Height, hands & handwriting

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CHAPTER 6

General discussion

6. General Discussion

In previous chapters, I presented a rather heterogeneous collection of studies. While at first glance they might appear as unrelated, I hope I was able to reveal the theoretical connecting thread. In the following paragraphs, I will first review and briefly discuss the main findings of the studies reported in this dissertation. Subsequently, I will mention some limitations of the present studies, and will finally suggest possible directions for future research.

6.1 Summary of Main Findings

6.1.1 Over-report of One's Height is Related to Intrasexual Competition Levels

It is generally believed that an expanded, upright position is a signal of dominance, both in primates and humans (e.g., Poggi & D'Errico, 2010). In the study described in Chapter 2, I wondered if a psychological analog to the self-inflating strategies observed in animals would also exist in humans. If such a mechanism or strategy existed, it would manifest itself in competitive situations, or would constitute a differential attribute of highly competitive individuals.

This study showed that the magnitude of over-reporting one's own height—i.e., reported minus measured height—is positively associated with a competitive attitude towards same sex individuals, as measured by the Intrasexual Competition Scale (Buunk & Fisher, 2009). Since in this study there were no experimental interventions, this deceiving strategy—either conscious, or unconscious—appears to be independent of an obvious challenging stimulus or direct threat. Surprisingly, the results failed to show an association of height over-report with sociable dominance. Since sociable dominance is related to assuming a central or preeminent position (Kalma, Visser, & Peeters, 1993), I hypothesized this form of dominance would be positively associated with over-reporting one's height.

A possible explanation for an association of the height bias report with intrasexual competition, and not with sociable or aggressive dominance could be the more reactive nature of the items in the Intrasexual Competition Scale (e.g., *I can't stand it when I meet another man/woman who is more attractive than I am*) vs the more proactive items in the Sociable Dominance (e.g., *I have no problem in talking in front of a group*) or Aggressive Dominance (e.g., *I can look anybody in the eye, and lie with a straight face*) scales.

6.1.2 Signature Size is Associated to Sociable Dominance and Narcissism

Building on the previous study, the research described in Chapter 3 was directed at exploring dominance and competition in relation to alternative representations of the self. I reasoned that if a competitive attitude was related to the magnitude of over-reporting one's height—reminiscent of animal self-inflating strategies—intrasexual competition and dominance levels might be associated to signature size which has recently been shown to be related to self-identity feelings (e.g., Kettle & Häubl, 2011; Shu, Mazar, Gino, Ariely, & Bazerman, 2012). Given that self-enhancement has been linked to narcissism (John & Robins, 1994), and, similarly, that grandiosity—either overt or covert—has been deemed as one of central features of narcissism (American Psychiatry Association, 2013), and that narcissism has been proposed to have evolved as a unique form of dominance (Holtzman & Strube, 2011), I also studied the relationship between signature area and narcissistic personality traits.

The results showed a weak, but highly significant association between signature area and sociable dominance both for men and women, whereas signature size was significantly related to narcissism only in females. These associations remained significant after controlling for par-

ticipant's age, number of characters in participant's name, average character area in the printed name—a likely indicator of the overall writing size—, and signature style. While the association of signature size with sociable dominance and narcissism was rather modest, the fact that highly similar results were obtained with three different measures of signature area, and that no relationships of printed name area with sociable dominance or narcissism were observed, suggest a genuine association of signature size with sociable dominance and narcissism.

According to Kalma and colleagues (1993), sociable and aggressive dominance are characterized by the person's social orientation: while individuals high on sociable dominance exhibit a positive attitude towards others, a central position in groups and a strong need to dominate in a reasonable way, individuals who score high in aggressive dominance display a negative attitude towards others, a strong motivation to impose their interests even at the expense of others. Intrasexual competition, in turn, can be viewed as competition among same-sex individuals access to potential mates (e.g., Buunk & Fisher, 2009). That signature area is associated to sociable dominance and narcissism, but not to aggressive dominance or intrasexual competition could then suggest that signature size might be related to self-promoting strategies rather than coercive behavior.

6.1.3 Physical Aggression is Related to Prenatal Testosterone Levels

It has been proposed that differential parental investment is a major driving force behind intrasexual competition—an individual from the sex investing less could increase its reproductive success by mating with a several members of the sex investing more, leading thus to competition among members of the former sex (Trivers, 1972). From this perspective, sexual size dimorphism and weaponry are generally believed to reflect intrasexual competition in many animal species (e.g., Clutton-Brock, 1985; Lindenfors et al., 2007).

