

Cross-cultural perception of sexual dimorphism in human face

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Technical and formal aspects of the thesis

The dissertation thesis by Mgr. Vojtěch Fiala deals with the perception masculinity and femininity in the human face, the differences between human groups in this perception and the environmental conditioning of possible differences between them. From the formal and methodological point of view, the thesis is a standard scientific work, namely it consists of three published and one unpublished scientific study and an Appendix (which is also a published scientific article). The studies are introduced by a sufficiently comprehensive and lucid explanatory commentary by the author practically to the extent of the dissertation itself.

The published studies have been peer-reviewed in high-quality peer-reviewed journals (Evolutionary Human Sciences, Scientific Reports, Philosophical Transactions of the Royal Society B: Biological Sciences). This is also reflected in the high quality of the language and the formal processing. Vojtěch Fiala is the first author in two of the published studies. The structure of the studies is sophisticated and complexly interconnected and demonstrates the author's ability to work together in a professionally diversified team, which is nowadays an essential part of scientific work.

Comments on the concept and topic

The focus of the dissertation is very topical nowadays. The notion of masculinity and femininity is currently undergoing dynamic changes in Euro-American society, including the concept of intersex differences, their connection to gender identity, gender roles and expressions, their immutability or fluidity. All this in a culture that is permanently on-line and communicates very intensely through two-dimensional images, including images of the human body and face.

Both the theoretical assumptions and the practical research design of the thesis are of a high standard and seek to address the core research questions. I consider the main motif – a critique of the concept of masculinity and femininity – to be quite correct and relevant.

Two things are commonly intertwined and not very distinct in today's thinking – one is the objectively measured dimorphism of each individual trait, which is (by definition) one-dimensional, on a single axis, and the other is the perception and conception of masculinity and femininity, which is always a subjective concept, assessed by individual people multi-dimensionally and always more or less differently, as each person has slightly different perceptions, experiences, needs and motivations, etc. The concept of masculinity and femininity is thus (rather than morphometrics) more similar to the perception of the concept of good and evil, where people all over the world will probably also agree on some basic aspects but will differ in details and the statements will be (externally assessed) clearly subjective and centric. This is precisely the (difficult to grasp) boundary between qualitative and quantitative approaches. If one then forces such a multidimensional reality to conform to a (predefined and universal) one-dimensional scale (e.g. masculinity/femininity of the face), it is certainly a possible simplification (reduction) for the sake of quantification (if perhaps even deliberately emphasizing

some aspect of interest at the expense of others; abstraction is a regular tool in science), but then one cannot be surprised to get a limited and often difficult to interpret account. Indeed, for each person and each human group, a given scale may express something slightly different. In this respect, therefore, this dissertation is extremely useful and needed in sciences which regard mankind because it uncovers, studies and sets the record straight.

Equally beneficial is an objective approach to quantifying facial shape, using geometric morphometrics, which allows a reliable description of the typicality of the complex shape of the whole face on one scale. This makes it possible to apply stimuli in the form of images of real faces without artifactual modifications of these stimuli, which are otherwise often used in the interest of abstracting from distractions, but in reality, introduce undesirable and often perhaps unknown tendencies into the stimuli. Objectification by GM (not only 2D but also 3D) is certainly a much cleaner and more advanced procedure, allowing a much more diverse range of downstream analyses than the aforementioned morphing of stimuli of certain averaged features. In this respect, I would only point out that the geometric morphometrics extracts into the analysis only the information captured in the position of defined units of measure (typically: landmarks and sliding semilandmarks, curves), but the space between those points also affects the observer of the real face.

Comments on results

The results of the thesis (published papers) clearly show that the author of the thesis is a member of a scientific team applying the methods of cognitive science at today's cutting-edge level. The applied methodology of GM and multivariate statistical methods allowed in these studies to test in detail the relationships between the variables under study in terms of strength and possible causality.

The results clearly show that the relationships between perceived facial masculinity/femininity, sex-typicality, attractiveness, dominance, and physical performance are not trivial and, moreover, vary quite a bit between the sexes. The author offers a meaningful interpretation based on ecological/reproductive differences between the sexes. Studies using morphometric methods have confirmed the positive association between perceived femininity and female facial attractiveness. On the other hand, in males perceived masculinity is related with dominance, strength and aggressiveness, but its relationship with attractiveness varies between samples and cultures. The high external validity of the results stems from the documentation of this relationship in five human cultures, and equally important is the search for moderating variables, particularly ecological contexts.

Further comments

The advantage of cognitive science is that the questions under investigation can be addressed experimentally, unlike most other human-related fields where this is difficult (for technical or ethical reasons). However, these are often laboratory experiments in which many aspects of real life, such as workload, stress, motivation, fatigue, etc. are abstracted away from in order to confirm causality in the experimental design (unless of course these are instead deliberately part of the research design). I confess that I sometimes fail completely to understand why it should be so important in evolution (EEA) to assess, say, perception of masculinity/femininity in another person's face in a matter of milliseconds, when we mostly (sure, I admit: probably...) lived in groups of up to 100 people, and everyone had known each other all their lives and had weeks, months and years of time to look at and assess each other? I could understand it in terms of perceiving emotions (being angry) in terms of danger coming from that person, or perceiving symptoms of pain or illness (helping fellow humans in need), but why would such speed be relevant to sexual dimorphism and sex-typicality? So, applications to real life should be taken with a grain of salt, of which the author is aware, and it is clear

from the experimental setup and interpretation that he is trying to overcome this limitation/disadvantage of the experimental approach (in layman's terms, I would call some aspects of the research design "qualitative-quantitative").

