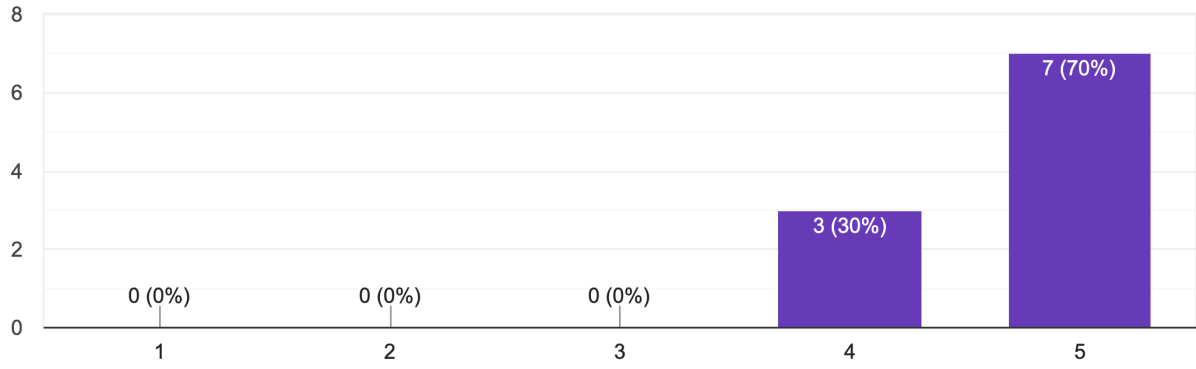
To what extent do you feel that the instructor makes an effort to make you feel included?

10 responses



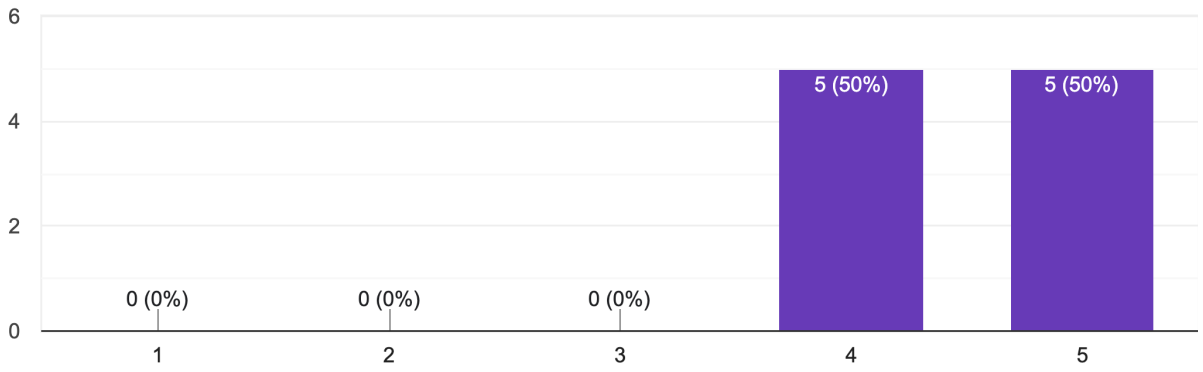
I feel confident and comfortable approaching the instructor for help with questions or concerns about the course.

10 responses



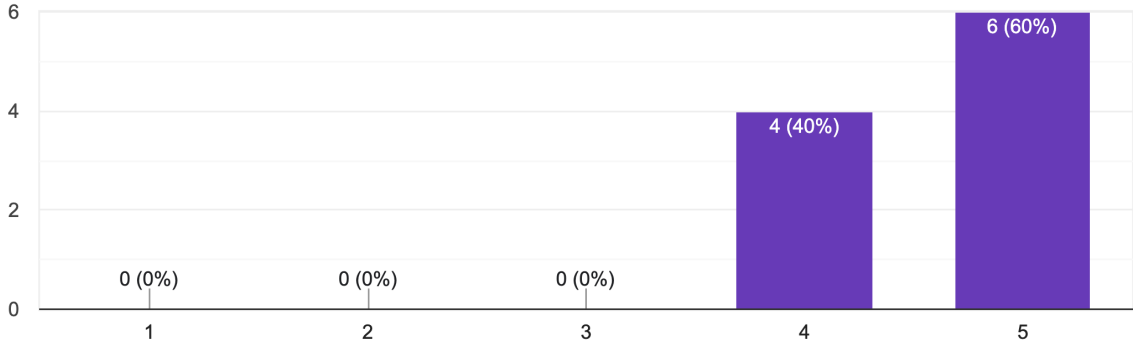
To what extent do you think you are achieving (or will achieve by the end of the course) the first learning goal for this class: Understand the fund... prominent methodologies in the study of cognition

10 responses



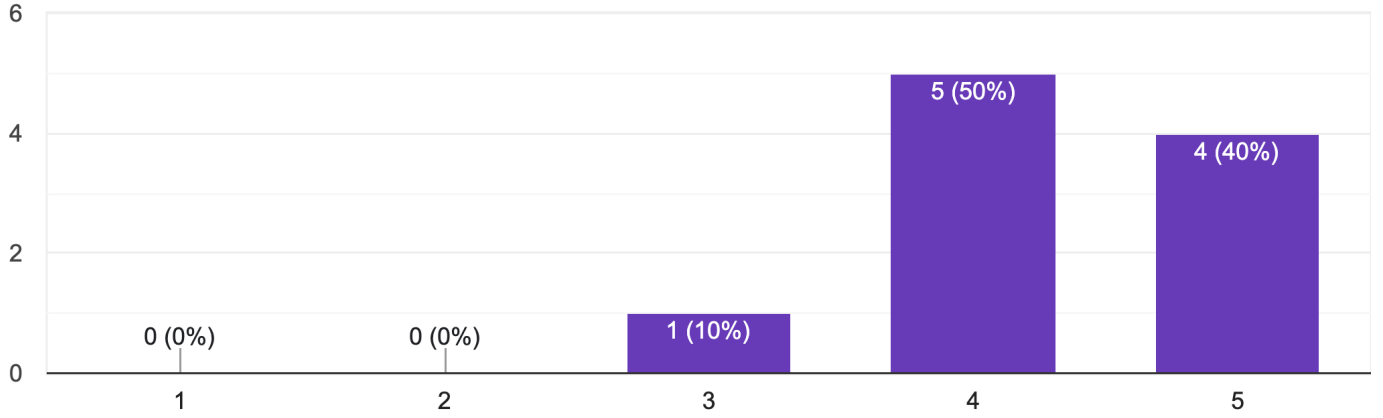
To what extent do you think you are achieving (or will achieve by the end of the course) the third learning goal for this class: Refl...iocultural issues surrounding the study of cognition

