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EVOLUTIONARY PSYCHOLOGY AND SEXUAL DIMORPHISM:

THE ROLE OF EMOTIONAL EXPRESSIONS IN MALE ATTRACTIVENESS

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Resumo

Há muito que a Psicologia Evolutiva tem estudado a atratividade em humanos. As três características mais estudadas pela sua desejabilidade na atratividade facial são: a simetria, a normalidade dos traços faciais e o dimorfismo sexual (ou marcadores hormonais). Sendo que as duas primeiras parecem ser suportadas pela literatura, o dimorfismo sexual tem-se mostrado alvo de dúvidas pelos resultados díspares entre os sexos. Dado que os traços faciais de dimorfismo sexual, em especial os mais masculinos, têm sido relacionados em estudos anteriores com a perceção de raiva, propomo-nos a estudar a influência das expressões emocionais nas preferências de masculinização/feminização de faces masculinas. Para isto, desenvolvemos uma tarefa interativa, em que mulheres heterossexuais puderam alterar os níveis de masculinização consoante as suas preferências de atratividade, sendo apresentadas faces masculinas que expressavam: raiva, felicidade e neutro. A nossa hipótese era que as participantes escolhessem masculinizar mais as faces com expressão de felicidade, já que isto iria contrariar a possível perceção de raiva em cara mais masculinas, em comparação com as faces neutras e com as faces com a expressão de raiva, respetivamente. No entanto, as participantes escolheram feminizar as faces independentemente da expressão emocional apresentada. Não foram encontradas diferenças significativas entre as condições, no entanto as participantes escolheram feminizar menos as caras com expressão de felicidade, indo um pouco ao encontro da nossa hipótese. Estes resultados sugerem que a relação entre a perceção de expressões emocionais e as preferências por características de dimorfismo sexual em faces masculinas é fraca ou nula.

Palavras-chave: Atratividade, dimorfismo sexual, expressões emocionais.

Abstract

Evolutionary Psychology has long studied facial attractiveness in humans. The three characteristics most studied for their desirability regarding facial attractiveness are: symmetry, averageness, and sexual dimorphism (or hormone markers). While the first two seem to be supported by literature, sexual dimorphism has been controversial due to the different results between men and women. Given that sexual dimorphic facial features, especially more masculine ones, have been related in previous studies to the perception of anger, we propose to study the influence of emotional expressions on the preferences of women for masculinization/feminization in male faces. To do this, we developed an interactive task, in which heterosexual women were able to change the levels of masculinization according to their preferences of attractiveness, while being presented with male faces that expressed: anger, happiness, and neutral. Our hypothesis was that participants would likely choose to masculinize the happy faces more in comparison with the neutral faces and angry faces, respectively, since this would counteract the possible perception of anger in more masculine faces. Nevertheless, participants chose to feminize all faces, regardless of the emotional expression presented. There were no statistically significant differences between conditions, however participants chose to feminize less the happy faces compared with the neutral and angry ones, somewhat meeting our hypothesis. These results suggest that the relationship between the perception of emotional expressions and the preference for traits of sexual dimorphism in male faces, is weak or null.

Keywords: attractiveness, sexual dimorphism, emotional expressions.

Introduction

Evolutionary Psychology, tells us that facial attractiveness is linked to the perception of a healthy and fit sexual partner (Fink & Penton-Voak, 2002; Johnston, Hagel, Franklin, Fink, & Grammer, 2001; Rhodes, Chan, Zebrowitz, & Simmons, 2003), due to sexual selection of heathy individuals throughout the years (Little, Jones, & Debruine, 2011). Thereby, is believed that humans find certain characteristics attractive because they signal mate quality (Little et al., 2011; Rhodes, 2006). The study of those characteristics has identified three factors cross-culturally that show to be significant in the perception of facial attractiveness: symmetry (Fink & Penton-Voak, 2002; Little et al., 2011; Mealey, Bridgstock, & Townsend, 1999; Perrett et al., 1999; Rhodes, 2006), averageness (Fink & Penton-Voak, 2002; Little & Hancock, 2002; Little et al., 2011; Rhodes, 2006) and sexually dimorphic features (Fink & Penton-Voak, 2002; Johnston et al., 2001; Little et al., 2011; Little & Mannion, 2006; Rhodes, 2006), also known as hormone markers. There is more than one factor at play when it comes to sexual dimorphism in human faces, however we will focus on shape.

Sexual dimorphism is directly related to the production of sexual hormones and their influence on the individual's facial traits. If we focus on males, testosterone is the hormone that determines how masculine facial traits can be. While in puberty, a high testosterone-estrogen ratio enhances the lateral growth of the cheekbones, mandible and chin, as well as the forward growth of the eyebrow ridges (Fink & Penton-Voak, 2002), which are indicative features of a more masculine face (Johnston et al., 2001). Results of a study by Pound, Penton-Voak, and Surridge (2009) supported this, by suggesting that men with a more masculine face shape show higher levels of testosterone after winning a competitive task than men with less masculine faces. Testosterone is also known to have a suppressive effect on the immune system, making men that have more masculine face traits appear more resilient, for their ability to cope with the possibly debilitating effects of higher levels of this hormone (Fink & Penton-Voak, 2002), this is known as the immunocompetence-handicap hypothesis. In fact, women seem to associate more masculine faces with good health (Johnston et al., 2001; Rhodes et al., 2003), which can be an attractive quality (Johnston et al., 2001). Furthermore, a study by Rhodes et al. (2003) showed a correlation between rated masculinity and actual health, suggesting that women can correctly associate the two.

