

- The title or name of the experiment:

Pupil dilation accuracy in the prediction of random events

- The name, affiliation, and email address for the lead experimenter(s) for the study:

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- Short description or abstract of the purpose and design of the experiment:

Starting from these studies and the cumulative evidences that the human psychophysiological and electrophysiological systems react differently before the presentation of two categories of emotional stimuli such as pictures, sounds, etc. (Mossbridge, Tressoldi and Utts, 2012), we aimed to investigate whether pupil dilation (PD) can predicts random events at a level of single trial and not, as it is custom, averaging different trials. An increase of approximately 20% above the mean chance expected (MCE) has already been observed by Tressoldi, Martinelli, Semenzato and Cappato (2011) in the prediction of alerting and neutral sounds presented randomly at level of single trial.

Two new experiments had been completed and two exact replications aimed at confirm the results observed, will start soon.

- The planned number of participants and the number of trials per participant.

Given that the expected effect size is estimated in the range 0.10-0.30, we planned to recruit 100 participants to achieve a statistical power >0.80

The study consists in two experiments using the following procedure:

Experiment 1:

Procedure

Each participant was seated in front of a 19 inch monitor in a sound and light attenuated lab. Before the formal sessions, each participant was told: “Before the formal experiment, we must record your personal pupil dilation reactivity to the two types of stimuli you will see behind the door. You must simply watch what will happen on the screen without doing nothing. When the door opens, you will see a gun shooting on you hearing a shot or you will see a smile. You will see ten times the shooting gun and ten times the smile, presented randomly”.

If there were no need of further clarification, the task started with the eyes position calibration for the Eye Tracker. Each participant was required to follow a dot slowly moving in different positions of the monitor.

Once the calibration was completed, the task started with the individual reactivity recording phase (IRR). The sequence of events is presented in Figure 1a.

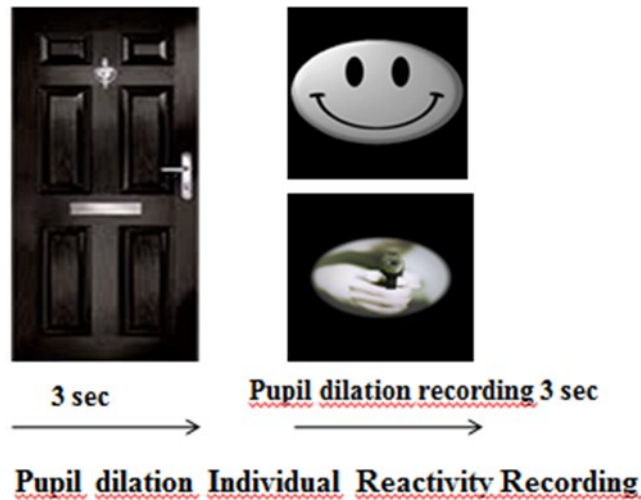


Figure 1a:

Inter item interval was 3 sec. At the end of the IRR, the software averaged the pupil dilation measures related to the shooting gun and the smile that served as templates to be compared with the averaged pupil dilation measured in the prediction phase in the formal experiment.

After the recording of the IRR, the formal experiment started.

The research assistant instruction to each participant was: “Now your task is to guess what you will see behind a closed door that will be presented in the center of the monitor. Behind the door you can see a gun shooting on you or a smile. The computer will monitor your pupil dilation and will guess for you what you will see. Remember that the choice of the shooting gun and the smile, is completely random and hence it is not possible to find an underline rule to predict their sequence. The task consists in two sessions of 10 trials each. For each correct hit you will gain 0.5 euros”.

The sequence of events is presented in Figure 1b.

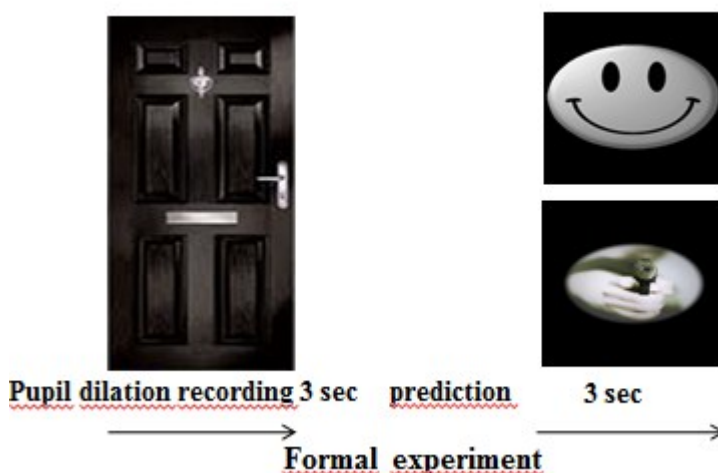


Figure 1b

In this case pupil dilation was measured for 3 sec during the fixation of the door. Just after, the software matched the averaged pupil dilation with the two templates related to the

shooting gun and the smile, recorded in the IRR. The smallest difference was used to predict which of the two stimuli will appear. For example, if in the IRR, the averaged pupil dilation measures related to the shooting gun and the smile were 4.5 and 4 mm. respectively, and the averaged pupil dilation recorded during the fixation of the door was 4.4, the software predicted the shooting gun. Inter item interval was 3 sec.