10 responses



To what extent do you think you are achieving (or will achieve by the end of the course) the second learning goal for this class: Co...n to real-world applications and their implications

10 responses



mid-semester survey: the highs

The readings have been super helpful as well as the in-class activities.

The in-class activities are the most beneficial for me, in addition to closely reading the textbook before we cover it in class

I think that the quizzes have really helped my learning so far because they force me to spend the time reviewing and truly understanding the material before I take them (review I would normally save for the time leading up to an exam).

Hearing prof talk about the readings and narrow down what we should know. Allow time for asking questions

The activities we do in class are very helpful

I think the opportunity to choose and combine end-of-week assessments has been very helpful for my learning and confidence in the class.

Weekly questions, lectures, quizzes, in-class pair-ups/discussions

Lectures are very effective!

Having the slides made available to me to follow along in class and review after class; your flexibility and reception students' needs, such as with extending the time limit on the weekly quizzes

Having a regular schedule for assignments, and I've really enjoyed the in-class activities.

mid-semester survey: the lows

The writing assignments have been a bit of a challenge, but in a good way, forcing me to think in ways that I haven't thought of before.

The biggest challenge has been time management, because I tend to leave everything for the weekend!

I think most recently we've started to have more complexity to the concepts. Got to review conditions

I think I've had a hard time with thinking of productive conceptual questions to ask on the discussion boards

Sometimes, having to complete a quiz that tests my knowledge of a module just taught/learned in the past week can be tight, but I also find that this schedule forces me to review the material as I go, so that I am incrementally building up and retaining knowledge.

I would say that I have been challenged by balancing taking notes as well as listening to Professor Kumar talk, as I often feel that I am just writing down words and immediately forgetting them because I am writing so quickly. We go through concepts relatively quickly, so it has been hard to keep up with the note taking and understanding.

Getting into a schedule for weekly assignments, I try my best but I still find some things slipping through the cracks at times.

I am yet to feel like I am able to digest the reading in its entirety really well, but class lectures do help quite a bit with this.

mid-semester survey: reflections

I think Im surprised by the amount of questions I am able to ask. I guess sometimes I know Im confused but don't know how to frame a question. Is that a valid question to ask: to be reexplained a concept (do not want to slow down the class but also don't want to go the rest of the lecture not knowing what this concept was, and the rest of the class is somewhat building off of that)

Unclear on conceptual questions due dates— Tuesday vs Wednesday each week and at what point is it too late? (I.e. how strict is 11:59)

I would say I hope the professor knows how helpful the partner/group activities are in terms of breaking up the lecture and inviting learning on a different level. I really like the lecture/activity/quiz design of the class because it reinforces the concepts in many different ways, and calls for a lot of participation as well. I would say the speed of concepts is a bit of a challenge because I have a hard time processing information that quickly. Finally, I have been intrigued learning information that I thought I already knew before, but more in depth (for example, I have learned about the schools of psychology and conditioning, but not to the extent with which we cover them in this class).

today's agenda

- mid-semester survey results!
- the four R(evolution)s
- Donders' processing stages

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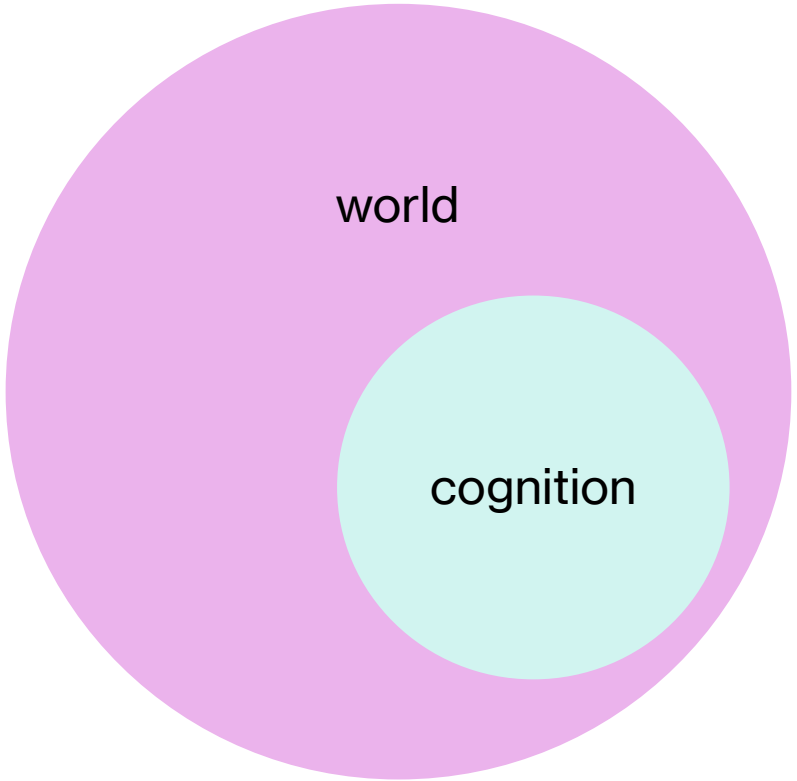
behaviorism's aftermath

