Research Spotlight

The Thinking about Animals Game

Things can be related to each other in a variety of ways. For instance, living organisms may be similar in shape or mode of locomotion, belong to the same biological taxonomic group, or live in the same habitat. Biological taxonomic relationships are particularly useful for thinking because they divide the domain of living organisms into clear categories that can form a reliable basis from which to acquire new knowledge. For instance, biological taxonomic categories can reliably guide inductive inferences about biological features, because organisms that belong to the same biological taxonomic category also share many features in common. However, education research suggests that students’ knowledge of other, more easily observed relationships, such as those based on shared perceptual features or habitat interferes with their understanding of biological taxonomic categories (e.g., linking bats with birds or dolphins with fish because of locomotion types rather than understanding the features that bats and dolphins share because of being mammals).

The purpose of this study by Dr. Anna Fisher and graduate student Layla Unger is to test whether providing perceptual input that connects organisms that belong to the same biological taxonomic category fosters both the organization of knowledge into these categories, and the formation of inductive inferences about biological features that are consistent with these categories. The perceptual input we are assessing is a “Taxonomic Co-Occurrence Stream”: a stream of images of organisms in which organisms that belong to the same biological taxonomic category simultaneously co-occur, and organisms that belong to different categories do not co-occur. These co-occurrence regularities are specifically designed to counter interference from other types of relationships. To test the effectiveness of the Taxonomic Co-Occurrence Stream, participants are randomly assigned to either an Experimental group, that observes the taxonomic stream, or a Control group, that observes a stream in which animals linked by familiar non-taxonomic relationships (e.g., shape, habitat, or locomotion) co-occur. Participants in both groups are asked to complete pre- and post-tests that measure knowledge organization and inductive inferences about biological features.

For this study, children participate in a pre-test session, a training session in either the experimental or control condition as explained above, and a post-test session. For the pre- and post-tests, children complete two short tasks. The first involves arranging pairs of blocks that are each labeled as a different organism on a grid so that children put organisms that are the “same kind of thing” close together. On each trial, the pair of organisms used to label the blocks belonged to the same or different biological taxonomic categories. Some pairs consisted of organisms that children commonly correctly judge to be the same or different kinds of things, whereas others consisted of organisms that children commonly judge incorrectly. In the second task, children see triads of organisms on a computer screen consisting of a Target, a Match from the same category as the Target, and a Mismatch from a different category. Some triads included Match and Mismatch organisms that children commonly correctly judge to be the same or different kinds of things as the Target, whereas others included organisms that children commonly judge incorrectly (as in the triad here). In either case, children hear about a novel biological property of the Target, such as “plaxium blood”, and have to decide which of the two other organisms also shares the property.
Research Spotlight, continued …

The Letter Finding Game

The goal of this study by students in the Research Methods class is to examine the degree to which different types of music (i.e., instrumental music, music with English lyrics, and music with lyrics in French, as well as a no music control condition) acts as a distraction or stimulation for a task that requires focus and attention. Being able to focus is important for children, and recognizing what can enhance or hinder that focus can be a valuable tool. This project uses a letter cancellation task that is patterned after a kindergarten activity in which children are asked to look at an array of letters and circle all of the “target” letters (both upper and lowercase). They are scored on accuracy (how many they find and how many they miss), and speed (how quickly they finish). Researchers expect children to do the task more accurately and complete the task quicker in conditions with no background music. This project is aimed at determining the influence of music as a distractor or stimulator. Gaining insight into what distracts children and what can help them focus can help researchers and educators design better solutions for helping children to focus and pay attention.

Recruiting more NIRS Participants

functional Near Infrared Spectroscopy (fNIRS)

Because Dr. Anna Fisher’s and graduate student Layla Unger’s initial tests of the functional Near Infrared Spectroscopy (fNIRS) techniques with Children’s School students has been going so well, they are interested in recruiting more participants. This technique has been approved by CMU’s IRB as a minimal risk procedure for use with young children, but the research permission form that families signed for the 2015-16 school year does not cover its use. Thus, fNIRS studies require separate parental permission. fNIRS records brain activity by measuring changes in blood flow in a given region of the brain. Changes in blood flow are measured by emitting infrared light into the scalp and underlying tissues, including the surface of the brain, at a frequency that is primarily absorbed by blood. By detecting the amount of light that is absorbed, researchers can infer changes in blood flow over the course of a cognitive task. Light is emitted and detected by diodes positioned on the scalp and held in place with a soft cap. The benefit of fNIRS is that it allows the child to sit and move comfortably while doing the task. In fact, the next study involves collecting baseline data about fNIRS readings while children engage in free play with simple toys.

Note that the near infrared light exposure in these studies is comparable to sun exposure MINUS the UV wavelengths. The researchers also have health and safety protocols to ensure that the caps are free from lice and that the light never shines in the children’s eyes. Please sign and return the enclosed permission form if you grant permission for your child to participate in fNIRS studies.