As a result of these factors, evolutionary theories predict that individuals considered attractive by the opposite sex have symmetric faces with average facial traits and display facial characteristics that are consistent with their sex. Consequently, it is expected that heterosexual women find men with more masculine facial features more attractive when compared with men who display more feminine facial traits, and vice versa. Results on the preference, of both males and females, for symmetry and averageness have been relatively consistent, yet the supposed preference for sexual dimorphism in faces has raised a lot of questions in recent studies.

Literature shows that sexual dimorphism of shape in female faces is considered to be more attractive to heterosexual males (Perrett et al., 1998; Rhodes et al., 2003), indicating that males indeed tend to prefer female faces that display more feminine traits. Nevertheless, results on male facial attractiveness are inconsistent. While some studies regarding face shape suggest that females tend to prefer male faces that display more masculine traits (Johnston et al., 2001; Little & Mannion, 2006), others support the hypothesis that a feminized male face is more agreeable to the female eye (Carrito et al., 2016; Little & Hancock, 2002; Perrett et al., 1998; Rhodes et al., 2003).

Throughout the years, the explanation that has risen for these differences is based on the other characteristics, besides health or resistance to debilitating factors, that can be associated with masculine facial traits. One of them is the perception of dominance, that can be associated with more masculine faces, both by females (Johnston et al., 2001; Perrett et al., 1998) and other males (Muller & Mazur, 1997). Dominance can be seen as a desirable attribute since it was probably very useful for survival in ancient times. However, several studies show that women tend to associate negative traits, alongside dominance, when presented with more masculine faces. Work done by Johnston et al. (2001), suggested that characteristics like dominance, unfriendliness, selfishness, tendency to be volatile, controlling, manipulative, threatening, or coercive were all associated with a more masculine face. Since such characteristics can help women predict behavior, and higher levels of testosterone can be associated with relationship problems (Booth & Dabbs, 1993), a preference for more feminine male faces can be an attempt to soften traits associated with negative behavioral attributes (Perrett et al., 1998). Moreover, results in Boothroyd, Jones, Burt, and Perrett (2007) showed an association between facial masculinity and dominance, but not with concepts like fidelity and commitment, suitable for a long-term relationship. In

the other hand, some studies suggest that valued traits like honesty, warmth, cooperation, and skill as a parent, can be associated with more feminine male faces (Little et al., 2011).

However, there is another plausible explanation. The perception of emotional expressions can be a prominent factor in human facial attractiveness, especially because emotional expressions can capture our eye remarkably, with evidence that even newborns can discriminate between, and show preference for, one emotion or another (Farroni, Menon, Rigato, & Johnson, 2007). Results from seven studies by Becker, Kenrick, Neuberg, Blackwell e Smith (2007), indicated that participants were quicker and more accurate identifying an angry facial expression when portrayed by a male face, and an happy facial expression when portrayed by a female face. With the manipulation of androgynous neutral faces, the authors found that lowering the brow ridge made participants perceive these faces as both more masculine and angrier (Becker et al., 2007), showing that there is a resemblance between the sexual dimorphic masculine traits and the facial expression of anger. This suggests that the association between masculinity and the expression of anger is not merely owed to gender stereotypes, but to similarity in the physical characteristics and traits. A few year later, Hess, Adams, Grammar, and Kleck (2009) found similar results, also suggesting that androgynous faces expressing anger are more often identified as being male than female. Subsequently, we can hypothesize that female participants in former studies could have perceived more masculine (or masculinized) faces as angrier faces, making them unpleasant and unattractive.

In addition to all these factors, there are other aspects that can have an influence on male facial attractiveness. Studies like Little, Burt, Penton-Voak, and Perrett (2001) have suggested that women that consider themselves to be more attractive than average tend to prefer increased masculinity trait in male faces. These preferences can be due to different mating strategies. More attractive women can prefer more masculine males because of the immunocompetence shown, and less attractive women may prefer less masculine males to increase their chance of reproduction by choosing the most likely to invest in a long-term relationship (Little et al., 2001). Women's menstrual cycle has also been connected with changes in preferences: women seem to prefer more masculine faces when in the fertile stages of their cycle than in other phases (Johnston et al., 2001; Penton-Voak & Perrett, 2000), what can imply that when there is a possibility for conception, immunocompetence related traits rise in importance (Penton-Voak & Perrett, 2000). Hormonal contraceptive use (Cobey, Little, & Roberts, 2015; Little, Burriss, Petrie, Jones, & Roberts, 2013; Little, Jones,

Penton-Voak, Burt, & Perrett, 2002), relationship status (Little et al., 2002), pregnancy and post-partum (Cobey et al., 2015), also seem to have an effect on female preferences regarding sexual dimorphism.

Therefore, we propose an empirical study with the goal to better understand the influence of emotional expressions in the preferences of heterosexual women, regarding sexual dimorphism. To do so, we will begin with a pilot study that has the purpose of ensuring that our manipulation of the stimuli is accurate and valid. We will ask heterosexual women to rate images of male faces, masculinized and feminized by us, in terms of perceived masculinity. Then, if these results allow, we will use these stimuli to show new participants images of male faces with angry expressions, neutral expressions, and happy expressions, asking them to increase or decrease masculinization until the face looks the most attractive to them. We hypothesize that participants will choose to increase masculinization levels on the happy faces more than on the neutral or angry faces, respectively, since this should counteract the perception of anger in more masculine faces – therefore making the masculine traits more attractive.

Pilot Study – Masculinity Ratings

1. Method

We executed a pilot study to ensure that our manipulation of the images, made using Psychomorph (Tiddeman, Burt, & Perrett, 2001), was indeed perceived by people as more masculine, when masculinized by us, and more feminine, when feminized. We did this by presenting the three versions (feminized, original, and masculinized) of every image to the participants and gathering their ratings of masculinity/femininity. This step is important to ensure the validity of our study.