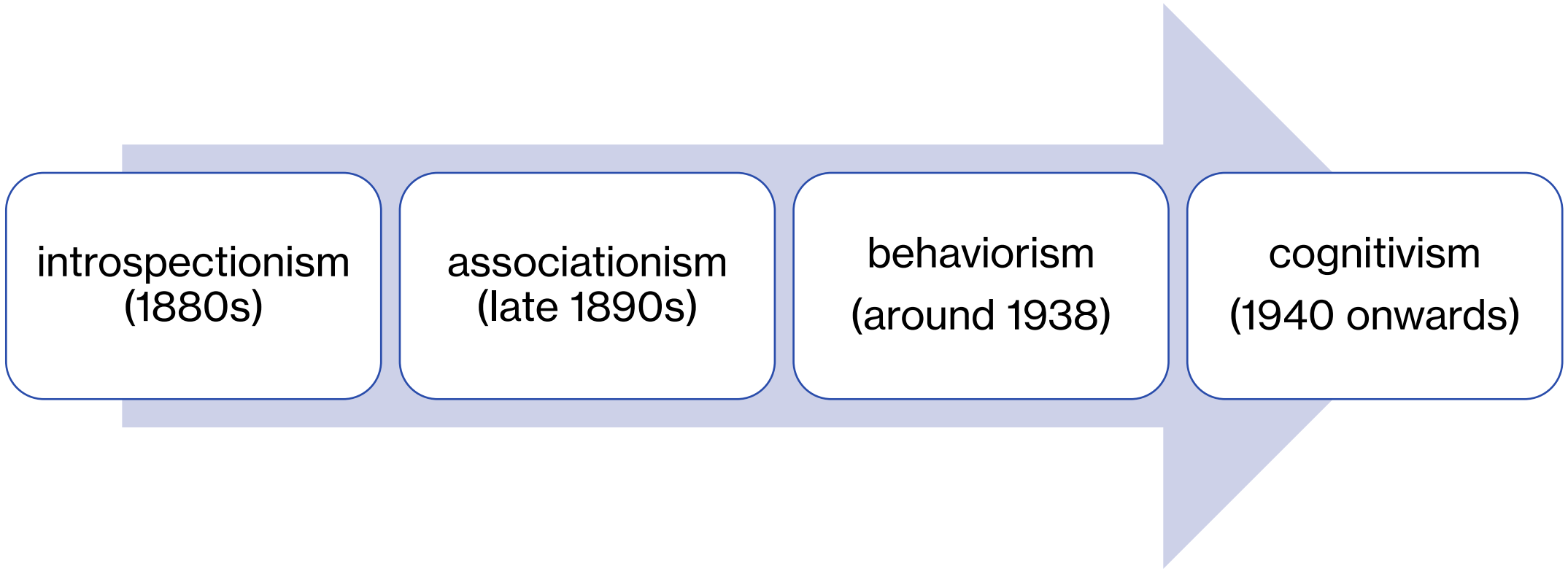
- behaviorism emphasized the relationship between stimulus and response, with the goal of controlling and predicting behavior
- the emphasis was more on how different stimuli directly lead to specific responses and less on the internal processes that bridge that gap
- not all behaviorists thought the same way...Tolman argued that internal drives and representations were critical to understanding behavior
- the "radical" form of behaviorism slowly started to fall out of favor, and more and more scientists began to embrace "cognitive" aspects of behavior

cognition and the four Revolutions

- the study of cognition has a bidirectional relationship with the world and its events
- several important events shaped how we think/thought about cognition
  - industrial revolution
  - technological revolution
  - digital revolution
  - “cognitive” revolution



the timeline so far



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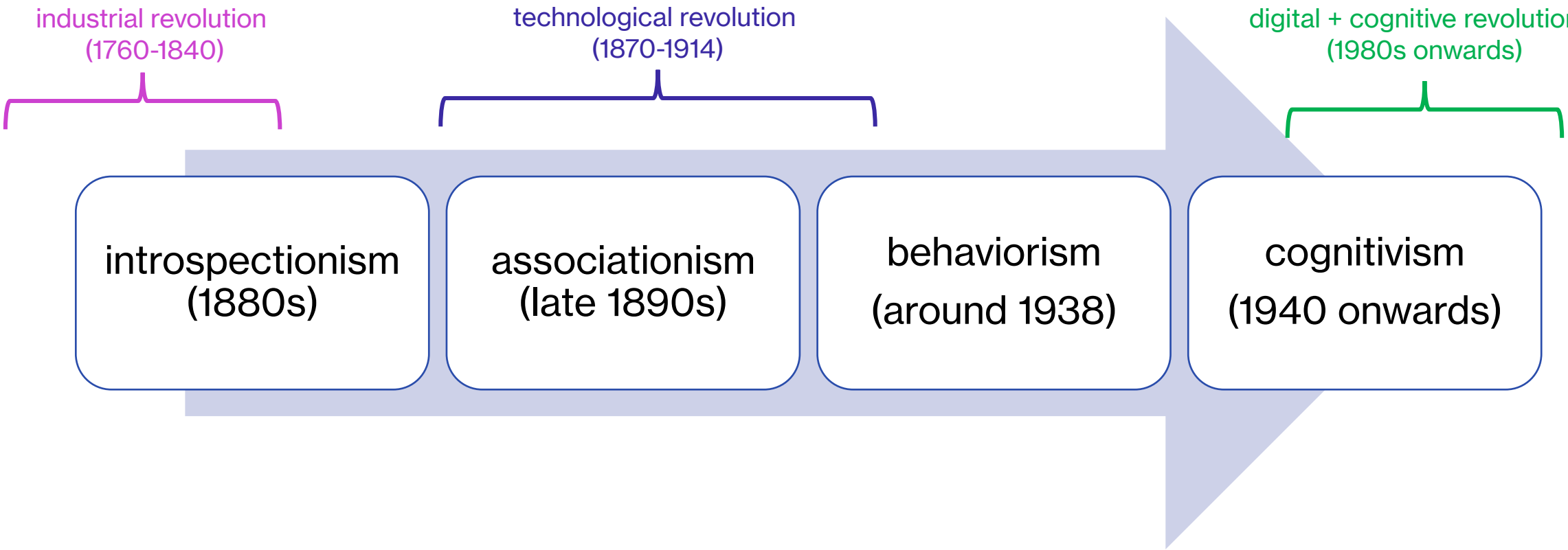

