Brian Wahome
SS110: Investigation Paper 1

Introduction

In my first year at Minerva, I was always amused by how the students struggled to identify individuals from different races. I personally struggled to tell individuals apart unless they had a very distinct feature like long, blonde hair. Over time, I became better and now, It is all too natural being able to tell faces apart. It is clear to me that facial discrimination is a process and thus this investigation into prosopagnosia. What defects hinder this process on an anatomical level?

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The Process of Facial Recognition

Facial cognition, just like most discriminatory processes follows entails both perception and sensation. While there are multiple perceptions that can facilitate sensation (Vision, sound and even touch), we will focus on the visual sensation. According to the research paper by Sam S Rakover, Cognitive and Computational processes, there exists a universal set of facial features. Facial recognition is one field where both the computational approach and biological approach, at least theoretically are virtually similar. PCA decompositions of multiple facial datasets almost always result in the same data hinting to a universal set of facial features namely the eyes, nose, hair etc. Similarly, people who develop this disability in adulthood, are able to identify a face but the problem comes in identifying whose face it is (Rakover, S. (2019)). A counterargument to this might entail investigation into how children who are born with the prosopagnosia abnormality. A research question along this line would be, given that such children are not trained to know what a face is, do they really have a general/universal perception of faces? Research suggests that facial recognition is not trained but innate, children are born with the ability to do so but this is not conclusive. Either way, this prompts the next question: [1]

[1] **#critique, #evidencebased:** I take a three-step process when discussing my papers, first I try to engage them and summarize what they are saying, then I engage the assertions they make and as a pivot to the next paper, I ask my own questions that I think the next paper may help address. In fact, this was how I found my paper, I sought those that may answer my questions. I have to acknowledge the potential for bias here but given the evidence a lot of these papers are based on, I feel relatively confident to follow the flow they create by answering the questions they invoke

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Can we recognize faces without knowing them?

To investigate this assertion that there are general facial features that the brain identifies, a review of David Rivolta's paper was done. A lot of patients describe their vision of faces as a blur. This, however, does not correspond with what they should be seeing going by Sam S Rakover's paper although it is not an outright falsification. It seems like these individuals, at least those who got the defect from brain damage, should be able to recognize that that is a face or a human face that they are seeing. But perhaps the deficit comes in communication where they have no better way to communicate what they see than a brain blur but in essence, they could be seeing the general facial features with a disregard for the finer details that facilitate discrimination. (Rivolta, Prosopagnosia)

Covert or implicit recognition refers to the ability to process information, despite a lack of awareness. This ability to unconsciously recognize information has been found in many domains, starting more than a century ago. (Rivolta, Prosopagnosia)

An example is described in this excerpt from David Rivolta's When all faces are the same:

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Might there be instances of covert or implicit recognition in any of the above cases? Emblematic of this ability is the amnesic case described at the beginning of the twentieth century by Cleparede, a French neurologist. Even though they met many times, the amnesic patient was approaching the doctor as it was the first time they met. The doctor decided to hide a pin in his hand to see whether the patient could remember this slightly painful event each subsequent time they met. It appeared that, despite having no recollection of meeting the doctor previously, he become very reluctant to shake his hand, where the pin was usually hidden. In other words, the patient could not consciously access information from memory (i.e., he believed he never saw the doctor before), but could unconsciously use it (i.e., not to shake the doctor's hand).

"(Rivolta, Prosopagnosia, p69)

We will get deeper into this discussing the next paper but post sensation, we rely on memory to conduct the perception. The brain then finds special features it associates with specific individuals. Pathological or[2] physiological damage to the regions that perform this function cause diseases that cause prosopagnosia.

[2] **#multiplecauses:** I identify the potential causes of damage to the perception system for facial recognition. I do this so as to ensure we address the nuances of the problem at hand. This is a depth-first exploration of one explanation for facial blindness but there are innumerable possible causes. We are taking a general perspective to see if there is a pattern in how all these causes cause the defect.

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The anatomical basis of Prosopagnosia

So far, we have hinted at the damage to critical brain regions as the primary cause for prosopagnosia. J C Medow's paper, The Anatomical basic of Prosopagnosia goes deeper into this. Location of Lesions, The evidence that has been presented points clearly to the importance of occipitotemporal lesions in prosopagnosia. The evidence for right-sided involvement is very strong: lesions in this region were found in multiple (seven) cases that came to necropsy so far reported, and this correlates with the extremely high incidence of left upper quadrantic visual field defects in clinical case reports (J. C. Meadows, p496). On the other hand, lesions at this site in the left hemisphere were found in only five of the seven necropsies, and right upper quadrantic field defects are not particularly common clinically. Patients with prosopagnosia nearly always have a left upper quadrantic visual field defect, correlated clinically and pathologically with a right occipitotemporal lesion. The few necropsies all show bilateral lesions but the right hemisphere lesions have all involved the region of the occipitotemporal junction.

Further discussion

The three papers tie together well with each subsequent paper trying to fill a void invoked by the one preceding it, nonetheless, there are some questions lingering that each raise. Future research into the exact nature of the universal facial features both from a computational perspective and psychological perspective will be the focus on the next iteration of this assignment. **What exactly do people with prosopagnosia see?**[3]

[3] **#organization:** I have a discussion structure that uses the papers to answer preceding questions by asking one or more questions any of the focus papers may be ignoring or not answering then using the findings from the next papers to answer these. This gives flow and organization to the discussion.

References[4]

Rivolta, Davide. “Covert Recognition.” Prosopagnosia [online], When All Faces Look the Same. Available at: https://www.springer.com/gp/book/9783642407833

J. C. Meadows, *The anatomical basis of prosopagnosia [online]* Available at: https://jnnp.bmj.com/content/jnnp/37/5/489.full.pdf (Meadows, *The anatomical basis of prosopagnosia*)

Rakover, S. (2019). Face Recognition. [online] James Benjamin Publishers. Available at: https://books.google.com/books/about/Face_Recognition.html?id=u7JmdWRlrAcC [Accessed 6 Oct. 2019].

[4] **#composition:** Formatted my text in the style required, APA citations, double space for the text and TNR font. This atop the flow I invoked in the structure of my paper, using questions from preceding ones as the transitional cues to discuss the next one.