1.1. Participants

We collected online data from 35 Caucasian heterosexual women, between the ages of 18 and 35 years old (M = 22.80, SD = 4.21). Through some demographic questions, we intended to control variables such as age, gender, self-rated attractiveness (assessed on a 7-point scale, where 1 meant *unattractive* and 7 meant *very attractive*), relationship status, and hormonal contraceptives use. Questions about sex, ethnicity, age, and sexual orientation (evaluated in a 3-point scale, where 1 was *heterosexual*, 2 was *bisexual* and 3 was *homosexual*) were also added to make sure the sample was as requested in the search for participants – volunteers were instructed to only partake in the study if they were Caucasian heterosexual women, between the ages of 18 and 35. In addition to these factors, we asked about the participant's vision with the purpose to exclude people with uncorrected vision problems.

1.2. Stimuli

We chose 30 faces from the Karolinska Directed Emotional Faces (Lundqvist, Flykt, & Öhman, 1998) showing three different emotions (angry, neutral, and happy), leaving us with 90 images to work with. Then, we manipulated these images in Psychomorph (Tiddeman et al., 2001), using the male and female average faces for the ages between 18 and 35 years old (L. M. DeBruine & Jones, 2015). The average faces were used to obtain 11 masculinization levels from -0.5 (50% feminization) to 0.5 (50% masculinization) and the levels selected to be rated by the participants were 0, 5, and 10, corresponding to 50% feminization, original and 50% masculinization, respectively. The hair, neck, ears, and

background were cleared from the image to ensure that it would not affect the results, as suggested in a study by DeBruine, Jones, Smith, and Little (2010).

In the end, we had 270 images to show our participants (30 faces × 3 emotions × 3 masculinization levels).

1.3. Procedure

This study has been approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of University of Porto and by the University Teaching and Research Ethics Committee of the University of St Andrews. The task was built on the online platform Qualtrics (https://www.qualtrics.com/) and the data was collected through a link generated by the program.

Given the large number of stimuli, and the need to obtain ratings for all the images, we decided to split the 30 KDEF faces (Lundqvist et al., 1998) in three sets of 10 faces, each expressing three emotions (neutral, happy, and angry) in three different levels of masculinization (original, feminized and masculinized). Volunteers were given information about the study and had to give consent before initiating the task, then were asked to answer a demographic questionnaire about themselves. During the experiment, participants were presented with 90 images (10 faces × 3 emotions × 3 masculinization levels) from set 1, 2 or 3, counterbalanced by Qualtrics so that all sets had a similar sample size. The order in which images in each set were presented was random. Therefore, the 10 faces selected for each participant were shown in 9 possible combinations of emotional expression and sexual dimorphism (1. neutral original; 2. neutral feminized; 3. neutral masculinized; 4. happy original; 5. happy feminized; 6. happy masculinized; 7. angry original; 8. angry feminized; 9. angry masculinized). Subsequently, participants were told to rate how masculine the face presented appeared to them on a visual scale from 0 (*extremely feminine*) to 100 (*extremely masculine*) (see example in Appendix A).

1.4. Data Analysis

All statistical analyses were performed using SPSS 25.0.0.0 and the significance level was set at $p = .050$. Our experimental design was within-subjects, with ratings of masculinity as our dependent variable, and the manipulation of masculinity (with three levels: masculinized, original, and feminized) and emotional expression (also with three

levels: angry, happy, and neutral) as the two independent variables. We divided the data in two categories, in order to perform comparisons: data based on masculinization levels and data based on emotional expression. Non-parametric tests were used to analyze the data, since the assumption of normality was not met. To do the comparisons between all the conditions, in each category, we used Friedman's test, and to compare conditions separately we used Wilcoxon signed-rank test with a Bonferroni correction applied, changing the significance level to be set at $p < .017$. Correlations were analyzed using Spearman's rank order test, since we used only non-parametric tests.

2. Results

We started by calculating the means for each participant in all the conditions (angry-feminized, angry-original, angry-masculinized, happy-feminized, happy-original, happy-masculinized, neutral-feminized, neutral-original, and neutral-masculinized). Then we conducted Shapiro-Wilk tests and verified that the residuals for the conditions happy-masculinized, $W(9) = 0.82$, $p = .037$, and neutral-feminized, $W(9) = 0.81$, $p = .025$, were not normally distributed on the participants who were presented with set 2, though Mauchly's test indicated that the assumption of sphericity had not been violated, $\chi^2(2) = 8.06$, $p = .529$. Therefore, we proceeded with a non-parametric analysis of the data, both in comparisons based on emotional expressions (angry, happy, and neutral) and comparisons based on the masculinization level (feminized, original, and masculinized).

For the comparisons based on the level of masculinization, Friedman test showed a statistically significant difference between the three conditions (masculinized, original, and feminized), $\chi^2(2) = 51.84$, $p < .001$. Subsequently, we compared the conditions one by one using Wilcoxon signed-rank test with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. Every comparison showed statistically significant differences. The masculinized faces (Mdn = 66.93) were perceived as significantly more masculine than the original faces (Mdn = 63.97), $Z = -4.43$, $p < .001$, and the feminized faces (Mdn = 59.23), $Z = -5.07$, $p < .001$. When compared with the feminized, the original faces were perceived as significantly more masculine ($Z = -4.77$, $p < .001$).

Lastly, we compared the data based on emotional expressions. Friedman's test indicated a statistically significant difference between all the conditions (angry, neutral, and happy), $\chi^2(2) = 42.34$, $p < .001$. Similarly to the previous analysis, we used Wilcoxon signed-

rank test with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. The differences in the neutral-angry comparison were statistically significant ($Z = -5.06$, $p < .001$), showing us that participants found the angry faces (Mdn = 71.00) significantly more masculine than the neutral faces (Mdn = 60.37), and in the happy-angry comparison ($Z = -4.71$, $p < .001$), where the angry condition was significantly higher than the happy condition (Mdn = 62.17). Despite not being statistically significant, we noticed that participants found happy faces more masculine than neutral faces ($Z = -1.11$, $p = .269$).