cognition and metaphors

- metaphors have been used as a tool to explain cognition
  - what are some metaphors we've already encountered?
- the revolutions brought along newer metaphors
  - industrial: cognition = assembly line
    - Donder's processing stages
  - technological: cognition = telephone network
    - Shannon's information theory
  - digital: cognition = computer
    - highly prevalent even today
  - broadly: cognition = machine
    - possibly reductive, but also extremely useful

activity: a new metaphor

- groups of 3
- log on to this online jamboard (link also on Canvas > L6)
- come up with a new metaphor (visual or verbal) based on your joint understanding of cognition so far and how it relates to:
  - the mind
  - the brain
  - the world
- debrief

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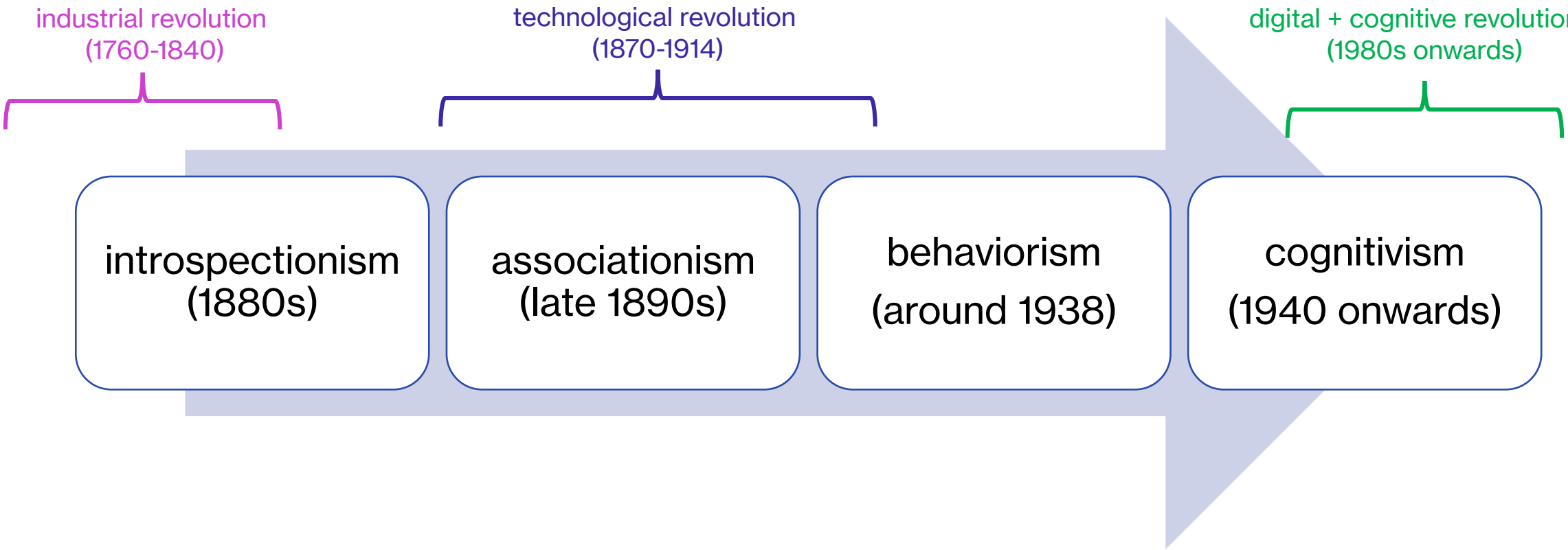

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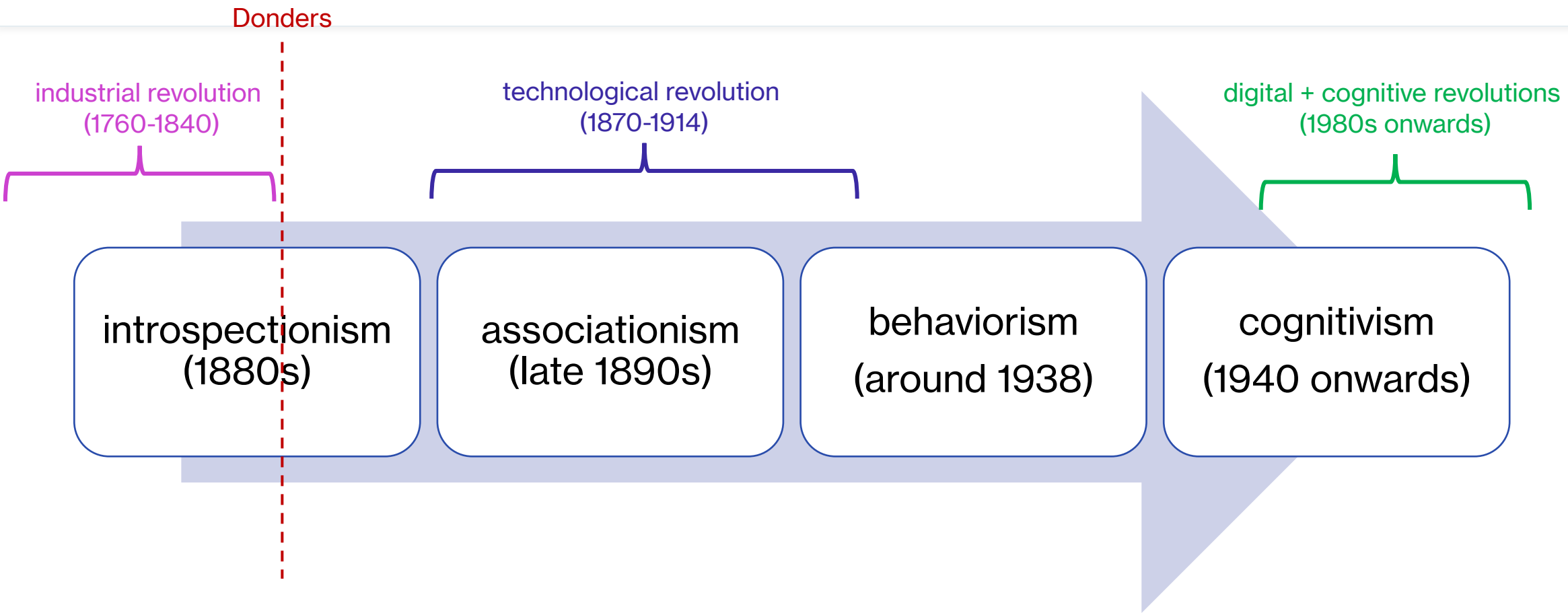
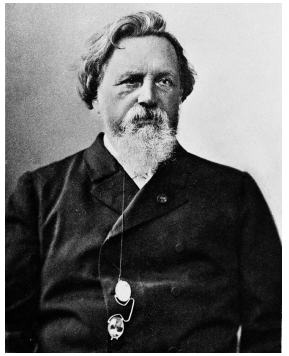


