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Prototypes and Recognition of Self in Depictions of Christ

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Abstract

We present a study on prototype effects. We designed an experiment investigating the effect of adapting a prototypical image towards more human, male or female, prototypes, and additionally investigating the effect of self-recognition in a manipulated image. Results show that decisions are affected by prototypicality, but we find less evidence that self-recognition further enhances perceptions of attractiveness. This study has implications for the psychological perception of faces, and may contribute to the study of Christian imagery.

Keywords: Prototype effects, Self Similarity, Attractiveness, Subjectivity in Face Perception, Experimental Esthetics

1. Introduction

The image of Christ, which is central to both modern and historical Christianity, has undergone many changes to evolve from the historically accurate, middle-eastern carpenter into the modern Hippie Christ that we still see today.

We will try to see this artistic revolution as a mechanism of prototype formation, where repeated exposure to a particular visual category influences our liking or disliking of what we see. Our theory is that the diversity of Christ images may reflect the diversity of the believers by means of artistic adaptation, i.e. painters produced more of the images that appealed most to believers on trustworthiness, attractiveness and identification with self.

Recently, Jackson et al. (2018) have shown that American subjects saw God as being similar to themselves regarding attractiveness and age. We argue that this egocentric bias also plays an important role when it comes to the Christ figure. Therefore, we expect that participants will prefer the images of Christ in which they may recognize features of themselves.

In accordance with this, other studies have documented that mere exposure to a category of stimuli increases the familiarity and liking of that particular domain of stimuli (Reber et al., 2004; Chenier & Winkielman, 2009). Mere exposure has been shown to reduce the identification and classification latencies for stimuli, meaning that it increases the processing speed or fluency.

Another effect of repeatedly seeing similar variants on a theme is that certain forms become prototypical. An everyday example is our tendency to like new retro models of cars, e.g., the Volkswagen Beetle. Winkielman et al. (2006), claim that prototypicality is one of many fluency-enhancing variables. Moreover, they suggest that part of the preference for prototypicality stems from a general mechanism that links fluency and positive values.

When encountering novel faces, we are quick to attribute different traits to them. These attributions happen as quickly as 33 milliseconds after exposure to the face stimulus (Todorov et al., 2009) and the mechanisms responsible for them are already present and reliable in children of 3 to 4 years of age (Cogsdill et al, 2014). To form these impressions, we rely mostly on facial cues, even when other, more relevant, information is available to us (Rezlescu et al., 2012; Oliviola et al., 2014).

There has also been evidence for a bias towards our own facial features when we attribute traits to strangers. The popular observation that couples tend to look alike supports the theory that, with increasing exposure to our face and genetically similar faces over time, we develop an attraction to faces similar to our own (Hinsz, 1989).

Facial similarity also has a positive effect on perceived trustworthiness, group cooperation, and voter preferences in political elections (DeBruine, 2002; DeBruine, 2005; Krupp et al., 2007; Bailenson et al., 2008). In our experiment, we test whether adding the subjects' features to the image of Christ, will make that image more likable as well.

This study explores the idea that the image of Christ has evolved to be more likable by adapting a similarity to the community of believers, including the female believers, by ameliorating hurdles to identify with the image. We hypothesized that this adaption leads to an increase in the attractiveness of the Christ figure. Furthermore, we hypothesized that participants would judge images containing their own image more favorably, even without being conscious of the presence of their own image. This would provide additional empirical evidence for the mere exposure hypothesis, according to which, a participant would prefer an image containing features that are familiar to them.

Previous research on the image of Christ has shown that the Renaissance preference for depicting Christ (as God) en face, is associated with enhancing positive attributions such as being harmonious, caring, trustworthy, inclusive and respected (cf. Folgerø et al 2016a). Furthermore, it has been shown that people may judge the gender of a face from facial proportions between the tip of the nose and the eyebrows (cf. Geniole et al., 2014). For images of Christ, Folgerø et al (2016b) showed in a priming experiment that a brief presentation of a word (*female* or *male*) made participants significantly over-represent a choice of female for images of Christ when primed by the word for female. Images of young men and women were less affected when primed by the opposite gender (ibid). This suggests that not only had the Renaissance image of Christ adapted towards a more Italian / European portrait, but also the painters may have included some female features, adding a more universal androgynous appeal.

