

## **Experiment 10: Second-order learning (Study 2)**

The study used the vicarious learning procedure developed by Askew and Field (2007; Askew et al., 2008) in order to investigate second-order conditioning (Rescorla, 1980) by observing whether increases in fear-related responses for a scared-paired stimulus (CS<sub>1</sub>) were also found for an animal (CS<sub>2</sub>) never seen with fearful faces (US) if it is presented together with the first stimulus (CS<sub>1</sub>). The study was an extension of Experiment 2. The procedure was essentially identical: children first completed the NRT and FBQ, followed by vicarious learning and second-order conditioning, then post-learning NRT, FBQ and BAT measures. The difference was that in Experiment 2 the CS<sub>1</sub> was always a marsupial and the CS<sub>2</sub> always a caterpillar, whereas in this experiment, animals were counterbalanced across children. Thus half of the children saw a caterpillar CS<sub>1</sub> and marsupial CS<sub>2</sub>, and the other half marsupials as the CS<sub>1</sub> and caterpillars as the CS<sub>2</sub>. Also, children were asked to approach all four CSs (marsupials and caterpillars) in the behavioural avoidance task and hence avoidance measures for both CS<sub>1</sub> and CS<sub>2</sub> were taken. This meant that approach times for caterpillars and marsupials (as first and second order stimuli) could be compared to investigate whether, regardless of vicarious learning, children avoid caterpillars more than marsupials.

As in Experiment 2, second-order learning would:

- a) Indicate that vicariously learnt fears can transfer to other stimuli
- b) Explain why some phobic individuals often have no memory of a negative learning experience with their feared stimulus
- c) Suggest that treatment interventions should be targeted specifically at associations between the stimulus and other stimuli

### **Procedure and methods:**

Children filled in computer-based questionnaires and watched a vicarious learning video (see below). Fear-related beliefs and avoidance preferences for the animals were measured using a series of measures.

#### **1. Nature Reserve Task (NRT: Avoidance preferences)**

Children were asked to imagine that the board was a nature reserve containing one of the animal CSs. One of the animals, depicted by a photograph, was at one end of the reserve. Children are asked to place a Lego model representing themselves on the board where they would most like to be. The distance between the animal and the Lego figure was measured and indicated children's avoidance preferences for the animals. The same procedure was then repeated for the other animals.

#### **2. Fear Beliefs Questionnaire (FBQ: Self-reported measure of fear beliefs)**

Children filled in a computer-based fear beliefs questionnaire for two Australian marsupials (the Quokka and Cuscus) and two caterpillars (the Automeris and Nymphalis) to measure their fear-related beliefs for the animals. The FBQ contained seven questions for each animal; for example, “Would you be scared if you saw a quokka?” and “Would you be happy to have a cuscus for a pet?” Children responded on a 5-point Likert scale: 0 (*No, not at all*), 1 (*No, not really*), 2 (*Don’t know/Neither*), 3 (*Yes, probably*), and 4 (*Yes, definitely*). Mean fear beliefs scores for each animal was calculated for each child.

### **3. Vicarious Learning**

Depending on the group they were in, each child was either shown one Australian marsupial (e.g., a quokka) or a caterpillar (eg. Automeris) with 10 faces expressing fear (‘scared-paired’) and one animal (e.g., a cuscus) or caterpillar (e.g. nymphalis) alone on the screen 10 times (‘unpaired’). Each trial began with a randomly chosen animal or caterpillar picture appearing alone on the screen for 1 s. The picture remained displayed for a further 1 s while, depending on the counterbalancing order, either a scared face was simultaneously presented on the opposite side of the screen or no face appeared and the animal remained alone. Accordingly, the total length of a single trial from start to finish was 2 s. The interval between each pairing was a random interval that varied between 2 and 4 s. Animals were counterbalanced across conditions.

### **4. Second-order learning**

Children saw 10 pictures of the previously scared-paired marsupial or caterpillar presented on the screen opposite 10 pictures of a caterpillar or marsupial (caterpillars were seen with marsupials and marsupials with caterpillars), and the previously unpaired marsupial or caterpillar similarly next to 10 pictures of a caterpillar or marsupial. The pictures were displayed opposite each other for 2s, and the interval between each pairing was a random interval that varies between 2 and 4 s. This procedure was presented immediately following vicarious learning.

### **5. FBQ and NRT 2**

Each child completed the FBQ and NRT for the four animals for a second time to ascertain whether fear beliefs or behavioural intentions changed as a result of the vicarious learning.

### **Behavioural Avoidance task (BAT)**

6. Children were timed approaching and placing their hand in four pet-carrier boxes they believe contain the two caterpillars and the two marsupials. In all conditions the box was empty. Approach times for the individual animals were compared to give a behavioural measure for how threatening they perceived the previously scared-paired animal to be compared to the unpaired animal. Children were reminded at the start of the study that

they could refuse to do any task with which they felt uncomfortable, and if the child has made no attempt to approach the box within 15 seconds they were assumed to be withdrawing from this part of the experiment.