

Summary

The Relationship between Facial Width-to-Height Ratio and Psychological Characteristics, Social Behavior, and Social Perception

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Recent research shows that human facial morphology plays an important role in the impressions that perceivers form about target individuals (Todorov, Olivola, Dotsch, & Mende-Siedlecki, 2015). Whether impressions accurately capture targets' psychological characteristics is a matter of debate. If certain biological factors underlie or influence both facial features and behavioral tendencies, perceivers could in principle make accurate inferences about targets. The facial width-to-height ratio (fWHR; i.e., bizygomatic distance divided by the distance between upper lip and middle of the eyebrows) has recently received increasing research attention due to the possibility that it serves as an honest signal in this sense. This paper reviews the empirical literature on the relationship between fWHR and psychological characteristics and social-behavioral tendencies of face-bearers, as well as the role fWHR plays in perceivers' impressions of face-bearers.

Initial theorizing and evidence pointed to the possibility that fWHR tracks face-bearers' testosterone levels (Lefevre, Lewis, Perrett, & Penke, 2013; Weston, Friday, & Liò, 2007). However, subsequent research produced evidence that failed to support this possibility (e.g., Bird et al., 2016). Because testosterone is more influential in male development (Nelson, 2011), fWHR was assumed to be sexually dimorphic, that is, greater in males compared to females. Evidence on this matter is also inconsistent, with some studies supporting dimorphism (e.g., Weston et al., 2007) and others not (e.g., Özener, 2012). Thus, further research is needed to settle the debate regarding fWHR's link to testosterone and whether it is a sexually dimorphic feature of the human face.

Due to the above-mentioned assumption of its link to testosterone, fWHR has been studied mostly in male targets and mostly in terms of its relation to behavioral tendencies such as aggression, dominance, and deceitfulness. fWHR appears to be related positively to ag-

gressiveness in both lab-based measures and real-world settings (e.g., in hockey and soccer players) (e.g., Carré & McCormick, 2008). It is possible that such findings, as well as others involving the fWHR, could be explained away by body mass index (BMI), which tends to be positively correlated with fWHR (Deaner, Goetz, Shattuck, & Schnotala, 2012). Furthermore, recent research indicates that it may be only low status males for whom this relationship between fWHR and aggressiveness holds (Goetz et al., 2013). Regardless, two meta-analyses support a small but reliable fWHR-aggressiveness link (Geniole, Denson, Dixson, Carré, & McCormick, 2015; Haselhuhn, Ormiston, & Wong, 2015). Likewise, fWHR was found to be related positively to dominance and the drive for success (e.g., to real-world financial performance of CEOs) in some studies (Lewis, Lefevre, & Bates, 2012; Wong, Ormiston, & Haselhuhn, 2011). Finally, fWHR is positively related to the tendency to deceive partners in economic games (Haselhuhn & Wong, 2012; Stirrat & Perrett, 2010) and to unethical behavior more generally (Geniole, Keyes, Carré, & McCormick, 2014), which in turn may be driven by the need for dominance. In fact, fWHR is positively related to the tendency to cooperate with ingroup members when it serves to dominate an outgroup (Stirrat & Perrett, 2012). Apart from these more commonly researched characteristics, fWHR has also been found to be related positively to explicit (but not implicit) prejudice (Hehman, Leitner, Deegan, & Gaertner, 2013) and there is mixed evidence in terms of its relation to reproductive success (Gómez-Valdés et al., 2013; Loehr & O'Hara, 2013).

Turning to social perception, fWHR is also related to perceivers' impressions of face-bearers in directions that parallel the findings above. For instance, fWHR is positively related to aggressiveness perceptions (Marsh, Cardinale, Chentsova-Dutton, Grossman, & Krumpal, 2014; Short et al., 2012). Evidence indicates that it is

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specifically fWHR and not other related facial qualities that is related to aggressiveness ratings (Boshyan, Zebrowitz, Franklin, McCormick, & Carré, 2014; Geniole, Keyes, Mondloch, Carré, & McCormick, 2012). fWHR appears to be related positively also to dominance perceptions but this relation was not statistically significant ($p = .06$) in a meta-analysis (Geniole et al., 2015). Some studies even find that fWHR is related *negatively* to perceived social status (Eisenbruch, Grillot, Maestriperi, & Roney, 2016). Finally, fWHR is negatively related to trustworthiness (Kleisner, Priplatova, Frost, & Flegr, 2013; Stirrat & Perrett, 2010). Wider faces (scaled for height) are generally perceived more negatively. For instance, male faces with greater fWHR are rated as less attractive by females, though this may depend on whether these faces are presented in a short- versus long-term mating context (Eisenbruch et al., 2016; Valentine, Li, Penke, & Perrett, 2014). Wider faces are also perceived as more prejudiced (Hehman, Leitner, Deegan, et al., 2013). More disturbingly, bearers of such faces are even more likely to receive the death (versus lifelong prison) sentence in U.S. courts (Wilson & Rule, 2015).