2. Method

2.1 Participants

17 students (8 male, 9 female) were initially recruited for the study. Due to the nature of the morphing procedure we used, one female participant was excluded from the study, so there were a total of 16 students, 8 male, and 8 female. All participants gave their informed consent to participate in the study and to have their picture taken and used for publication.
Only 12 participants (aged 18 to 65; mean 26.4 CI[18.2; 34.6]) participated in the final experiment. Thus only 12 images matched the 12 participants for self: 6 male and 6 female.

2.2 Stimuli

We used *Sqirls Morph*, which uses Beier & Neely's (1992) algorithm to morph pictures.
We first chose three renaissance depictions, and one Eastern depiction from the 6th century A.D. of the Holy Face and we produced a *"Christ prototype"* by morphing them (Figure 1).
Furthermore, we created a female and male prototype by combining the pictures of eight female participants and eight male participants, respectively. The male and female prototypes were also combined to produce a human prototype (Figure 2).
We then morphed each picture (the individual pictures and the prototypes) with our Christ prototype to create the stimuli used in the experiment. The 16 individualized Christ images consisted of 80% Christ and 20% the image of the participant (Figure 3).

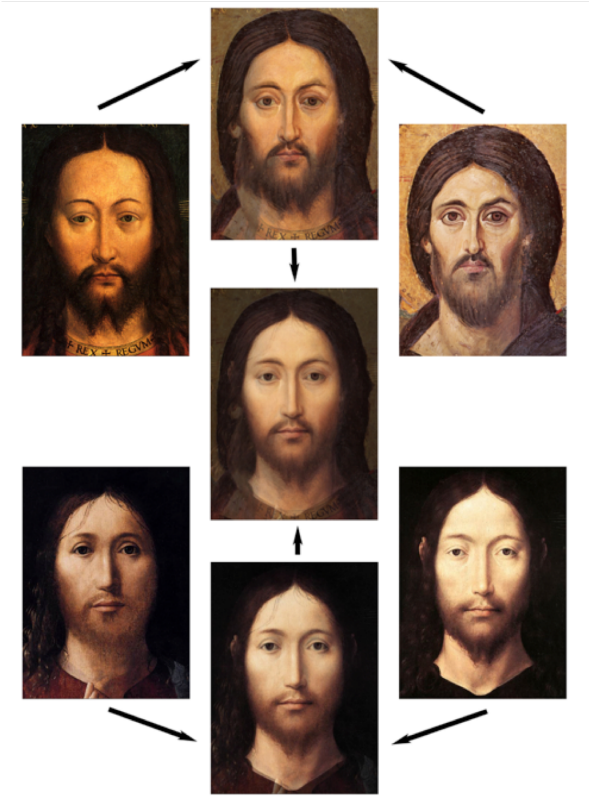

Figure 1: Creation of the Christ prototype. First four canonical images of Christ are morphed pairwise, and then the pairs are morphed.

Figure 2: Prototypes created from participants. All created by pairwise morphing. Upper row: Female, Human and Male prototypes. The lower row shows the effect of adding the Christ prototype.

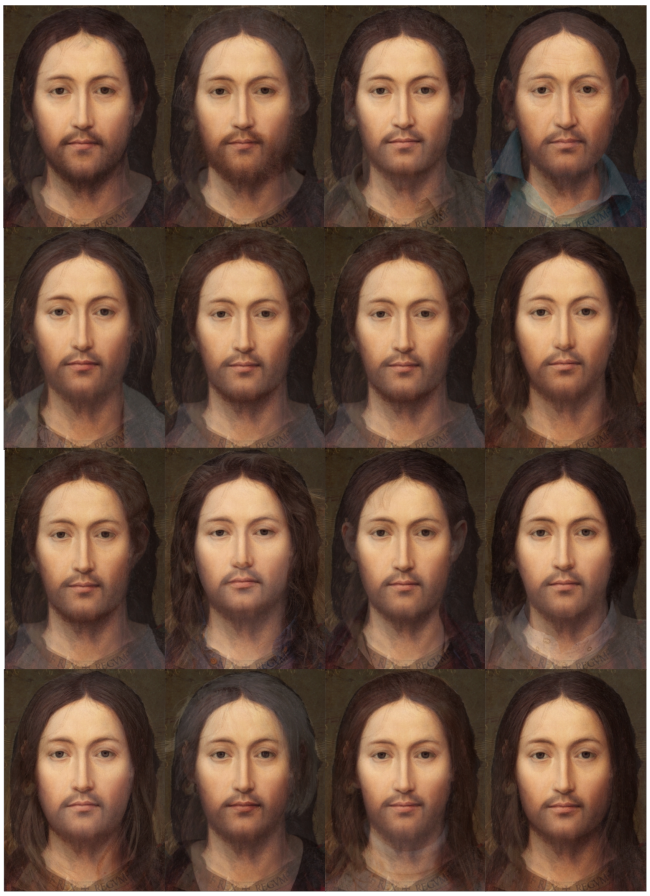

Figure 3: Individual participants morphed with the Christ prototype. The alternating rows show first male, then female participants. The morphed pictures consist of 80% Christ prototype and 20% individual picture.

