**How to run the experiment**

1. **Contents of the package:**

The package contains three folders:

1. **Reward uncertainty:** contains the MATLAB programs for running the reward uncertainty condition.
2. **State uncertainty:** contains the MATLAB programs for running the state uncertainty condition.
3. **Instructions:** contains the instruction sheet for each of the two conditions. There are two sheets for state uncertainty; one for each mapping between the two states (dark vs light) and the two response options (triangle vs rectangle) in the preliminary phase. This is to counterbalance the assignment of mappings to subjects. You will thus need to alternate between the two mappings when you run the experiment (e.g., mapping 1 for subject 1, mapping 0 for subject 2, etc).

The next two sections provide details about how to run each condition using the provided MATLAB programs. Before trying to run each condition, I would suggest reading the corresponding instruction sheet.

1. **How to run the reward uncertainty condition**

The program is divided into 3 files:

1. *DispParams.m*: this is where you can set the values of the main parameters of the experiment, such as the level of reward uncertainty =0.7 (this should match the state uncertainty level), the number of trials before and after the switch (“nBS=100” and “nAS=100”) and the value of the positive reward (“r0=10”). This file also generates the sequence of observations. Everything is already set up, and the file will be called automatically in the main program *RewardUncertainty.m*.
2. *OneTrial.m*: this contains what should be displayed/computed in each trial. This file will be called by the main program inside a ‘for’ loop going through all the 200 trials. All display timings such as the inter-trial duration (WaitSecs(0.75)), the duration of stimulus or reward feedback are defined inside this function. It is also where you can play with the size of the response shapes if needed.
3. *RewardUncertainty.m:* This is the main function that runs the experiment. You can call it by typing RewardUncertainty(3) if, for example, you want to run the 3rd subject.

The output of the program will be a text file named ‘*RewardUncetainty\_subNo.txt’*, where SubNo is the current subject’s number. The file will record the following variables: SubNo, TrialNo (trial number), Mapping (mapping randomly generated at the beginning, and could take the value of 0 or 1), State (0 for black and 1 for white), Resp (0 if the response associated with ‘black’ state is chosen and 1 if the ‘white’ response is selected), Acc (1 if the response is correct and 0 otherwise), reward (0 or 10 points), Balance (number of bonus points won so far), ReactionTime. The function will also record all variable into a separate MATLAB file called Data\_SubNo.mat, as a backup.

Note that for the payment of participants you will need to define the exchange rate from points to Australian dollars in DispParams.m that you want to use. The value I’ve set is “rate=1/200”.

1. **How to run the state uncertainty condition**

As in the reward uncertainty case, the program is divided into three MATLAB functions: a function for setting the parameters (Disparams.m), a function for the sequence in one trial (OneTrial.m), and a main function that runs the experiment (StateUncertainty.m). The difference is that now we have two phases, and that in phase one, there is a pre-training part of 90 trials and post-training part of 250 trials. Here are the main files categorised by phase:

1. *StateUncertainty.m*: This is the main function that runs the experiment. Call it by typing StateUncertainty(3, 0) if you want to run the 3rd subject with mapping 0 or StateUncertainty(3, 1) if you want to use mapping 1.
2. *DispParamsPreTraining.m, DispParamsMain.m* *and DispParamsPhase2.m*: contain respectively the values of the parameters to use in the pretraining part (first 100 trials in the preliminary phase), the post-training part (last 250 trials in the preliminary phase) and in the learning phase. Again, these functions will also be used to generate the sequence of observations to use in each part.
3. *OneTrialPhase1.m and OneTrialPhase2.m*: Encode what to compute/display on each trial of the estimation and learning phase respectively.

The program will output six text files and two MATLAB data files. The two important ones to keep are ‘StateUncertaintyPhase1\_Main\_SubNo.txt’ and ‘StateUncertaintyPhase2\_SubNo.txt’ (we also need FrequencePhase1\_Main\_ SubNo.txt to generate some plots but we can obtain it from the first file), which record for each trial, the stimulus contrast (% of white dots), state, response, accuracy and reaction time (as well as reward in phase 2). The extra MATLAB data files would work like a backup.

There are a bunch of files that start with PAL\_ (as well as History.m) contained in the folder “PAL files”. These are used to estimate the psychometric function. **You need to add the folder to the MATLAB search path using the “pathtool” function**. I would suggest copying them with the other files in the main directory just in case you cannot permanently save a new search path in your lab computer.

Note that you will need to define the grey value to use in StateUncertainty.m depending on the luminance of your screen. In my case, I used “grey=200”. Once you have determined your grey value, you will need to change the grey background of the pictures used for the reward feedback on a software like Photoshop (the images are contained in the “Images” folder within each condition’s folder).