There were no significant correlations between our conditions and age, self-rated attractiveness, relationship status, hormonal contraceptives use, or the set participants were presented with (all $p > .145$).

As expected, with these results, we can assume that our manipulation of the stimuli, done in Psychomorph software, led to a statistically different perception of masculinity between the conditions. Masculinized faces were perceived as significantly more masculine when compared with feminized faces. Original faces were perceived as significantly more feminine than masculinized faces and as significantly more masculine than feminized faces. Therefore, the data suggests that our manipulation of the images is viable to be used in our main study.

Main Study

1. Method

1.1. Participants

In our main study, we obtained data from 81 heterosexual women, between the ages of 18 and 35 years old (M = 22.56, SD = 4.60). With a small demographic questionnaire before the task, we intended to control the variables already described in the pilot study (age, self-rated attractiveness, relationship status, and hormonal contraceptives use), adding menstrual cycle-related questions (current day of the cycle and the average cycle length) and pregnancy-related questions ("Are you currently pregnant?" and "Are you currently breastfeeding?"). In our sample, there were no pregnant women and only one participant was breastfeeding at the time of the experiment. We considered participants to be fertile if they were on days 9 through 15 of their menstrual cycle (N = 20) and non-fertile if on other days of the cycle (N = 53) (Carrito et al., 2017). Ethnicity was assessed in two different ways, participants were asked to choose the image that better represented their ethnic roots (if there was one) and then to select their ethnic group in a list of 18 categories (African, Portuguese Caucasian, other European Caucasian, American Caucasian, other Caucasian, Afro-Caribbean, Indian, Pakistani, Bangladeshi, Chinese, Japanese, Southeast Asian, other Asian, Native American, Hispanic, Polynesian, mixed, or other). We decided to ask about the participants' sexual orientation with a 7-point scale (Kinsey scale) instead of the previous 3-point scale used in the pilot study.

Exclusion criteria focused on the requested characteristics of gender (we only accepted people who identify as women), ethnicity (Portuguese Caucasian, other European Caucasian, American Caucasian, or other Caucasian), sexual orientation (we accepted the first 2 points on the Kinsey scale, *exclusively heterosexual* and *predominantly heterosexual, only incidentally homosexual*), and age (18 to 35 years old).

1.2. Stimuli

As previously described, the manipulation of the 30 male KDEF faces (Lundqvist et al., 1998) was done through Psychomorph (Tiddeman et al., 2001) and the validity of the stimuli was assessed in the pilot study.

From the 30 faces rated earlier, we chose the first 10 with better results to include in this experiment – images that scored higher in perceived masculinity when masculinized and scored lower in perceived masculinity when feminized. A continuum of 11 images was created for each of the 10 selected faces, ranging from -50% masculinized to 50% masculinized. Once again, the hair, neck, ears, and background were cleared from the image to ensure that it would not influence the results (DeBruine et al., 2010).

1.3. Procedure

This study has been approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of University of Porto and by the University Teaching and Research Ethics Committee of the University of St Andrews. The task was programmed using PHP scripting language and all the data was collected through a link, in a non-presential manner.

Volunteers were given information about the study and had to give consent before initiating the task (see Appendixes B and C), and then were asked to answer a demographic questionnaire (see Appendix D). The experiment consisted of an interactive experience in which the participants changed the level of masculinity of the images presented. While unaware of the nature of the face manipulation, participants were asked to change the presented faces searching for the most attractive appearance in each (see Appendix E). After the demographic questionnaire, 30 images were shown (10 faces × 3 emotions), in random order, which could be altered by horizontal mouse movement. Mouse movement resulted in a more feminine or more masculine face (within the range of our manipulation, -50% to 50%), a procedure also adopted in Carrito et al. (2016). All participants were presented with the same faces, portraying the same emotional expressions: 10 angry faces (see Appendix F), 10 happy faces (see Appendix G), and 10 neutral faces (see Appendix H). In the end, a debriefing page was show, to ensure that all the information was given to the participant.

1.4. Data Analysis

All statistical analyses were performed using SPSS 25.0.0.0 and the significance level was set at $p = .050$. Our experimental design was within-subjects, with preferences of masculinity as our dependent variable and emotion as our independent variable (with three levels: angry, neutral, and happy). Non-parametric tests were used to analyze the data,

since the assumption of normality was not met. To do the comparisons between all the conditions we used Friedman's test, and to compare conditions separately we used Wilcoxon signed-rank test with a Bonferroni correction applied, changing the significance level to be set at $p < .017$. Correlations were analyzed using Spearman's rank order test, since we used only non-parametric tests.

2. Results

We calculated the mean degree of masculinization considered to be maximally attractive in all 30 faces and for each condition in particular (angry, neutral, and happy). Early on we noticed that participants tended to feminize all images, regardless of emotional expression: angry (M = -14.64, SD = 14.33), neutral (M = -14.63, SD = 15.46), or happy (M = -12.05, SD = 13.89). The Shapiro-Wilk test showed that the residuals values of the neutral condition were not normally distributed, W(81) = 0.93, $p < .001$, even though the conditions angry, W(81) = 0.98, $p = .293$, and happy, W(81) = 0.98, $p = .277$, checked the normality assumption and Mauchly's test indicated that the assumption of sphericity had not been violated, $\chi^2(2) = 2.11$, $p = .348$. With this information, we proceeded with a non-parametric analysis of the data.

