

**Report Format**

You are expected to produce a report with succinct answers to three research questions, and a data visualisation. The expectation is that you write one or two paragraphs per question, and submit a report of roughly 1 or 2 pages (A4). Your answers will be judged on accuracy, not verbosity.

**Report Options**

For this report, you will be given two options. You need only complete one of these options, and you are free to choose which. There will not be a difference in grading or weighting, as both options are of equivalent difficulty.

**Grading**

The assignment will be graded as “Satisfactory” (pass), “Failed” (fail), or “Revision Required” (fail with option to redo). In the latter case, you will be provided with an indication of how your report can be improved to achieve a satisfactory grade.

**Deadline**

The deadline for this assignment is 23 February 2021, 5 pm (UK time).

**Required Data**

In the Data Analysis 3 practical, you and your colleagues took part in an experiment. If you missed this practical, a short summary can be found below. A selection of the data generated in this experiment is provided on Moodle, under “NST Part IB Experimental Psychology” / “Practicals 2020-21” / “Lent Term” / “Data analysis 3-7” / “Data Analysis Assignment”. The file format is comma-separated values (CSV), which is the format used for data in previous practicals.

**Required Software**

You are free to use the software that you feel most comfortable with. This includes Python and JASP, which have been the focus of the practicals; but is not limited to those. Alternative options include Libre/OpenOffice Calc, Microsoft Excel, iWork Numbers, and SPSS; or any other platform that you might prefer. The data is provided as CSV, which you can directly download to your computer (e.g. to import into JASP); and a pre-prepared Jupyter Notebook is provided in which the CSV can be loaded directly.

## Experiment Background

Participants were Cambridge undergraduate students who took part in a web-based experiment as part of Data Analysis practicals in the NST-IB / PBS4 Experimental Psychology module. (Demographic details are included in the data file.) The experiment consisted of two main parts: an individual short-term memory test, followed by three rounds of a collaborative short-term memory test/game.

In the individual test, participants were presented with two or four Gabor stimuli (sinusoidal gratings with an orientation) for five seconds, followed by a maintenance duration of three seconds during which the items were masked with noise gratings, and finally followed by the probing of one of the stimuli (selected at random). Participants used the mouse to indicate the orientation of the probed stimulus as they recalled it. This short-term memory test was used to assess the short-term memory capacity of each individual player.

In the collaborative game, participants were paired against artificial agents that were programmed to behave like human players. In each of 20 trials, a pair was presented with eight stimuli. Participants were free to claim any number of stimuli, and the artificial agent would ultimately claim all remaining stimuli (it was programmed to pick up four at reasonable speed, and further at slightly longer delays; much like humans did in a pilot experiment). After all stimuli were claimed, they were masked for three seconds, and one stimulus was probed for each player. As in the short-term memory test, the player could use the mouse to indicate the orientation of the probed stimulus. Their collaborator provided a response generated from a normal distribution that matched a human player's. Rewards were provided, and scaled according to each player's accuracy.

Crucially, participants played three games: one with a collaborator of higher short-term memory capacity, one with equal capacity, and one with lower capacity. Participants were made aware of their collaborator's capacity at the start of each game.

Participants were not directly made aware of the artificial nature of their collaborators; in fact, the experiment's narrative was that they would be paired up with other humans. Participants were made aware after the game that being paired up with a computer-based opponent was a possibility, and were asked to rate each collaborator's human-likeness on a scale of 1 (computer) to 10 (human).

**OPTION 1: A test of differences**

Participants played a game with a higher-capacity collaborator, and another with a lower-capacity player. In an equitable collaboration, higher-capacity players could be expected to claim more items, as they have better short-term memory. (This is akin to carrying a larger share of weight if you are stronger than your collaborator.)

The research question is this: Do participants claim a different number of items when they are playing with a lower-capacity collaborator compared to when they are playing with a higher-capacity collaborator?

**Question 1:** Plot the data in the way that you think best highlights the comparison between the number of claimed items in the higher-capacity compared to the lower-capacity condition. Then explain why you opted for your visualisation of choice.

**Question 2:** Explain which statistical test would best help answer the research question.

**Question 3:** Run the statistical test of your choice, and report and interpret its outcomes. The statistics in your answer do not have to be formatted according to a specific format. Your answer should include a correct interpretation of the test's  $p$  value.

**OPTION 2: A test of relationships**

Participants played with artificial agents, but were not made aware of this at the time of the game. However, at the very end of the experiment, they were allowed to indicate whether they thought their collaborator was a human on a scale of 1 (computer) to 10 (human). In addition, after each game, participants rated the quality of the collaboration in three ways.

The research question is this: Did participants have a tendency to rate the collaborations as good if they thought the collaborator was human?

*(Note: Each participant played three different games, each with a different collaborator. Assume that you can treat these as independent samples.)*

**Question 1:** Plot the data in the way that you think best highlights the relationship between the collaboration quality rating and the collaborator humanness rating. Then explain why you opted for your visualisation of choice.

**Question 2:** Explain which statistical test would best help answer the research question.

**Question 3:** Run the statistical test of your choice, and report and interpret its outcomes. The statistics in your answer do not have to be formatted according to a specific format. Your answer should include a correct interpretation of the test's  $p$  value.