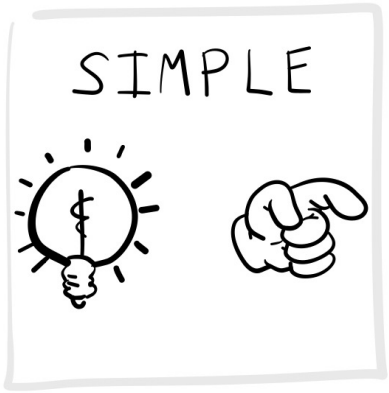
Donders' processing stages

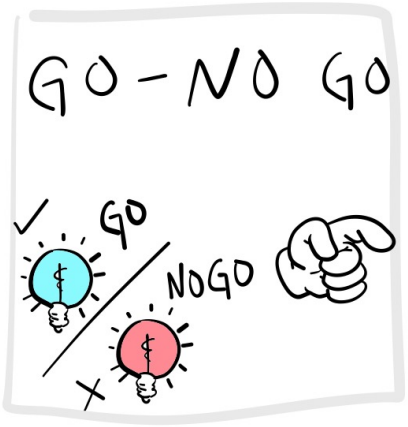


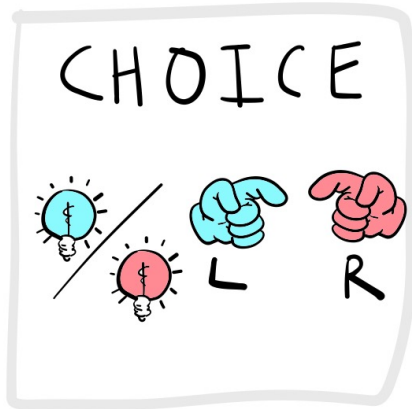
- key idea: there are individual stages of cognitive processing
- Donders attempted to identify these stages and estimate the time to complete each stage
- Donders used mental chronometry for this work:
  - where else have we seen this before?
- he conducted reaction-time experiments with various types of stimuli
- two main questions
  - do different sense organs have different "physiological times"?
  - do more complex tasks require additional "mental time"?

Donders: levels of complexity

- simple reaction time task
  - present stimulus (e.g., light) and record time taken to detect it
- go-no go task
  - present stimulus, ask to respond only for some trials (go) and not others (no go)
  - record time taken to respond on “go”
- alternative forced-choice task (AFC)
  - present many stimuli, respond with specific response (e.g., blue: left, red: right)
  - record time taken to respond





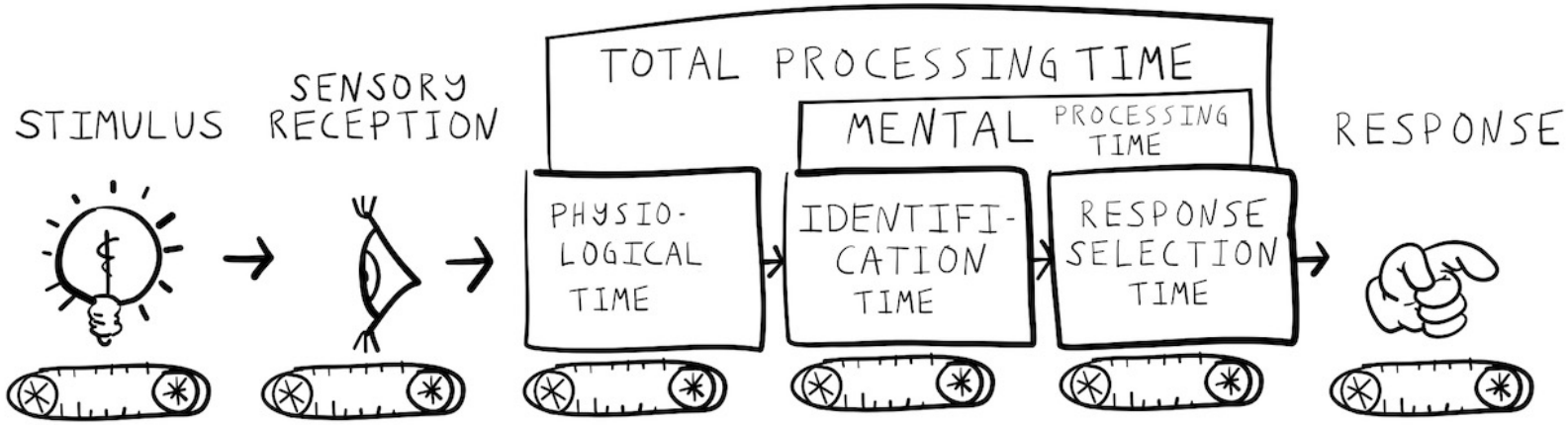


activity: classify the tasks!