Friedman's test showed there was not a statistically significant difference between the conditions (angry, neutral, and happy), $\chi^2(2) = 5.64$, $p = .060$. Likewise, Wilcoxon signed-rank test with a Bonferroni correction applied (resulting in a significance level set at $p < .017$, instead of $p < .050$) showed that the differences between the in faces with different emotional expressions were not statistically significant.. Nevertheless, it should be noted that participants chose to increase the masculinization levels on the happy faces (Mdn = -12) more than the neutral faces (Mdn = -17), Z = 1.85, $p = .065$, or the angry faces (Mdn = -15), Z = 1.58, $p = .114$, and on the angry faces more than the neutral faces, Z = -0.22, $p = .829$.

There were no significant correlations between mean preferences for masculinization in any of our conditions (angry, neutral, and happy) and ethnicity, self-rated attractiveness, relationship status, hormonal contraceptives use, breastfeeding, menstrual cycle phase, or sexual orientation (all $p > .112$). However, there was a statistically significant correlation between the participant's age and the angry condition, $r_s = -0.30$, $p = .006$ (for the other conditions all $p > .176$).

Discussion

In this study, our aim was to understand the role of emotional expression in the preferences of heterosexual women for sexually dimorphic features in male faces. Our hypothesis was that females would choose to rise masculinization when presented with happy faces, as this would neutralize the perception of anger in more masculine faces. Subsequently, it was expected that participants would lower the masculinization levels on neutral and angry faces, respectively, making them look more feminine.

In the pilot study, participants (N = 35) were asked to rate male faces on a masculinity scale, with the purpose of validating our manipulation of 30 KDEF faces (Lundqvist et al., 1998) for the main study. Results showed a statistically significant difference between conditions, with masculinized faces being perceived as more masculine than original and feminized faces, respectively. This suggested that our manipulation of the stimuli was accurate, therefore allowing us to proceed.

Consequently, in the main study, 81 women were presented with 10 of the KDEF faces (Lundqvist et al., 1998), chosen by us accordingly with their ratings, portraying three emotions: anger, neutral, and happiness. Participants could change the masculinization levels with horizontal mouse movement, making images look more or less masculine, and were told to make the faces look the most attractive as possible to them. Results showed no statistically significant differences between conditions, with participants choosing to feminize faces across all emotional expressions. However, happy faces were less feminized than angry or neutral faces, suggesting that our hypothesis could still be valid.

Our results could mean a lot of different things. One of them is that the influence of emotional expressions in male attractiveness could be not as prominent as expected, regarding traits of facial sexual dimorphism. Although, this seems inaccurate with the amount of evidence in other studies (Becker et al., 2007; Hess et al., 2009), and even in our pilot study – angry faces were rated as statistically significantly more masculine than neutral or happy faces –, suggesting that the perception of anger is associated with more masculine faces. Another explanation could be related to the other variables at play when it comes to facial attractiveness, since we did not control important factors like symmetry, averageness, skin color, and skin texture – which is linked to the perception of health and the decrease in

attractiveness (Alley & Cunningham, 1991; Penton-Voak et al., 2001). It is possible that participants found the presented faces to be mainly unattractive, which is consistent with the feedback given, especially by participants in our pilot study sample. Similarly to the inference made by Perrett et al. (1998), preference for more feminine traits can be an attempt to "soften" other traits, considered unattractive. Furthermore, "a happy facial expression could even compensate for relative unattractiveness" (Golle, Mast, & Lobmaier, 2014), what could mean that the happy faces were perceived as more attractive as it is, making space for a preference for higher levels of masculinity. The fact that results showed a significant correlation between participant's age and the masculinity preferences in angry faces, is also very important to note, and could be related to the findings of Little et al. (2010) that women's preferences for more masculine traits changes with age. The importance of movement when evaluating human attraction, was highlighted by Penton-Voak and Chang (2008) where results suggested that the presentation of a video instead of a static image increased the perceived attractiveness of male faces. Since we only used static images, this factor can also have an impact on our current results. Other limitations of our study, such as surroundings and focus on the task – since the data was collected exclusively online – could also have real influence on the results. Participants could also have been experiencing boredom if they the images unattractive and uninteresting.

Future research is required to answer the questions of why females tend to prefer more feminine facial traits in male faces, regarding shape, and how this associates with the perception of emotional expressions, like the perception of anger in more masculine faces. An important step following this study, would be to use the same procedure, but rating the stimuli on other important factors for facial attractiveness, like symmetry, averageness, skin color, and texture, and categorizing these images in order to see if the effects of emotional expression vary with any of these factors. Since the participant's age was correlated to the preferences in angry faces, it would also be interesting to divide participants in several age groups evaluating the differences between them, with the purpose of understanding if the preferences change due to hormonal stages in life or if there's a correlation with the perception of anger in more masculine faces.

Conclusion

To our knowledge, this study is the first to investigate the relationship between the preferences of women regarding traits of sexual dimorphism (of shape) in male faces and the perception of anger in more masculine faces. Even though our results are not conclusive, since female participants chose to feminize all images without any statistically significant differences, they raise a lot of questions and open the doors for future research.

Human facial attraction is a complex concept and involves a high number of factors. Understanding it is a great task that research tries to accomplish. As we remain with far more questions than answers, this work is still valuable to the conversation and can lead to other developments in the search for the aspects at play in the preferences of women for more masculine or more feminine faces in men.