3. Design and Procedure

The experiment has two phases. In the first phase, all participants had their picture taken by a professional photographer in a standardized setting. They sat at an equal distance to the photographer in front of a uniform gray wall directly facing the photographer. The second phase took place six weeks after all pictures had been taken. We created a balanced Round Robin tournament in SuperLab, where an individualized picture (20% from an individual and 80% from the Christ prototype) was presented next to one of the prototypes. All pairs were presented in a different random sequence for each subject. The side of the screen on which the prototype was presented was also randomized (left or right). All combinations were presented exhaustively.

Participants were asked to select the image they found most attractive of the two, as in a *"Hot or Not"* task. All participants were asked to make their responses quickly while remaining accurate. Reaction times were collected, and difficult choices were expected to show increased reaction times.

The experiment is prepared for a follow-up using a *"Visual World"* paradigm, where eye-tracking is used to detect which of the images receive the longest focused attention. Eye-tracking was not available in our lab at the time of our experiment.

4. Results

Four participants did not take part in the final task. That left us with data from 12 participants (aged 18 to 65; mean 26.4 CI[18.2; 34.6]), and gender balanced. Responses that were faster than 300ms were excluded because it would be impossible to process both images and take a decision within that time.

Visualization is performed by **assoc** from the R **vcd** package (cf. Meyer et al. 2003). Prototypes competed against 12 individualized images and the original four images of Christ (cf. Figure 1), each presented one time on the left and one time on the right side.

The female and Christ prototypes won significantly more competitions than any of the other images (Figure 4). The female prototype also shows the fastest reaction times.

Subjects did not show evidence of self-recognition in preference (Figure 5) or decision times. The differences are as in Figure 4. Self tends to win more over the human and male prototypes. In the debriefing after the study, only one participant claimed to have recognized themselves in the images.

Reaction time data was analyzed using a mixed effects model (Kuznetsova et al. 2017) using two fixed factors: the prototype and the choice (for prototype or person). Participants and test items (marked for first or second trial) were used as random factors (explanations for random variance). Furthermore, we used different intercepts for prototypes by each participant and for choice by each item. The reaction times were transformed using a natural logarithm transformation that improves skewed data (long decision times are thought to signal close decisions, but the analysis demands normal distribution). One similar well-known transform is acoustic energy into the decibel scale, which mirrors our perception of sound volume. We investigated some models that included interaction between choice and prototype, but this interaction was not significant and was thus excluded for better model-convergence. The Mixed Effects analysis of the reaction times for decisions (Figure 6) shows a significant effect for choice. When the decision is for a prototype the decision is faster ($F(1,35.6) = 5.3$; $p = 0.027$). There were also differences between prototypes ($F(6,15.2) = 3.9$; $p = 0.015$), most notable PW is faster. We could not confirm any interaction between participant gender and choice (i.e., male subjects seemingly had a larger, but not significant, prototype effect).

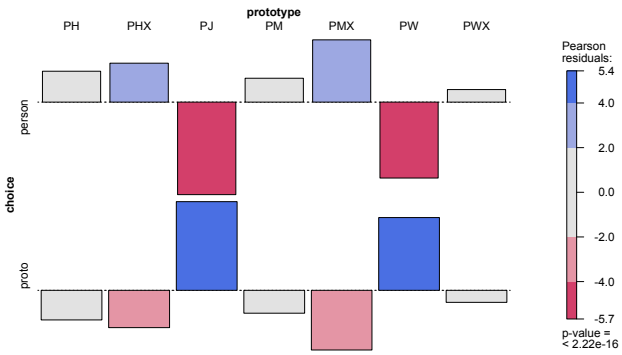

Figure 4: Prototypes are: PH (Human), PHX (Human with Christ), PJ (Jesus Christ), PM (Man), PMX (Man with Christ), PW (Woman), PWX (Woman with Christ). Differences are significant. Red marks cells with lower than expected frequencies, blue are higher than expected. $\chi^2_{(6)}=154.4$, $p<0.001$, $\Phi_c=0.096$

	PH	PHX	PJ	PM	PMX	PW	PWX
PE	241	254	138	236	271	151	227
PR	220	214	335	227	190	319	237

Table 1: Frequency of choice for person (PE) or prototype (PR), competition for each prototype.