- In groups, do the following tasks and classify them as simple reaction-time, go/no-go, or forced alternative choice
  - Group 1: Stroop task
  - Group 2: Impulsive response task
  - Group 3: Lexical decision task
  - Group 4: Sustained attention to response task
  - Group 5: Wisconsin Card Sorting task
  - Group 6: Self-paced reading
- debrief: describe the task to the class and how you classified it

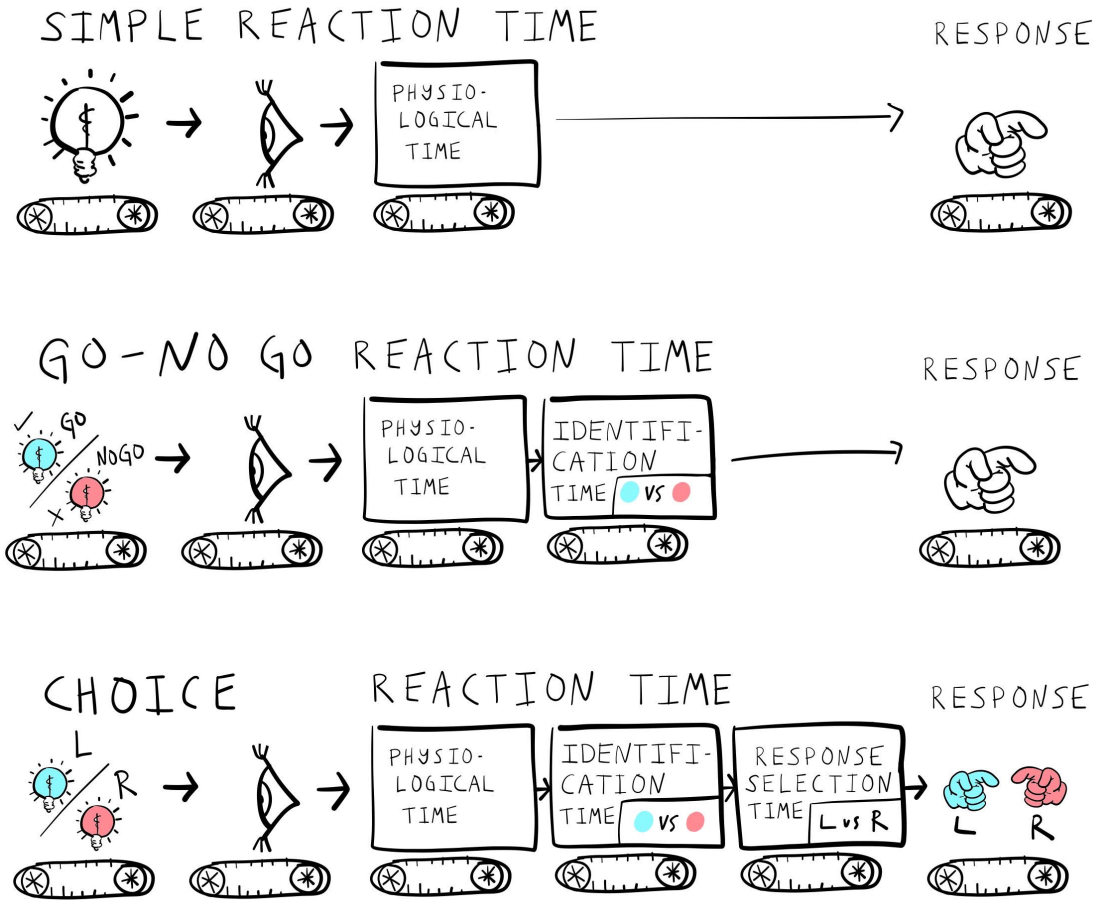
Donders: subtractive logic

- Donders assumed that mental operations occurred in successive stages, i.e., like an assembly line



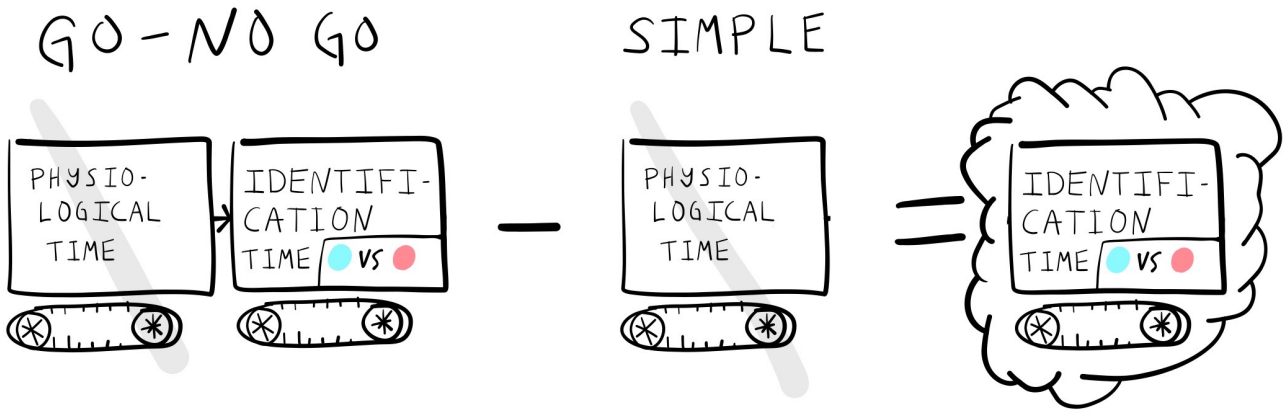
Donders: subtractive logic

- time taken to respond should depend on number of processing stages required to complete the task
  - simple tasks have fewer stages and are therefore performed quickly
  - complex tasks have more stages and therefore performed slower



Donders: subtractive logic

- the problem: we do not know how long each processing stage takes
- solution: subtract the times from two different tasks!