Personally, I believe that one of the disadvantages (resulting from the need to standardize stimuli) of all experiments with faces is precisely the absence of dynamics, head movements, facial expressions and gestures. Even though we do not manipulate the facial stimuli artificially (we do not artificially create different morphs of the same smoothed face all the time), we still need, even in case of 2D geometric morphometrics, a standardized photograph in "neutral", i.e. fixed, expression (I know from my own experience that asking, for example, school-age children to keep a neutral expression is a superhuman feat and the resulting images tend to be questionable...). In real life, women purse their lips differently, smile differently and more often, men tend to raise their heads more (giving the face to the observer as if from below they look seemingly taller, young women, on the other hand, lower their eyes more and let the observer see their face rather from above, therefore they look seemingly smaller, more defenseless, more submissive and less sexually proceptive – more faithful...), each person preferentially offers the observer more of one half of the face, etc. Human operations with the face as a "information board" (or *animi vultus*) are quite varied in real life. (Ancient marble statues look similarly austere and homunculoïd – though morphologically perfect and beautiful, no doubt, we perceive them as artifacts. It is only by colouring them, and even more animation, that we give them life and begin to see them as people with all the human attributes; until then, no.). Although we use real human faces, we lose this dynamic of facial expression. It is possible that our perception unconsciously enriches it with aspects that are there in real life (attributing/estimating more information than is actually seen in the face of the stimulus), while objective analysis of facial images necessarily extracts only what is actually there.

On p. 8 the author says: "We thus assume that cross-cultural disagreement in facial preferences and perception is itself adaptive and put the locals' tastes into accord with local circumstances [...]" I don't think that a disagreement of status in two cultures or their difference can be adaptive. In principle, an adaptation can be something specific (physical structure and/or behaviour) in one individual, in one group (e.g., a certain body height or mate preferences), in another individual or group something else can be adaptive (the resulting form can then be called an adaptation). But the difference between two individuals or the difference (disagreement) between two societies is the result of the observer's comparison, i.e., an abstract product of cognition, which cannot itself be an adaptation of the one cognized. Unless, of course, the disagreement is produced by some interaction in the two cultures, and the differences are produced by just such an interaction (often in just the tendency to differentiate, e.g. the emergence of new nations in contrast to the existing majority). This process is sometimes (according to Bateson) referred to as "schismogenesis" (see, e.g., D. Graeber, D. Wengrow, 2021: *The Dawn of Everything*) and is also related to Graeber's concept of "creative refusal". I don't think this is what the author had in mind, but it might be a good idea to start thinking about the perception of facial sex differences in the human cultures in these terms as well.

The results of the presented studies show, and the author also states this in the dissertation, a positive, but relatively weak relationship between objectively measured dimorphism (on the axis between average male and average female face shape) and subjectively perceived masculinity/femininity (Fiala et al. 2021, Figure 1.3). In my opinion, this may be due to the cultural processes mentioned above. Facial morphology is heavily clouded by the genetically fixed and growth and physiologically realized experiences of evolution of the last hundreds of thousands of years with less influence of external factors (issues of the alveolar arch during teeth eruption and loss, the influence of nutritional and other factors in the lower jaw area, the intensity of oxidative metabolism during growth relative to the paranasal sinuses etc.). Conversely, the way of how we perceive the face will be both much more influenced by visual experience in childhood (as the author sufficiently discusses theoretically in the first part of the dissertation) and much more influenced by cultural concepts, habits, and enculturation

mechanisms. While our genes, through hormones and physiology, push us to create an ancestral paleolithic-like morphology of face, our brain's actual grasp of that morphology takes on a current new environmental context where there may be vital and reproductively important cultural aspects that simply are not (and cannot be) included in our ancestral heritage. What might be most interesting about this is the degree and direction of disagreement between these two aspects (objectively measured dimorphism and perceived masculinity/femininity) in different cultures.

Questions for the defense

Do you think, and if so, to what extent, can the perception of the face and masculinity/femininity within it be influenced by the ubiquitous and dense use of artefactual and graphically very advanced adaptations of facial visualization in the media, internet and on social media (e.g., Instagram face filters, profilepic.com, etc.)? It affects today's generation of children from a very early age indeed. Do you have any idea to what extent masculinity and femininity is embedded in the computational principles of these filters? And to what extent can global culture act as a unifying factor today?

Could it be that the identical features of the perception of at least some aspects of the face are influenced by globalization? (i.e., cultural convergence instead of common evolutionary roots...) I know from a colleague studying the Mebengokre group (indigenous people of the Amazon) that even these still very traditional people are influenced by it, e.g. they commonly use cell phones and WhatsApp.

Conclusions

The theoretical review shows the author's excellent overview of both general biological theories and studies specifically focused on the human face in the context of sex differences. The empirical studies presented here show great erudition, are full-blooded scholarship, based on a deep theoretical understanding of the subject, a precise and imaginative methodology, a great deal of challenging and arduous work, and contain many improvements and new ideas. The author is, in my opinion, a scholar who has demonstrated a capacity for scholarly work and has great promise of continuing to do so in the future. Therefore, the dissertation of Mgr. Vojtěch Fiala's is fully recommended for defense.

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