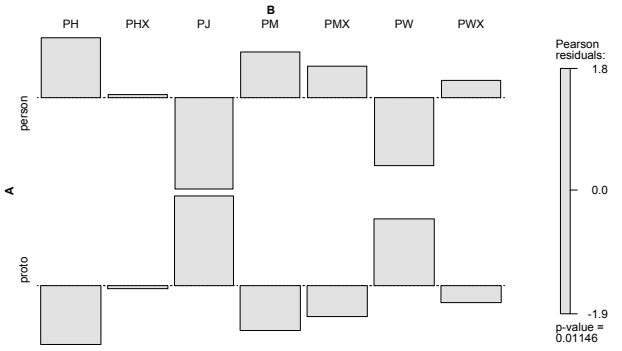

Figure 5: Same graph restricted to choices between *self* (=person) and *prototype*. $\chi^2_{(6)}=16.5$, $p=0.011$, $\Phi_c=0.140$.

	PH	PHX	PJ	PM	PMX	PW	PWX
PE	16	12	5	15	14	7	13
PR	8	12	18	9	10	17	11

Table 2: Table 1 restricted for choices between *self* (PE) and a *prototype* (PR)

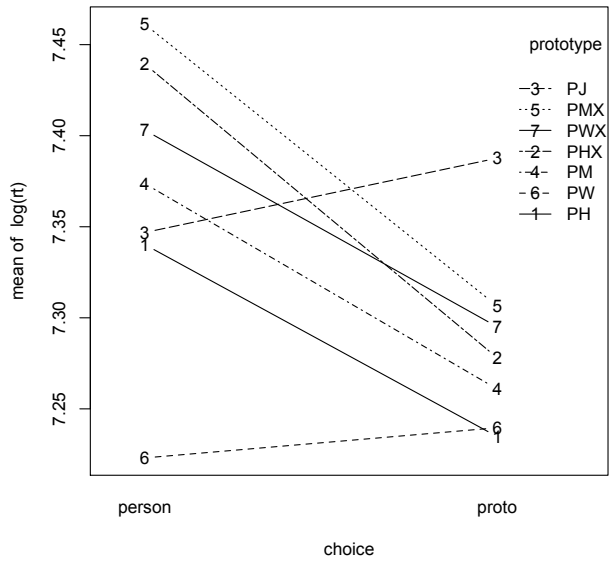

Figure 6: Response times (natural logarithms). Prototypes are generally faster when the decision is *for* the prototype, with exceptions for the Jesus Christ prototype (PJ) and the woman prototype (PW).

A model test of the residuals shows an excellent fit to a normal distribution up to +2 quantiles, but the larger residuals give room for improvement (Figure 7).

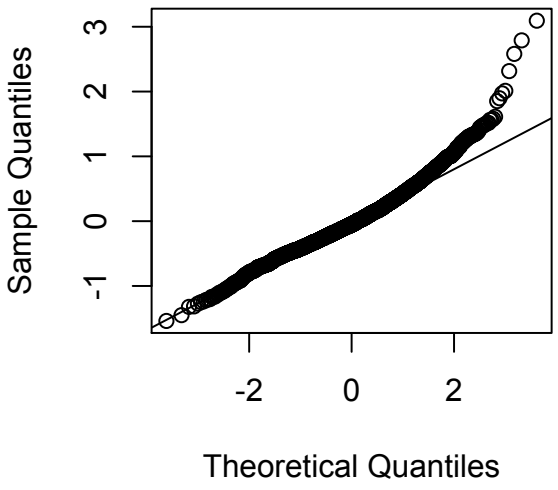

Figure 7: Model test of residuals shows a good fit.

Contrary to our hypothesis, we did not find any significant tendency for participants to rate their own disguised image as more attractive. Instead, there was an insignificant tendency in the opposite direction. One interpretation is that we simply did not have enough statistical power since four of our initial 16 participants were not able to participate in the final task. Alternatively, our subjects might have judged their own image as slightly less attractive than the ratings from others.

5. Ethical Considerations & Discussion

Our work poses many ethical questions that we would like to briefly examine.

In general, as we are working with personal images, special care must be taken that the subjects stay anonymous. It is every researcher's responsibility to inform all participants of what exactly will happen with their images after the study itself has come to an end.