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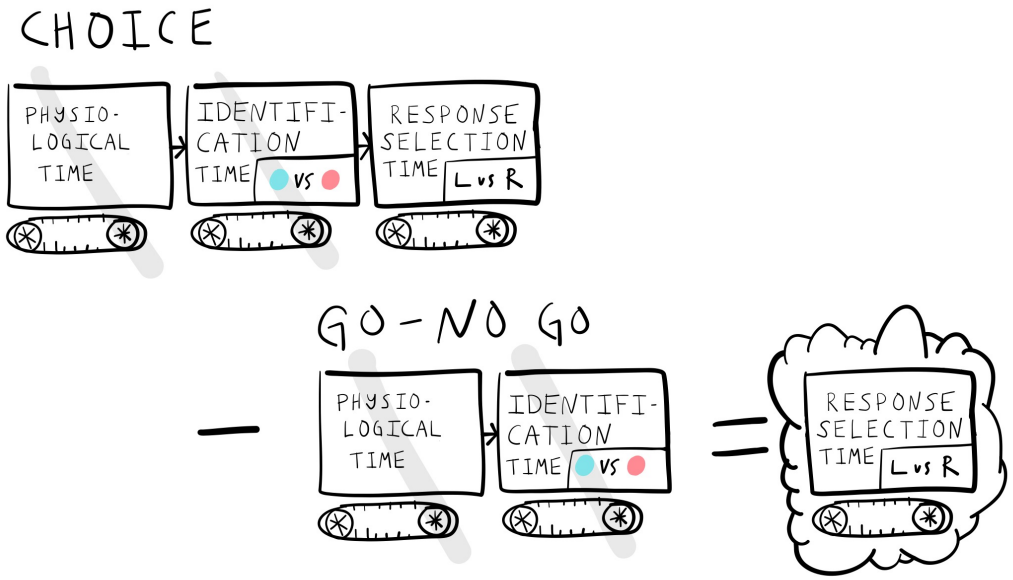
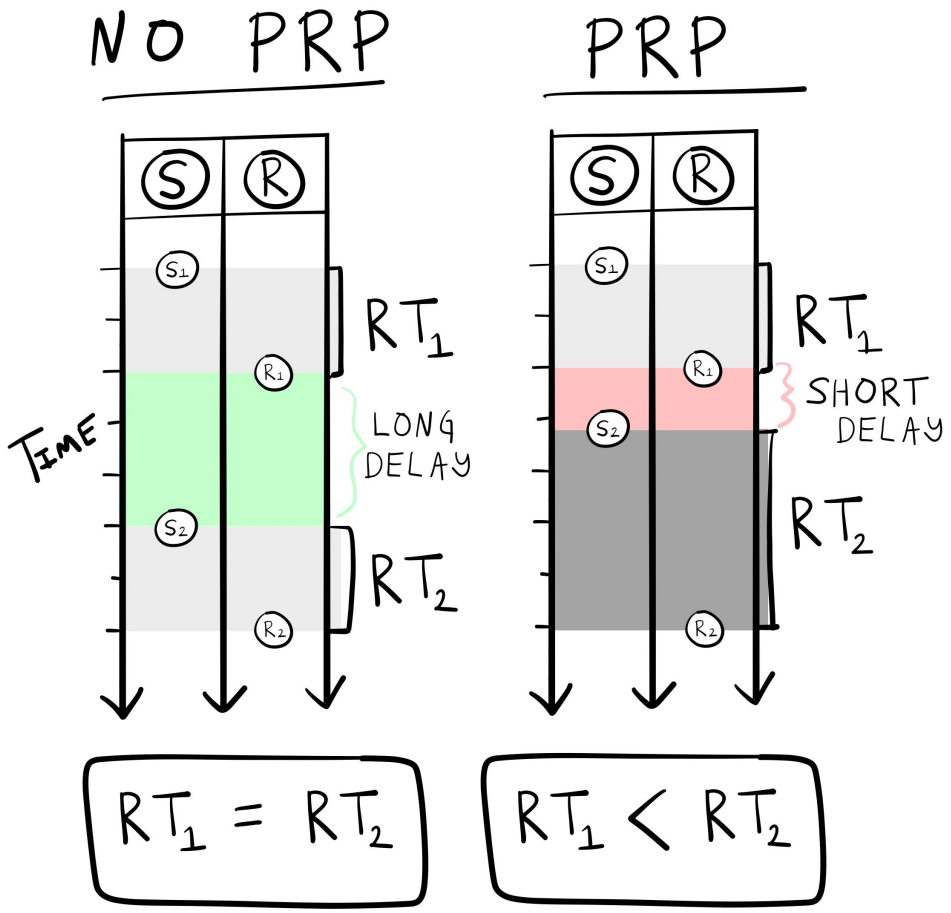


subtractive logic: reflections

- metaphors are attractive but can be misleading: what is the evidence that our cognition indeed works like an assembly line?
- potential issues:
  - what if multiple stages occur in parallel?
  - what if the stages don't have *constant* times?
- aftermath
  - additive factors logic (if two variables independently affect behavior)
  - neuro/brain imaging (brain activation in area 1 – area 2)

