

Spring Brain Conference

Neuroscience Teaching Team

Visual Motor Adaptation

VISUAL MOTOR ADAPTATION - A demonstration will show students how the brain can adapt to change in visual input.

- I. Demonstration 1: How long does it take to adapt to prism goggles?
 - a. Divide students into two groups, Experimenters and Subjects
 - b. Students sit in two rows, each facing a partner
 - c. We are going to learn about visual motor adaptation
 - i. What is visual?
 - ii. What is motor? (movements)
 - iii. What is adaptation? (get used to something... temperature, glasses...)
 - iv. Cerebellum
 1. is important for adapting motor movements or learning new movements
 2. point out where it is & what it looks like
 - d. We will be doing an experiment. What are the parts of the Scientific Method?
 - i. Observation
 - ii. Hypothesis
 - iii. Methods / Experiment
 - iv. Results / Analysis
 - v. Conclusion
 - e. Observation
 - i. Have 1 student put on a pair of prism goggles and tell them to look at your finger
 - ii. Ask students what they notice (it looks like they're looking off to the side)
 - iii. See if they can figure out what goggles are doing, then explain prism goggles bend light to right or left
 - f. Hypothesis
 - i. If you had to put these goggles on in the morning, how long do you think it would take for you to get used to the goggles?
 - g. Methods / Experiment
 - i. To test how the goggles affect your hand eye-coordination, we can do a reaching task. (touch their own nose, then the finger of partner several times in a row)
 - ii. If you want to see how long it will take for you to get used to the goggles, what would be a good control experiment? (have Subjects do reaching task without goggles, notice that they have no problems)
 - iii. Test with goggles
 1. Make sure students have their eyes closed, then put on goggles
 2. On your signal, they can open their eyes and begin touching their nose and partner's finger as fast as possible for 1 min.
 3. Keep goggles on
 - h. Results / Analysis
 - i. Have experimenters report results (first they miss, gradually adapt)
 - i. Conclusion
 - i. Without thinking about it, subjects start to move their arms so that they hit their target every time.
 - ii. This is visual motor adaptation, your cerebellum at work
 - j. Hypothesis (again)
 - i. What will happen when they take the goggles off?
 - k. Methods / Experiment
 - i. Have students close their eyes, take off their goggles
 - ii. On your signal, open their eyes and begin reaching task
 - l. Results / Analysis
 - i. Now students point to opposite side of finger, but adapt
 - m. Conclusion
 - i. They had adapted to the goggles, but now they have adapted back
 - ii. How is this useful for everyday life? (glasses...)
 - iii. You can repeat on the other group of students if they want

- II. Demonstration 2: How does your cerebellum help you to adapt to prism goggles when throwing?
- a. Set up a target on blackboard or large paper
 - b. Choose students to be
 - i. Subject (wears goggles and throws balls)
 - ii. Recorder (marks where balls hit on blackboard)
 - iii. Clay ball supplier (hands clay balls to subject so subject can keep looking at target, not hand!)
 - iv. 2 Clay ball retrievers (pick up clay balls off of floor, give to Clay ball supplier)
 - c. Hypothesis
 - i. What will happen when student tries to hit the target with the balls while wearing goggles?
 - d. Methods / Experiment
 - i. Have subject stand ~20 feet from target
 - ii. Control: baseline without goggles (~10 throws)
 1. make sure subject is not looking at hand or ball before throwing (supplier should put them directly into subject's hand)
 2. Recorder marks where balls hit with one color
 - iii. Close eyes, put on goggles, begin throwing (mark hits with second color) (~20 throws)
 - e. Results / Analysis - Subject misses to side, gradually adapts
 - f. Conclusion – cerebellum
 - g. Hypothesis – where will balls hit when student takes off goggles?
 - h. Methods / Experiment – (mark hits with third color)
- III. Demonstration 3: Is adaptation to goggles specific to one movement (overhanded throw), or does it extend to other movements (underhanded throw)? (optional)
- a. Hypothesis
 - i. Is this adaptation movement specific?? i.e. if you adapt your overhand throw, does this carry over to your underhand throw?
 - b. Methods / Experiment
 - i. Choose new students for different positions
 - ii. Control: Throw baseline overhand and underhand
 - iii. Throw overhand with goggles until adapted
 - iv. Now throw underhand
 - c. Results / Analysis – underhanded throw is not adapted
 - d. Conclusion – adaptation IS movement specific, each movement will have to adapt on its own