Explicit consent was gathered from all participants, also regarding the use of images. Special care should nevertheless be taken when publishing the data. In our case, we decided to only publish the images of the morphed face stimuli in order to keep the subjects' anonymity intact. The debriefing of our subjects verified the validity of this method as only one of our subjects reported that they had recognized themselves in any of the presented pictures.

Since we are using images of Christ, we realized that this might be sensitive in a religious setting. However, the image of Christ is widespread and familiar to all of our subjects. We discussed this in the debriefing with our participants, with no negative reactions. Participants were generally positive about the underlying theme of finding something holy in everyone.

This study is thus limited, and therefore generalization of our findings may be less than absolute. Our small subject pool may not be representative outside of our local student population. Minorities are difficult to represent fairly within a study limited to a dozen subjects. An option to increase subject diversity is to partner with other researchers, taking particular caution to safely sharing the images in order to protect the subjects' interests.

As with any other field of science, there are distinct ethical concerns that arise when we research human attributes. It is essential for all researchers to identify these ethical issues to the best of their abilities.

In a small study, it is essential to limit the number of variables in order to have better control of variance. Many factors affect attractiveness. Our study was open to everyone, and thus we could not balance all possible features. Skin tone is one feature that has been linked to attractiveness, and a lighter skin tone is often reported as more attractive (Vera Cruz 2018). In our study, the participants were all similar in skin tone, which was toned down further by the morphing process. Similarly, blue eyes became a tone of brown after morphing. It is conceivable that both skin tone and eye color may affect ratings of attractiveness. In our experience, when we observed art interpretations of Christ from the relevant period it is obvious that Christ has a lighter skin tone and bluer eyes in Northern Europe than in Southern Europe, which may be interpreted as an adaptation to the local populations. In a larger study, the relative importance of features can be estimated. Symmetry and androgyny may be more important factors than skin tone and eye color. However, we do find dark-hued representations of both the Mother Virgin and Christ. A dark skin tone in Europe points at an anti-adaptation for the Black Madonna (cf. https://en.wikipedia.org/wiki/Black_Madonna), and an adaptation for the Christos Negros of Central America (cf. https://en.wikipedia.org/wiki/Cristos_Negros_of_Central_America_and_Mexico).

A possible hypothesis is that facial anatomy and symmetry are more important than skin tone in regards to how people identify with a representation.

We also know from the Thatcher-effect that people perceive features of a face separately. Yamaguchi et al (1995) investigated features of the face that affect perception of gender, and found that eyebrows and outline of the face were important features. They found a bias towards own gender in Japanese students, which we have not detected for Norwegian students in our lab. In our own research, we found that Renaissance portraits of Christ had facial proportions (width between eyes vs. length between eyebrows and tip of nose) that were more typical of portraits of female subjects.

It is also interesting to note the deep history of morphing and composite (prototype) effects. Galton (1878) used early photographic techniques to overlay portraits in order to form a composite image. Galton describes a physical procedure for normalizing the pictures by aligning some fix points such as pupils of the eyes. He notes: "... that the features of the composites are much better looking than those of the components." Thus, he is one of the first to notice the prototype-effect on beauty, as the composites get more symmetrical and blemishes are blurred out. Galton also noticed that individual characteristics could be hard to perceive across ethnic classes, as we tend to remember deviances from a familiar composite prototype formed by experience. In a sense, the prototype of the other could be just as distant as the individual, with implications for witness psychology.

6. Conclusions

Both female and Christ prototypes were judged as more attractive (by winning more competitions). Prototypes were processed more fluently, as reflected in their reaction times. The female prototype displayed the fastest decision times, and was more frequently chosen, which may be interpreted as easier to process and possibly more attractive to our participants. Being part of all the individualized images made decisions for the Christ prototype harder, but this prototype was more frequently chosen. The findings support our central hypothesis concerning the adaption of the image of Christ towards a cognitively more pleasing image. An advantage for female features was detected, supporting earlier results on feminine features in the image of Christ (cf. Folgerø et al. 2016b). In Folgerø et al. (2016b), the stimulus was restricted to a section of the face between the tip of the nose and the eyebrows, and yet people showed effects for correct identification of gender, as well as recognition of Christ as a female when primed with "woman."

However, we did not find that images containing features of self were judged as more *attractive*. Following DeBruin (2005), we suggest that the results would have been different if we had asked the participants to judge *trustworthiness* instead of attractiveness. In ongoing data-collection, we note that a majority of our participants now claim, in debriefings, to have recognized themselves in a similar task that includes selecting the face they trust the most. More research is needed to investigate if trustworthiness is more associated with self-similarity.

7. Acknowledgements

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