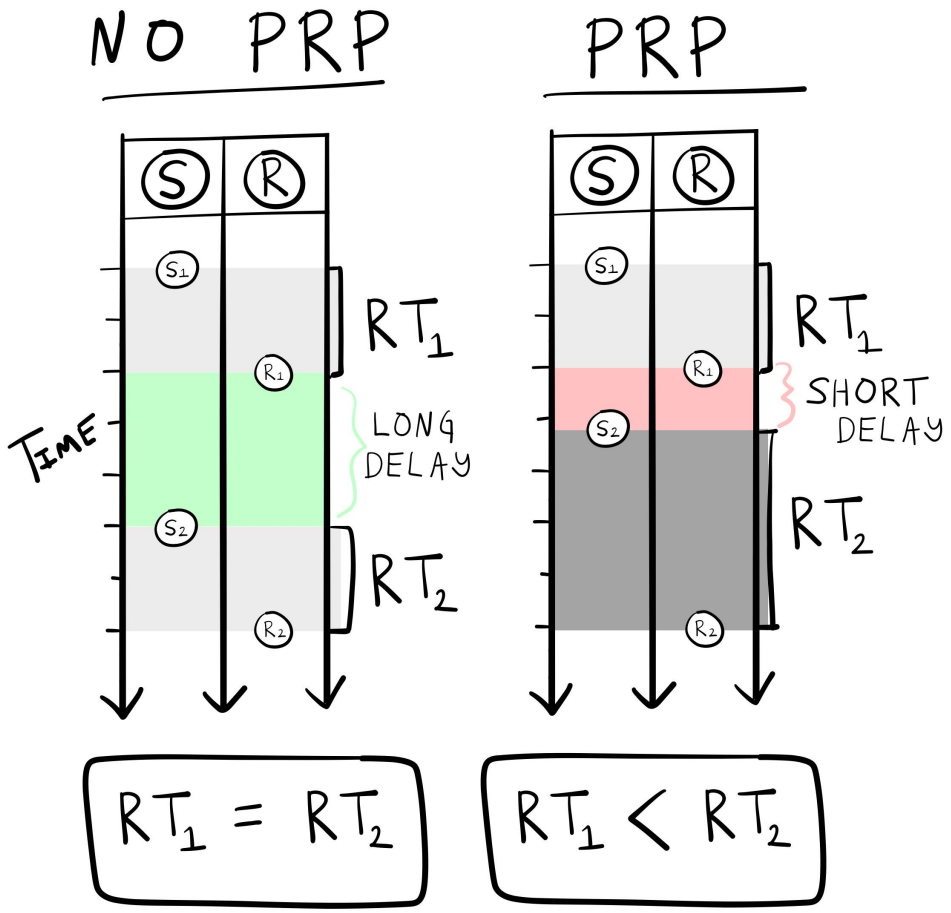
PRP effect

- the psychological refractory period (PRP) effect was documented by A.T. Welford
- the idea was that if two identical stimuli (S1 and S2) are presented with a short delay, then the time taken to respond to S2 is longer (RT2 > RT1)



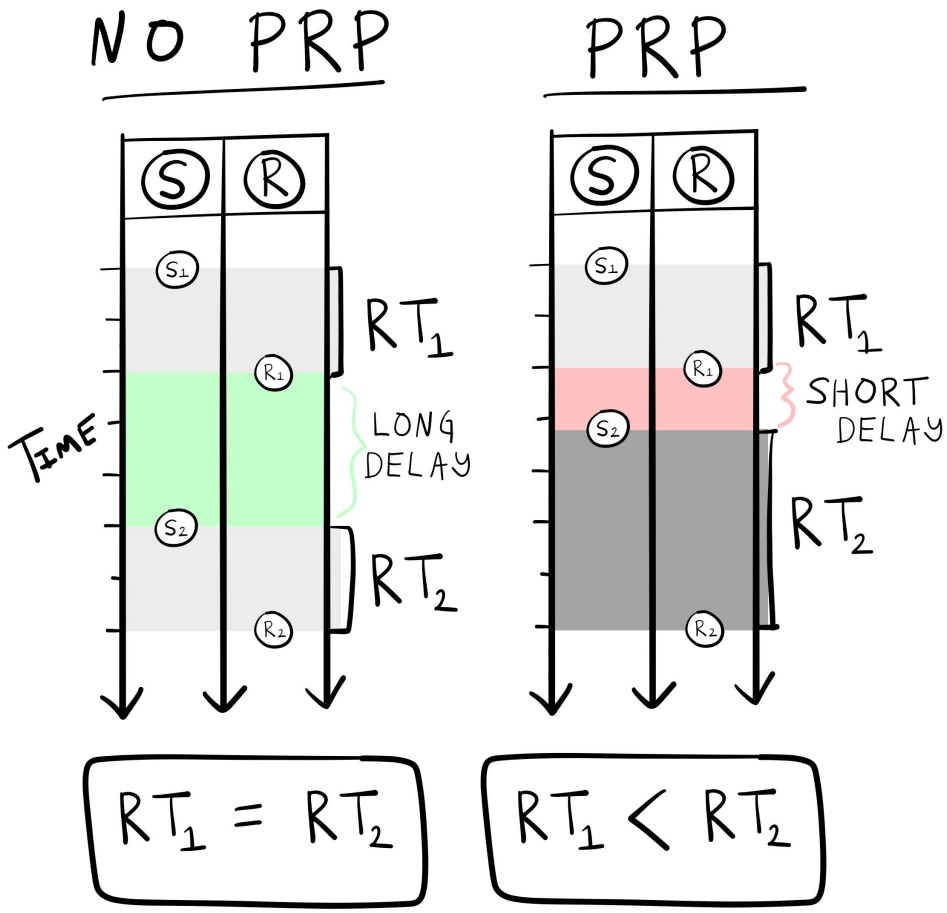
PRP effect: real-life examples

- groups of 2
- come up with a real-life example
- debrief



PRP effect: explanations

- properties of nerve fibers
- participant surprise: shorter delays produce more surprise which increases time
- limited-capacity single channel
  - inspired by the assembly line metaphor and how a bottleneck might be created if stimuli were presented quickly one after the other
  - also inspired by telecommunications...the idea of a “single channel” (next time!)



try a PRP experiment (optional)

- https://www.psytoolkit.org/experiment-library/experiment_prp.html

big takeaways

- the study of cognition moved from introspectionism to associationism to behaviorism to “cognitivism”
- cognition was influenced by world events
- Donders’ processing stages are an example of the assembly line metaphor, inspired from the industrial revolution
- other world events also influenced cognition and led to a greater emphasis on mechanisms that influence how individuals react to stimuli and what processes lead to responses

next class

- **before** class:
  - *work on:* project milestone #3
  - *post*: conceptual question
  - *block out time*: practice assessment 1
  - *explore*: L6 assignments
- **during** class:
  - the telephone metaphor of cognition
  - the rise of cognitivism via information processing