

## Online computer mouse tracking study of adult belief processing

### Explanation of Methodology and Dataset

#### Methodology

##### **Participants and Procedure**

267 participants took part in an online experiment, recruited through [Prolific](#) using the following pre-screening criteria:

*Age:* 18 – 50 years

*Language:* Fluent English, first language English and primary language English

*Handedness:* Right-handed

*Past participation:* Minimum 10 previous submissions, minimum approval rate 95%, registered for Prolific at least 3 months prior to the study release date.

Participants could only complete the study using a desktop device (i.e., desktop computer or laptop) and were exited from the study if they attempted to complete it using a mobile device. Participants were requested to only use a device with an external physical mouse where possible.

Participants completed a theory of mind task. Experiments were run using [lab.js](#). On each trial participants clicked a start button, located in the bottom centre of the screen, and a short video played. In each video two untrained actors, one female, one male, sat across from each other at a table on which there was a small toy, a red cup and a blue cup. The female actor first put the toy in one cup. In true belief (TB) scenarios, the female actor then moved the toy to the second cup, and the male actor left the room. In false belief (FB) scenarios, the male actor left the room first, and then the female actor moved the toy to the second cup.

At the end of every video the final frame remained on-screen and a question appeared beneath. The three experimental questions were: “Which cup does HE think the toy is in NOW?” (belief question); “Which cup do YOU think the toy is in NOW?” (reality question); “Which cup do YOU think the toy was in FIRST?” (memory question).

Participants gave their answer on each trial by clicking on one of the two response boxes, located in the top left- and top right-hand corners of the screen. The answers to all questions was always either “red” or “blue”, with a 50% distribution of which answer was correct. The location of the “red” and “blue” response boxes was held constant across trials for a participant, and counter-balanced between participants.

Participants were instructed to answer as quickly and as accurately as possible. Participants were also told to start moving their mouse as soon as the question appeared, even if they were unsure of their answer. If participants didn’t initiate their first mouse movement within 1000ms of the question appearing, they received an onscreen warning telling them to move faster on subsequent trials. Participants were also instructed to keep their mouse

within the start box while watching each video. If they moved the mouse outside the box, they received an onscreen warning.

Prior to the experimental trials, participants completed four practice trials to familiarise themselves with the requirements of the task. These practice trials used the same video scenarios as the experimental trials, but used different questions, asking participants to report the colours of the shirts or the locations of the cups in the videos.

Participants completed 12 experimental trials: 2 trials from each scenario (2) x question combination (3). Experimental trials were completed in four blocks of three, with each block containing one trial of each question. Across the first two and the final two blocks, participants viewed three videos from each scenario. Questions and videos were otherwise presented in a random order.

### **Datasets**

Two .csv files are provided.

***“Demographic\_Info.csv”*** contains demographic information for each participant, recorded at the beginning or end of the experiment. The following column headings are used:

**p\_ID:** 4-digit randomly assigned participant ID

**IRI\_total:** Total score on the [7-item perspective-taking subscale of the Interpersonal Reactivity Index](#). See: Davis (1980). *JSAS Catalog of Selected Documents in Psychology*.

**EQ\_total:** Total score on the [10-item Empathy Quotient](#). See: Greenberg et al. (2018). *PNAS* <https://doi.org/10.1073/pnas.1811032115>

**Age:** Age in whole years.

**Gender:** Response in answer to the question “What is your current gender identity?”. Response options were: “Female”; “Male”; “Non-binary / third gender”; “Prefer not to say”.

**Device:** The nature of the device that participants reported completing the study on. Response options were: “A desktop using an external computer mouse” (“desktop\_mouse”); “A laptop using an external computer mouse” (“laptop\_mouse”); “A laptop using a built-in trackpad” (“laptop\_trackpad”); “other”; “do not know”.

**Hand:** Self-reported handedness. Response options were: “Right”; “Left”; “Ambidextrous”.

**Mouse\_hand:** Self-reported hand used to operate a computer mouse. Response options were: “Right”; “Left”.

**DB\_memory:** Response to the following debrief question, given at the end of the study: “Did you try to “artificially” improve your memory performance, such as by making notes or pointing at the screen while watching the videos?”. Response options were: “Yes”; “No”.

**DB\_video\_quality:** Response to the following debrief question, given at the end of the study: “Which of the following best describes the video quality in the main part of the study (not the practice)?”. Response options were: (1) “All videos played fine”; (2) “Some slight delay after

pressing start, but otherwise the videos played fine”; (3) “Some videos played slowly or stopped for short periods (after the initial starting delay)”; (4) “Many videos played slowly or stopped for short periods (after the initial starting delay)”; (5) “So many videos stopped, or played slowly, that it became difficult to actually complete the study”.

**“Experimental\_Trials.csv”** contains participant performance from the 12 experimental trials. This data file is provided in long format, with one trial per row. The following column headings are used:

**p\_ID:** 4-digit randomly assigned participant ID

**Order:** Numerical order (1 – 12) in which the trial appeared.

**Probe:** Experimental question asked (Belief; Reality; Memory).

**Scenario:** Video scenario presented (false belief = FB; true belief = TB).

**Answer:** Correct answer to the question.

**Left\_colour:** Which response option (red or blue) was in the top left-hand corner.

**Accuracy:** Whether the participant gave the correct answer (1) or not (0).

**Wrong\_start:** Whether the participant’s first recorded mouse position after the question appeared was within the start box.

**IT:** Time elapsed in ms between the question appearing and participants making their first mouse movement. This is calculated by lab.js.

**RT:** Time elapsed in ms between the question appearing and participants clicking on a response box. This is calculated by lab.js.

**timestamps; xpos; ypos:** Recorded mouse x-position, y-position, and associated time-stamps. Recording started once participants made their first mouse movement after the question appeared, and ended when the participant clicked on a response box. Mouse positions are recorded relative to individual participants’ screen-size.

Mouse path trajectories are recorded in “mousetrap” format. In order to analyse the mouse path data, we recommend using the [MouseTrap package \(Kieslich et al., 2022\)](#) in R. Data files should be imported using the `mt_import_mousetrap` function in the MouseTrap package. Please see the MouseTrap reference manual, examples and resources for further information.

### **Data Quality**

We provide here all data from all participants who completed the study. However, we would recommend (in addition to the typical participant- and trial-level outlier exclusion criteria applied to mouse-tracking data) excluding any participants responding “Yes” to the Debrief Memory question, or response options 3 – 5 to the Debrief Video Quality question (see details above). Further, we would recommend excluding any trial flagged as “Wrong\_start == 1” from analyses of temporal or spatial characteristics of participant responses.