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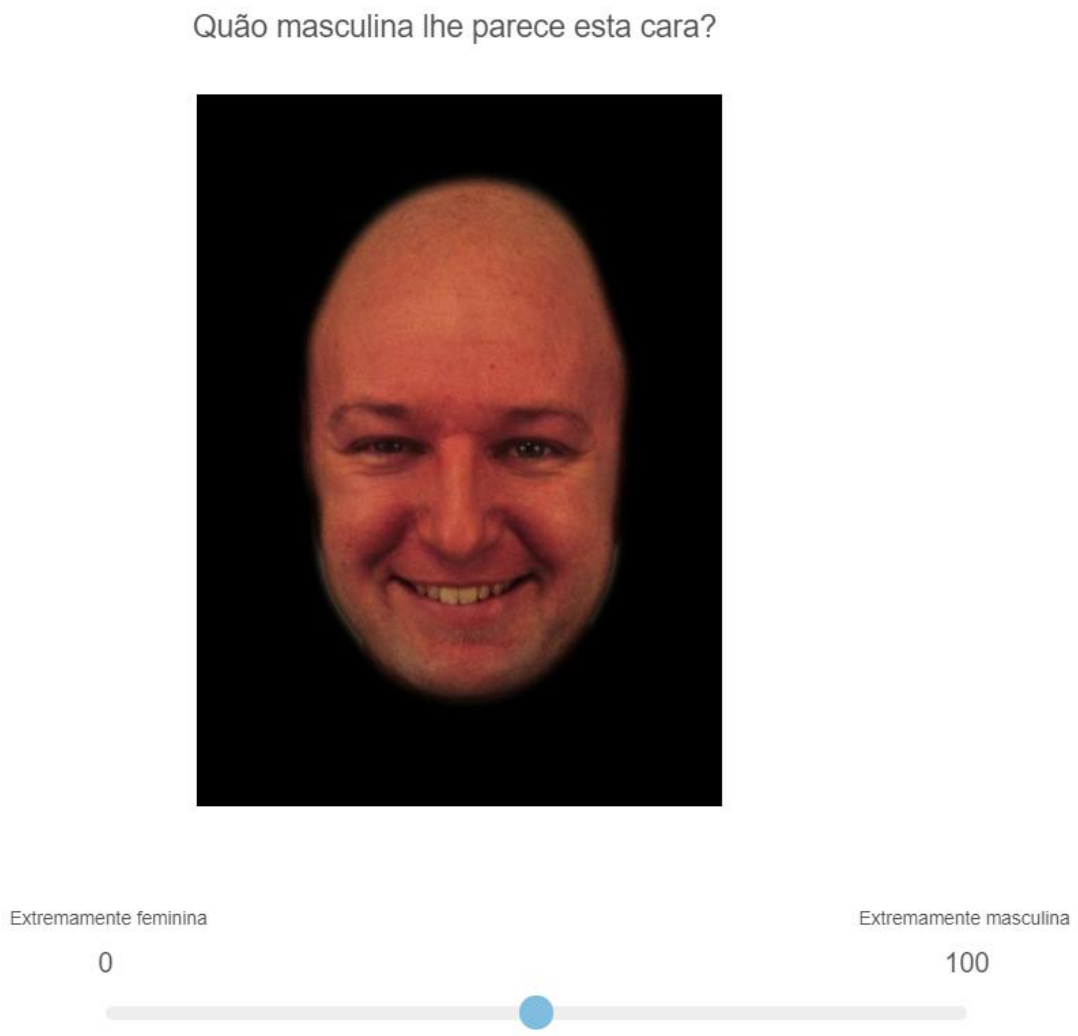
Appendixes

Appendix A – Example of stimuli presented in the pilot study.



Appendix B – Participant Information presented in the main study.

INFORMAÇÃO AO PARTICIPANTE

Título do projeto: Preferências de atratividade em faces masculinas com diferentes expressões emocionais.

Sobre o que é este estudo? Convidamo-la a participar neste projeto de investigação que explora os fatores que influenciam a atratividade das faces, a masculinidade e a emoção.

Porque fui convidada a participar? Procuramos voluntárias, do sexo feminino, com idades compreendidas entre os 18 e os 35 anos, para participar neste estudo sobre a atratividade de caras e a expressão emocional.

Sou obrigada a participar? Não. Esta página informativa tem como objetivo ajudá-la a decidir se quer participar no estudo. Cabe apenas a si decidir se quer ou não participar. Se decidir participar, poderá desistir a qualquer momento sem ter que justificar a sua decisão.

Em que consistirá a minha participação? Ser-lhe-á pedido que altere várias caras que vão ser apresentadas no ecrã de computador, de acordo com a sua preferência. A tarefa será realizada por computador, e pode demorar o tempo que achar necessário. Não existem respostas corretas. Juntamente com a tarefa, ser-lhe-á pedido que responda a algumas questões sociodemográficas sobre si. Estas questões são sobre a sua idade, sexo, etnicidade, hábitos contracetivos, ciclo menstrual, possível gravidez e orientação sexual. É livre de omitir a resposta a estas questões.

A minha participação será anónima e confidencial? Sim. Apenas os(as) investigadores(as) terão acesso aos seus dados, os quais serão armazenados de forma anónima, confidencial e segura.

Armazenamento de dados: Os dados que recolhemos estarão acessíveis para os apenas os investigadores, a menos que forneça consentimento explicito para um acesso mais abrangente no formulário de consentimento informado. Os seus dados serão armazenados num formato anonimizado, num sistema computacional. Mais uma vez, realçamos que toda a informação será mantida como confidencial, e que a análise dos dados será realizada sem conhecimento das identidades individuais dos participantes.

O que irá acontecer aos resultados deste estudo? Os resultados serão publicados como parte de um artigo científico numa revista científica. Se partilhados (publicados e/ou colocados numa plataforma de dados acessível a outras pessoas), os seus dados estarão num formato ANONIMIZADO, o que significa que ninguém poderá identificá-la a partir destes.

O que irá acontecer aos resultados deste estudo? Os resultados serão publicados como parte de um artigo científico numa revista científica. Se partilhados (publicados e/ou colocados numa plataforma de dados acessível a outras pessoas), os seus dados estarão num formato ANONIMIZADO, o que significa que ninguém poderá identificá-la a partir destes.