Software: the program controlling randomization, stimulus presentation, pupil measurement and automatic scoring was written by one of the authors using E-Prime™ v.2.0 and interfaced with the eye tracker

Experiment 2:

Procedure

Each participant was seated in front of a 19 inch monitor in a sound and light attenuated lab.

Before the formal sessions, each participant was told: “Your task is to guess under which of two identical doors there is a smile. The computer will monitor your pupil dilation and will guess for you. Before the two doors presentation, you must observe a cross in the middle of the monitor for 5 seconds. Just after, you will have 10 seconds to look at the two doors. Please move slowly your eyes between the two doors, you have enough time to look at both.

Remember that the choice of the doors of the smile, is completely random and hence it is not possible to find an underline rule to predict it. The task consists in two sessions of 10 trials each. For each correct hit you will gain 0.5 euros”.

If there were no need of further clarification, the task started with the eyes position calibration for the Eye Tracker consisting in following a dot slowly moving in different positions of the monitor.

Procedure

The sequence of events of this experiment, is presented in Figure 2

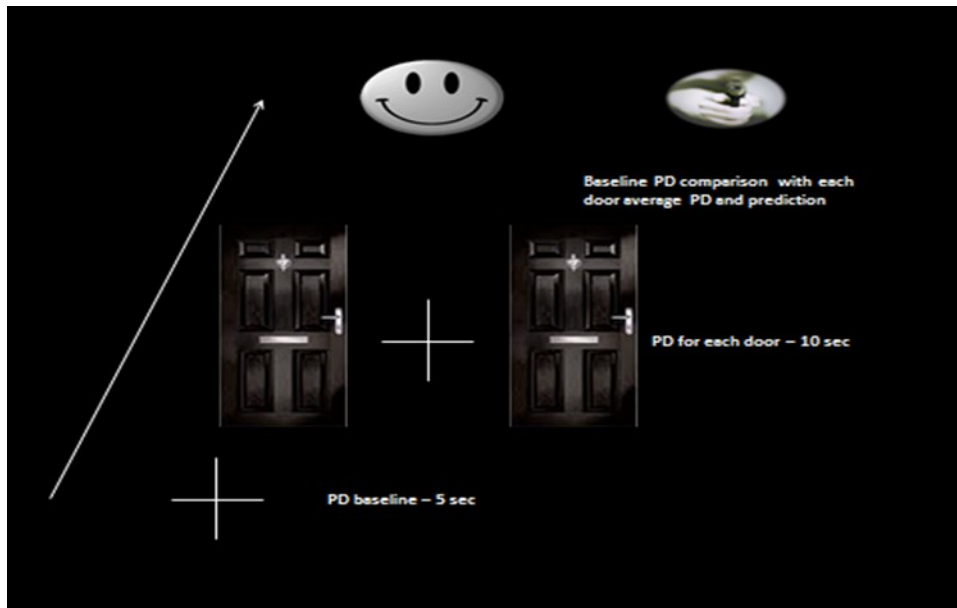


Figure 2: Sequence of events of the experiment

In this case the individual PD baseline was obtained averaging the PD during the 5 seconds fixation of the white cross in the middle of the screen before the two doors presentation. Just after, the software recorded the PD when eyes were looking at the two doors and averaged it after 10 seconds. These two means related to the two doors, were compared with the baseline condition.

Assuming that the PD enlarges with arousing stimulation (Bradley et al., 2008) the least difference was used as default to predict the smile. For example if the PD means of the door at the left and at the right of the fixation point are 4.0 and 4.2 respectively and the baseline PD, 3.9, the software predicted that the smile was behind the door at the left.

To compare the efficiency of the prediction by using PD, we added a manual condition, that is a simple forced choice prediction in a normal state of consciousness. In this case, see procedure, participants were required to guess which door masked the smile. The presentation of two version were balanced among the participants.

Summary of the confirmatory hypotheses:

In the first experiment we expect:

- to replicate the result that pupil dilation predicts the appearance of the alarming stimulus, the shooting gun, more than the mean chance expected 50%.
- to replicate the result that pupil dilation predicts the appearance of the neutral stimulus, the smile, below the mean chance expected 50%.

In the second experiment we expect:

- To replicate the result that pupil dilation can predict the door covering the smile more than the mean chance expected, 50%.

- A statement that the registration is submitted prior to testing the first participant, or indicating the number of participants tested when the registration (or revision to the registration) was submitted.

At this date two formal experiments have been completed and the two exact replications will start soon.