Hong Kong Student Science Project Competition 2022
Extended Abstract (Investigation)

Team Number: JBBC202   **Project Title: The Face Detective**   **Project type: Investigation**

To our best knowledge and after thorough literature research, as at <u>05</u>/<u>07</u>/<u>2022</u> , there are / ~~are no~~*-similar works. If there are, the reference links are as below:

> https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6204458/
> https://pubmed.ncbi.nlm.nih.gov/26528640/

The enhancement our project has made for the existing related products or research is summarized as below:

> ➢ We have tested the above theories with a broader audience and shifted the focus onto the perception of the viewer and role of the right brain, rather than simultaneous representation or emotional expression. We have also tested if less data provided to the viewer affects the result (See Experiment 2) and extended it to areas of emotional perception (See Experiment 3).

I.   Background

> ➢ Scientists estimated that humans can remember up to 10000 faces in life. How does our brain analyze all this information?
> ➢ **<u>Literature review</u>:**
> > ❖ LEFT-SIDE BIAS: The left face is more representative of the whole face than the right face
> > https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6204458
> > ❖ LEFT-CHEEK BIAS: The left cheek of a model appears more emotive
> > https://pubmed.ncbi.nlm.nih.gov/26528640
> > ❖ EMOTIONAL LATERALIZATION DUE TO RIGHT HEMISPHERE DOMINANCE: The right hemisphere has a greater role in emotional perception than the left hemisphere of the brain
> > https://www.frontiersin.org/articles/10.3389/fnagi.2019.00055/full
> ➢ Our study consists of 3 experiments (left and right faces in the rest of the extended abstract below refer to the left and right faces seen from the viewer's perspective)
> > ❖ Experiment 1: Participants to evaluate whether a picture formed of the left face and its mirror image (abbreviated as left-left) or the right face with its mirror image (abbreviated as right-right), is identical to the original photo
> > ❖ Experiment 2: Repeats the procedure of Experiment 1 but having the faces covered with a mask
> > ❖ Experiment 3: Participants to rate the level of happiness shown in the left-left image and the right-right image of smiling people
> ➢ **<u>RESEARCH GAP:</u>** We may not be able to totally ensure that the left face of the person in the picture (to the viewer) falls into the left visual field

II.   Objectives

> ➢ We hope to further explore the functions of the right hemisphere of the brain.

III.   Hypothesis

> ➢ **<u>HYPOTHESIS:</u>** More people will think that the new face formed by the original left face of a person and its image is identical to the original face, compared to the new face formed by the original right face of the person and its mirror image.
> ➢ **<u>EXPLANATION AND RELATION TO EXPERIMENTS:</u>** The right hemisphere of the brain is more involved in both facial recognition and emotional perception. It processes information from our left visual field; thus we can determine that it is more involved in the above if participants rely on the left side of the face for perception.

IV.   Methodology

> ➢ **<u>Experimental protocol of the computer programme experiment tool:</u>**
> > ❖ Experimental group: Teachers and students randomly at school
> > ❖ EXPERIMENT 1: Original face of Person A will be shown for 5 seconds; a blank space appears to cover the original face of Person A for 5 seconds; a random face of Person A appears on the screen for 5 seconds (right-right/left-left/original (*control set-up)*); participants vote whether the faces shown are identical or different without time limit → Repeat steps with Person B (repeated experiment)

- ❖ EXPERIMENT 2: Repeat procedures of experiment 1, but there is a picture of a mask edited separately onto each face of Person A and Person B
- ❖ EXPERIMENT 3: Left–left face of Person C will appear on the screen for 5 seconds; the participants will rate the emotion on a scale of 1 to 5(most happy); blank space appears for 5 seconds; repeat similarly with right–right face of Person C → Repeat all steps with Person D (repeated experiment)
- ➢ **Analysis used in the investigation:**
  - ❖ EXPERIMENTS 1&2: Analysis is made by comparing the number of people who thought the left-left face was identical to the original, to the number of people who thought the right-right face was identical to the original
  - ❖ EXPERIMENT 3: We compare the total marks given by participants based on the happiness of the left-left face and the right-right face

V.   Results

- ➢ **Presentation of data:**
  - ❖ EXPERIMENT 1 *Percentages are rounded down to 1 decimal place for all experiments*

	Left-left	Right-right	Original
Identical	5(55.5%)	6(60%)	12(92.3%)
Non identical	4	4	1

  - ❖ EXPERIMENT 2

	Left-left	Right-right	Original
Identical	8(66.6%)	4(33.3%)	8(100%)
Non identical	4	8	0

  - ❖ EXPERIMENT 3

	Left-left	Right-right
Total marks	113	85

- ➢ **Data analysis:**
  - ❖ Experiment 1: There is little difference in the data obtained from the left-left face and right-right face. The result is not very obvious.
  - ❖ Experiment 2: More people thought that the left-left face was identical to the original, compared to the right-right face of the same person. The result is more obvious.
  - ❖ Experiment 3: More people thought that the left-left face of the person looked happier than the right-right face of the same person. The result is obvious.
- ➢ **Interpretation and implication of results:**
  - ❖ Experiment 1: The advantage of the right hemisphere of the brain may not be very significant
  - ❖ Experiment 2: We rely on the right hemisphere of the brain for facial recognition
  - ❖ Experiment 3: We rely on the right hemisphere of the brain for emotional perception.
- ➢ **Limitation and comparison with existing related works**
  - ❖ Experiment 2: It corresponds with the left-side bias effect.
  - ❖ Experiment 3: This result does not correspond with the effect of left-cheek bias, but corresponds with the theory of right hemisphere dominance when perceiving emotion.
- ➢ **Importance or impact of the research and application to real problems:**
  - ❖ This can help us understand how the brain works and take advantage of the left visual field to help us recognize faces better.

VI.   Conclusion

- ➢ From the three experiments, because of left-side bias, humans could never precisely grasp the entire scope of one's facial image, causing misidentification of persons, especially when there is lack of data. The right hemisphere of the brain has a larger role in perceiving faces, including facial recognition and emotional perception. Thus, we can make use of the left visual field to leave a deeper impression of others' faces on our minds. This helps us understand more about the functions of the right hemisphere of the brain and meets the objective.