Existem riscos inerentes à minha participação? A sua tarefa consistirá em alterar faces, sendo que nenhuma delas ser-lhe-á familiar. Não existe risco significativo na sua participação. No entanto, se ficou incomodada com o estudo ou com algum dos tópicos abordados no questionário, deverá entrar em contacto com vários serviços de aconselhamento de saúde (Saúde 24, por exemplo).

Consentimento informado: É importante que dê o seu consentimento informado antes de participar neste estudo.

Quem está a financiar a pesquisa? Esta investigação não é financiada por nenhum patrocinador ou agência externa.

Recompensa/compensação: Não receberá remuneração por participar nesta investigação.

Questões: Se tiver alguma questão sobre este estudo, sobre os resultados ou sobre a sua participação, sinta-se à vontade para enviar um email ao investigador responsável. Os endereços de contacto serão disponibilizados no final da experiência.

Uso dos seus dados pessoais e direitos de proteção de dados: A Universidade de St Andrews está vinculada à Lei de Proteção de Dados do Reino Unido 2018 e ao Regulamento Geral de Proteção de Dados (RGPD), que exigem uma base legal para todo o processamento de dados pessoais (neste caso, é a "realização de uma tarefa realizada no interesse público" - ou seja, para fins de investigação) e uma base legal adicional para o processamento de dados pessoais contendo características especiais (neste caso, é "pesquisa de interesse público"). Como participante, são lhe concedidos vários direitos sob a legislação de proteção de dados. Para obter mais informações sobre a legislação de proteção de dados e seus direitos, visite https://www.standrews.ac.uk/terms/data-protection/rights/. Para qualquer dúvida, envie um e-mail para dataprot@st-andrews.ac.uk

Como os seus dados serão anonimizados, não poderemos apagá-los depois de realizar a experiência, uma vez que não seremos capazes de identificar quais foram as suas respostas.

Aprovação Ética: Esta proposta de investigação foi examinada e subsequentemente aprovada pelo Comité de Ética em Ensino e Investigação da Universidade de St Andrews. Este projeto também foi revisto e aprovado pela Universidade do Porto.

O que devo fazer se tiver preocupações com este estudo? Numa primeira instância, deverá comunicar as suas preocupações a um dos investigadores responsáveis. No entanto, se não se sentir à vontade para fazê-lo, entre em contacto com o departamento de ética escolar (detalhes abaixo). Uma descrição completa dos procedimentos regidos pelo Comité de Ética em Ensino e Investigação da Universidade está disponível em https://www.st-andrews.ac.uk/research/integrity-ethics/humans/ethicalguidance/complaints/.

Contactos dos investigadores:

Mariana Carrito - mariana.carrito@gmail.com

David Perrett - dp@st-andrews.ac.uk

Para continuar carregue no botão abaixo.

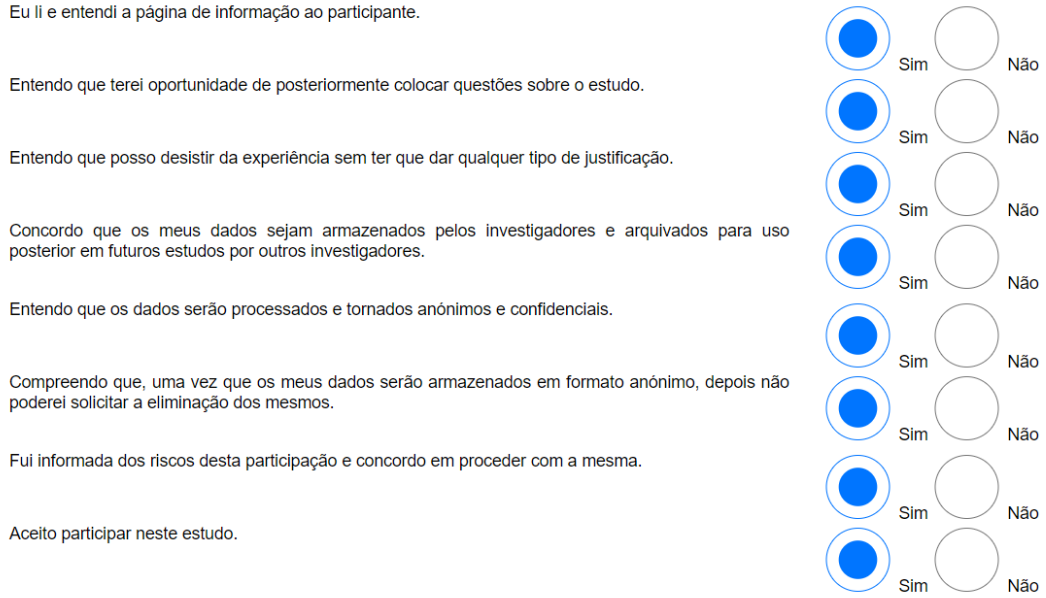
Continue

Appendix C – Participant Consent presented in the main study.

CONSENTIMENTO INFORMADO

A Universidade do Porto e a Universidade de St. Andrews valorizam os aspetos éticos dos estudos conduzidos. Portanto, solicitamos que considere os seguintes pontos antes de prosseguir. O seu consentimento confirma que você deseja participar neste estudo. No entanto, o seu consentimento não a obriga a responder ao que não desejar, e é livre de abandonar a sua participação a qualquer momento.

Por favor, confirme cada uma das afirmações:



Se aceita participar e tem mais que 18 anos, carregue no botão abaixo.

Continue

Appendix D – Demographics Questionnaire presented in the main study.

1) Qual é o seu género?

Masculino Feminino Não-Binário Prefiro não dizer

2) Qual é a sua idade? Please select

3) As fotos abaixo representam alguns grupos étnicos. Alguma das imagens representa melhor as suas raízes étnicas? Percebemos que nem todos os grupos étnicos estão representados.