Based on the literature briefly summarized above, fWHR does seem to be related to both psychological characteristics and behavioral tendencies on the one hand, and to social perception on the other. However, empirical efforts concerned with fWHR appear to be facing several pitfalls and challenges. First of all, it must be noted that the first type of relation is accompanied by a small effect size. For instance, the fWHR-aggressiveness link was estimated to be $r = .16$ in one meta-analysis (Geniole et al., 2015). The second type of relation might be accompanied by a somewhat stronger effect size: In the same meta-analysis, the relation between fWHR and perceived aggressiveness was estimated at $r = .46$. Researchers new to this area must keep in mind that the human face is an extremely complicated constellation and fWHR is a single metric within this configuration that is unlikely to be associated with large effects. Second, there are a number of technical challenges to conducting solid research on faces generally and fWHR specifically. For instance, different research teams appear to employ different methods of measuring fWHR, although there is no direct evidence that this makes a difference in terms of the patterns of findings (Haselhuhn et al., 2015; Kramer, Jones, & Ward, 2012). Likewise, fWHR is often measured from static facial photographs and technical aspects of the images, such as focal length of the camera lens, emotional expression, and angle of the face in relation to the camera, may result in disparate measures of the same face (Hehman, Leitner, & Gaertner, 2013; Třebický, Fialová, Kleisner, & Havlíček, 2016). There may be even greater variability in fWHR mea-

asures within images of the same person than between different target persons when non-standardized photographs are used (Kramer, 2016). Unfortunately, most research ignores these variables or does not report on them. Third, in line with the rest of the literature, most evidence comes from Western cultures and there is therefore a need for replication in different samples, both in terms of targets and perceivers. Similarly, most evidence pertains to males. Some studies test but fail to find effects for female faces (e.g., Carré & McCormick, 2008) whereas others do find effects for female faces that replicate effects found for males (e.g., in terms of the relation between fWHR and perceived aggressiveness) (Lefevre & Lewis, 2014). Fourth, how fWHR is related to other facial and bodily features must be considered in order to identify its unique role. As noted above, fWHR is positively related to BMI and when the latter is accounted for, fWHR effects sometimes disappear (Mayew, 2013). Bodily and facial adiposity is important to consider for similar reasons (Lefevre et al., 2013). There are many metrics that could be derived from the human face and most studies do not take into account a large number of metrics or focus only on fWHR. Thus, further research is needed to test whether fWHR effects rely on the relation of fWHR to those other metrics or whether fWHR has potential to explain unique variance (e.g., Skorska, Geniole, Vrysen, McCormick, & Bogaert, 2015). Fifth, some mixed findings are suggestive of the presence of moderators. Social status (of face-bearers) was mentioned above as one moderator already discovered (see also Welker, Goetz, & Carré, 2015 for a similar finding in terms of fWHR's relation to risk-taking tendency). In addition, the previously mentioned finding that wider-faced males tend to cooperate more with ingroup members when it serves intergroup domination (Stirrat & Perrett, 2012) could be seen as an example of a contextual moderator. More research is needed for the discovery of both subject variables and contextual factors that may moderate fWHR's effects. Finally, fWHR studies should begin to focus outside the commonly studied negative behaviors and perceptions (i.e., aggressiveness, dominance, deceitfulness). For instance, cognitive variables related to risk-taking, such as capacity for cognitive inhibition, appear to be good candidates for further research. This is because risk-taking may underlie the negative behavioral tendencies associated with fWHR (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Welker et al., 2015) and going beyond self-reported risk-taking measures (e.g., Anderl et al., 2016) would add to our confidence regarding fWHR's ability to track important psychological characteristics. In addition, fWHR's relation to prejudice indicates that it may also be related to political psychological variables,

a possibility awaiting research. Perceivers' impressions and inferences are very commonly measured via direct rating scales. However, such explicit measures often tap into distinct psychological mechanisms relative to implicit measures (Rydell, McConnell, Mackie, & Strain, 2006). Thus, another possible direction for extension is assessing how fWHR is related to more rapid, automatic, and indirect responses to faces.

In conclusion, fWHR as a relatively well-defined and easily measured (given that the above-mentioned technical challenges are handled) facial metric has received wide attention in the recent literature. fWHR does

appear to be related to both social perception and social behavior with partial evidence that it can sometimes serve as an honest signal of the face-bearer's psychological characteristics. This research topic appeals to biologists, anthropologists, and psychologists, thereby facilitating inter-disciplinary communication. Future research along the lines mentioned above promises to be a fruitful avenue for the continued exploration of connections between these fields and for a better understanding of the biological aspects of human appearance related to social behavior and perception.