Facial Attractiveness SE367A: Cognitive Science

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Abstract

In this project, we wish to analyze 3 aspects of facial attractiveness and how people judge various faces on the grounds of these 3 features, confirming work done by our references and analysis to discover something new. There have been studies to relate attractiveness with facial features in the past. People have taken specific points under consideration like estimated age by looking at photo, expressions, physique like fat, thin, sallow, skin color etc. We wish to examine the work firstly on symmetry [1], [2], then on averageness [3], and finally on sexually dimorphic features [7]. Facial symmetry shall be studied based on experiments recording the audience's response on normal faces and those against symmetry mapped faces of the same image. Averageness will be considered with rating pictures of a person individually vs their aggregate picture and with an average of all pictures under the experiment. Sexually dimorphic features will involve comparison between images of the same person under different features such as feminized and masculinized version of same face etc.

Keywords: Facial attractiveness, dimorphic features, averageness, symmetry

Introduction

Facial attractiveness is an important aspect of overall beauty of a person, probably the most important aspect. People feel happy when someone complements them about their beauty. Also people tend to agree to an approximate level on facial attractiveness across the globe. For example, most people from Africa and Europe at the same time would agree upon the facial attractiveness of Emma Watson. So, there are aspects of facial attractiveness that are independent of the society and are universal. The reason for the same is evolution. It can be deduced that we are evolved to find certain faces attractive. When we see a face, we make a judgment about its attractiveness. The evolutionary explanation is that this judgment has evolved so that we find a mate which is best for our gene propagation. Facial attractiveness is measure of the fitness of the mate (here by fitness, we mean genetic/ phenotypic fitness and not presence or absence of diseases).

Previous studies have been done on how attractiveness judgments give hint about mechanism for detecting special cues to assess an individual's phenotypic condition. The studies have been done on the following 3 aspects:

1. *Averageness:* The hypothesis is that our "beauty detecting mechanism" averages images we see and observe. When we see a face, our mechanism compares that with the average image. The closer the image to that average image, the more attractive we perceive the face. However in [8], they have shown that certain non-average traits can make face more attractive.

- 2. **Symmetry:** In a perfect situation, a human face is supposed to be developed perfectly symmetrical. However, the real world situation isn't perfect. There are environmental pressures on facial development which tend to increase asymmetry in faces. Therefore, symmetry of a face can be thought of as the ability and fitness of the individual's genes to allow symmetrical development under environmental pressures. Hence, symmetry may reflect phenotypic quality. In other words, symmetrical faces are perceived to be more attractive than their un-symmetrical counter-parts.
- 3. *Dimorphic features:* Dimorphic features are phenotypic difference between males and females of the same species. Faces can be masculine, feminine depending upon facial features like eyebrow, jaw shape etc. Among other organisms, it is clear that males prefer feminized faces while females prefer masculine. However, the results from [9] suggest that humans (on an average) prefer feminized faces over masculine faces irrespective of the sex. In humans, feminized traits are related to good social behaviors like honesty, trust. On the other hand, masculinized faces are related to behaviors like dishonesty, rudeness, etc. These results are not consistent. There are studies which shows that female tend to prefer masculine faces during fertile phase of their menstrual cycle.

Objectives

- To analyze the effect of symmetry on facial attractiveness.
- To analyze the effect of averageness on facial attractiveness.
- To analyze the effect of feminized and masculinized features on facial attractiveness.

Our objective is to get the responses from people on faces we have selected and edited for our experiment.

Methodology

We finally created 27*2 images for our survey. We created 2 survey forms, each with 27 images. The participants were asked to rate images from 1(less attractive) to 5(very attractive). Each participant is required to fill only one survey form.

Each of those 54 images had some properties. These can be:

- Original un-edited image.
- Averaged composite (morphed) image of 3 to 13 images.

- Mirrored symmetrical image.
- Symmetry of the face quantified.
- Feminized image (quantified).
- Masculinized image.

The methods used to create these images are described below.

Dataset

Physiological image collection at Stirling (PICS). All the images for symmetry and averageness analysis are from 2D face sets of this database. Images from sets Aberdeen, Iranian women and Nottingham scans are used.

Symmetry

We did symmetrical analysis by creating few perfectly symmetrical mirrored images. We also quantified symmetry of few images in our dataset.

Generating mirrored symmetrical image

For this purpose, we used existing method at pichacks.com. The steps are; upload an image, choose a median line to generate mirrored symmetry. And, the method generates two perfectly symmetrical images from each half of the face. Some precautions are needed in choice of images. Only front facing, properly oriented faces will generate natural looking, symmetric faces. Also, the hair style of the face shouldn't be highly asymmetric.



Choosing a median line for generating mirrored image.



The mirrored image generated from

each half of the line.

Quantifying symmetry of images

For this purpose, we used symmetry quantifying algorithm at symmeter.com. The steps are; upload an image, create a boundary under which you want to quantify symmetry. The algorithm calculates symmetry in terms of percentage, higher the percentage higher is the symmetry.



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Averageness

We used software Squirlz Morph to average multiple images. Various composite images were created using 3 to 13 individual images. All the individual images should be oriented in same direction and of the same size (length and width).



Left one is one of the 4 individual images and right one is the composite of those 4 images.