				Algo mais do que estas	Nenhuma destas

4) Indique o seu grupo étnico. Selecione

5) Quantos dias passaram desde o primeiro dia da sua última menstruação? (por favor comece a contar desde o primeiro dia de sangramento). Por favor, selecione o número de dias

6) Indique a duração média do seu ciclo menstrual. Por favor, selecione o número de dias

7) Indique o seu estado relacional.

Estou atualmente numa relação

Estou solteira

8) Está a usar algum tipo de contracetivo hormonal (Ex: pílula, anel vaginal, DIU hormonal, adesivo, implante, injetável)?

Sim Não

9) Está grávida?

Sim Não

10) Está a amamentar atualmente?

Sim Não

11) Qual o nível de atratividade que atribui a si própria? (Escolha um nível de 1 a 7)

1= Extremamente não atrativa	2	3	4	5	6	7= Extremamente atrativa

12) Indique, por favor, a sua orientação sexual.

1. Exclusivamente heterossexual	2. Predominantemente heterossexual, apenas incidentalmente homossexual	3. Predominantemente heterossexual, mas mais que incidentalmente homossexual	4. Igualmente heterossexual e homossexual	5. Predominantemente homossexual, mas mais que incidentalmente heterossexual	6. Predominantemente homossexual, apenas incidentalmente heterossexual	7. Exclusivamente homossexual

Submit

Appendix E – Task instructions presented in the main study.

Irá visualizar várias imagens de caras.
Movendo o seu rato na horizontal sobre a imagem e o fundo, conseguirá controlar a atratividade de cada cara apresentada.
Demore o tempo que necessitar para explorar como a aparência da face muda quando altera a posição do seu rato. A sua tarefa consiste em fazer com que a cara fique o mais atraente possível de acordo com a sua preferência.

Continue

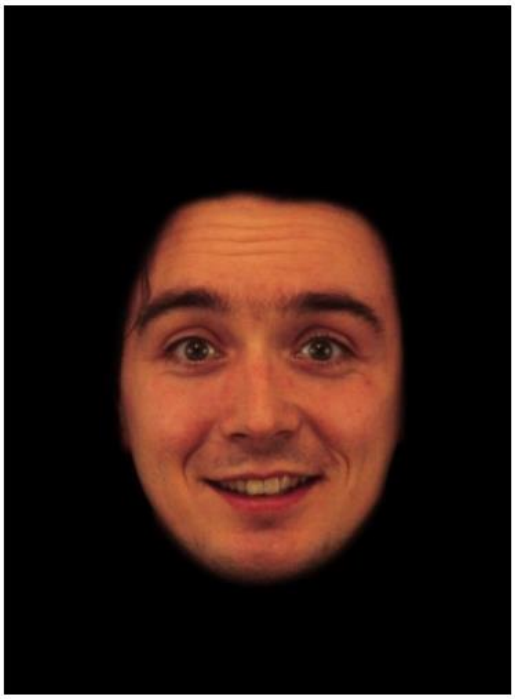
Irá ver um conjunto de caras. Por favor altere a atratividade movendo o seu rato lentamente na horizontal sobre a imagem apresentada. Quando considerar que encontrou a aparência mais atrativa possível, carregue no botão esquerdo do rato.

CONTINUE

Appendix F - Example of stimuli presented in the main study, expressing anger.

Appendix G - Example of stimuli presented in the main study, expressing happiness.

Por favor, altere a cara de forma a torná-la o mais atraente possível.



Faltam 16 ensaios para o fim da experiência.

Appendix H - Example of stimuli presented in the main study, neutral.

Appendix I – Debriefing presented in the main study.

DEBRIEFING

Título do Projeto: Preferências de atratividade em faces masculinas com diferentes expressões emocionais.

Natureza do projeto: Esta investigação pretende explorar como é que a perceção de pistas emocionais influencia as preferências de masculinidade em participantes do sexo feminino. Uma vez que faces masculinas neutras se assemelham a faces zangadas, a nossa hipótese é de que as preferências de masculinidade serão mais evidentes em faces sorridentes comparativamente com faces zangadas/neutras.

Além disso, esta investigação pretende explorar se as preferências de masculinidade em faces que expressam diferentes pistas emocionais também dependem de fatores individuais que, segundo estudos prévios, influenciam as preferências por faces masculinas neutras. Estudos anteriores mostraram que fatores hormonais influenciam as preferências das mulheres heterossexuais, e que estas tendem a preferir faces mais masculinizadas quando férteis. Além disso, em relação ao impacto da perceção da auto-atratividade, estudos demonstraram que as mulheres que se consideram mais atraentes têm uma maior tendência para considerar as faces masculinas masculinizadas como mais atraentes. O nosso objetivo é investigar se estes resultados são replicados quando as participantes realizam julgamentos de atratividade relativos a faces que expressam alegria ou raiva. Este objetivo justifica algumas das perguntas pessoais apresentadas no questionário inicial. Gostaríamos de enfatizar que as suas respostas, relativas tanto aos questionários como à tarefa de faces, não serão tratadas ou analisadas individualmente, mas sim submetidas a uma análise de grupo que considera os dados de todos os participantes.

Armazenamento dos dados: Como indicado na página de informação ao participante, os seus dados serão utilizados para fins académicos tendo em conta o seu consentimento concedido no início desta experiência.

Para terminar, basta que feche esta janela. Se desejar receber informações sobre este estudo, nomeadamente sobre os resultados do mesmo, por favor envie email ou ligue para:

Mariana Carrito (mariana.carrito@gmail.com; (+351) 22 607 97 00)

Se se sentir preocupada com alguma questão de saúde depois da realização deste questionário, deverá contactar uma linha de apoio médico (ex: Saúde 24 – telefone: 808 24 24 24).