Dimorphic features

Dimorphic features can be varied by exaggerating feminine or masculine traits of faces. This can be achieved by morphing a male face with female face to a varying degree and so on.



feminized traits.

Varying

For our survey, we used an existing database of varying feminized faces. Database is courtesy of: *Rhodes, G., Hickford,C., & Jeffery, L. (2000). Sex typicality and attractiveness: Are supermale and superfemale faces super attractive? British Journal of Psychology, 91, 125-140.*

We created two survey forms. Each having 27 images. Participants are required to fill one of the forms. Here are the two forms. These participants were unaware of the motive of this survey. SET 1: <u>https://docs.google.com/forms/d/1eRNWPr3NRgfr5okWweUGhzoFk-dJZgAJwQqf6b0I0ec/viewform</u>

SET 2: <u>https://docs.google.com/forms/d/19lhk6lyfe5W-</u> 6RxBhR5mO0zIG94xNeVxMTEYIjZ5F1M/viewform

Results

Following 2 tables shows mean ratings of each images. Total 53 participants (16 females) took part in our survey. Each image ID corresponds to 2 versions of same image in 2 sets.

SET 1

Image Id	Mean rating	Image
	+- S.D.	annotation
1	2.37+-1.08	Original
5	3.79+-0.76	Average 3
6	2.33+-0.85	Original
7	2.66+-0.74	Average 4
8	2.08+-1.07	Average 6
9	2.33+-1.14	Original
10	2.57+-1.04	Average 6
11	3.125+-0.98	Average 8
12	2.91+-0.93	Average 6
13	2.5+-0.96	Original
14	2.66+-1.06	Average 6
15	3.16+-0.95	Original
16	2.83+-0.89	Average 3
17	4.29+-0.79	Original
18	3.91+-1.2	Original
19	3.86+-0.85	Original
20	3.09+-1.13	Average 13
21	1.13+-1.12	Original
23	3.2+-1.14	M. symmetric
24	2.52+-0.88	Symmetry 97.73
25	1.78+-0.93	Symmetry 96.5
26	4.26+-1.15	Symmetry 95
27	2.74+-1.1	Symmetry 92.7
28	2.56+-0.96	Original
29	3.09+-1.2	Original
30	2.74+-0.93	Original
31	3+-0.75	Original

SET 2

Image Id	Mean rating	Image
1255IN	+- S.D.	annotation
1	2.84+-1.03	Average 6
5	3.72+-0.73	Original
6	2.44+-0.76	Average 5
7	2.4+-0.89	Original
8	1.68+-0.74	Original
9	1.72+-0.63	Average 9
10	2.56+-1.03	Original
11	2.64+-0.81	Original
12	2.9+-1.02	Original
13	2.4+-0.88	Average 5
14	1.92+-0.73	Original
15	2.72+-1.02	Average 5
16	2.88+-0.89	Original
17	4.8+-0.6	Average 3
18	4.2+-0.81	Average 3
19	3.92+-0.87	Average 3
20	2.52+-0.75	Original
21	1.4+-0.57	Average 13
23	3+-1.27	Original
24	2.28+-0.76	Symmetric: 97.6
25	1.64+-0.70	Symmetric 94.3
26	4.64+-0.74	Symmetric 97.5
27	2.4+-0.99	Symmetric 96.1
28	2.4+-0.89	Masculine
29	2.52+-0.9	Feminine
30	2.56+-0.8	Feminine
31	2.16+-0.71	Feminine

Observation & Inferences

- More symmetrical the images, more attractive they were perceived. This turns out to be true in 4 of 5 images. (23, 24, 25, 26)
- Composite images got higher ratings most of the times. 14 times, average images got higher mean ratings than original images. 4 times, original images closely edge out average images.
- The difference in the ratings of average images and original images increases significantly when large number of images was used to create the average image (Image 20 and 21). Verifying that more average faces are more attractive.
- The ratings of image 28 are consistent with current theory that masculine faces are perceived less attractive.
- The mean ratings of images 29, 30, 31 are contradictory to current theory. In our survey, feminized faces were rated less attractive than the original images. 29 and 30 are feminized male faces. Since our participants are male dominated, probably males don't prefer too much feminized male faces. However, the number of participants is not large enough to make any concrete inferences. Analyzing the responses, it is observed that females do prefer feminized face in one case. Dimorphic features are needed to be studied more extensively on a larger audience.

Conclusion

Our experiment verified that more symmetrical and average faces are perceived more attractive than the normal faces. However, our results of feminized faces are inconsistent with current observations of [9] that feminized faces are attractive. This theory itself has many inconsistencies across literature. We hypothesized that probably males don't prefer too much feminized traits in male faces. However, number of participants in our experiment is not large enough to make this as a conclusive reason. We suggest carrying out this experiment on a larger audience with varied age groups to have better understanding.

Discussion

We tried to collect survey from as many people as possible. 53 participants filled the survey. The mean age of the participants is 21.4 with S.D. of just 1.64. A varied audience (in terms of age and society) will give results to make better conclusion. The number of images in each survey is 27. That's a lot in a single survey. People get tired half way through the survey and their responses might not be accurate. A good survey will be to have 10-15 images in set. One more suggestion, one can try to have this survey with children and babies. That will be interesting experiment to verify whether these mechanisms are active by birth or not.

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