Sex differences are not restricted to anatomical structures, but also include behavioral sexual dimorphisms. In this regard, in humans, physical aggression is more common in males than females across cultures, from early childhood on, peaking between 20 and 30 years of age (Archer, 2004). The fact that physical aggression is more frequent in males than females, and that physically aggressive behavior reaches its maximum by 20-30 years—just before male fertility starts to decrease (Ford et al., 2000; Hassan & Killick, 2003)—is consistent with a role of male aggressive behavior in sexual selection. Consistently, the positive association between skeletal muscle mass and age also reaches a peak around age 27 years, when skeletal muscle mass starts to show a negative association with age both in men and women (Silva et al., 2010).

It has been argued that sexually dimorphic behavior in humans is related to prenatal, and perinatal testosterone exposure (Forger, Strahan, & Castillo-Ruiz, 2016; Knickmeyer & Baron-Cohen, 2006). Given the strong evidence that the second-to-fourth digit length ratio is a marker of prenatal testosterone levels (Manning, Kilduff, Cook, Crewther, & Fink, 2014; Romano, Rubolini, Martinelli, Bonisoli Alquati, & Saino, 2005; Zheng & Cohn, 2011), in the study described in Chapter 4, I explored the association of the 2D:4D ratios and aggressive behavior—measured as type and number of cards awarded—in a sample of junior soccer players. This study showed that second-to-fourth finger ratios are indeed associated with both level and frequency of aggressive conduct.

The results showed that 2D:4D ratios of soccer players who exhibited the highest level of aggressive behavior—i.e., players awarded one or more red cards throughout the season—were significantly lower than 2D:4D ratios of players who exhibited the lowest levels of aggression—i.e., players who received no yellow or red cards during the championship season. Accordingly, soccer players who exhibited intermediate levels of aggression—i.e., players who received one or more yellow cards, but received no red cards—exhibited intermediate second-to-fourth finger ratios. Additionally, Pearson correlation analyses showed that yellow, red and weighted cards per match were

negatively correlated with 2D:4D ratios; that is, players with lower 2D:4D ratios were awarded more yellow, and/or red cards per match than individuals with higher 2D:4D ratios. These results are consistent with a role of prenatal testosterone in facilitating aggressive behavior in later life by means of acting on early neural development.

6.1.4 Aggressive Dominance is Related to Prenatal Testosterone Levels

The results from the previous study strongly suggest that prenatal testosterone plays a role in adult aggressive behavior. In the study described in Chapter 5, I explored whether prenatal testosterone levels—measured as 2D:4D ratios—were also associated with dominant attitudes in junior soccer players. Contrary to expected, Pearson correlation analyses showed a moderate significant positive correlation between aggressive dominance and right hand 2D:4D ratios, while no significant correlation was observed between 2D:4D ratios and sociable dominance. The positive association between the right hand second-to-fourth finger ratios and aggressive dominance in this study goes in the opposite direction of the association between 2D:4D ratios and aggressive dominance in university students reported by van der Meij and colleagues (2013). There are some methodological differences between the study reported in this dissertation and the study reported by van der Meij and colleagues, which could help to explain—at least in part—the discrepancy in the results: different translations of the Sociable and Aggressive Dominance scales were used in the studies; additionally, an odd number of choices in the Likert answers was used in this study, while van der Meij used an even number of choices. More important, both studies used quite different samples. While the sample in this study consisted of male junior soccer players, aged 13-17 years, the sample used by van der Meij and colleagues consisted of male university students, aged 18-29 years. Soccer is a highly competitive sport where individual aggressive attitudes can hinder team performance, or prompt aggressive behavior which might result in an increased risk of sanctions. Additionally, player selection procedures may result in a positive bias favoring soccer players with low levels of aggressive attitude.

6.2 Strengths and Limitations

One of the strengths of the present thesis is the innovative character of most of the studies included. To the best of my knowledge, the study reported in chapter 2 is the first to have looked at height over-report as a self-inflation mechanism related to competition and dominance. In order to explore for the potential association of signature size and personality traits, in the study described in chapter 3, I devised two novel operationalizations of signature size, and suggested a robust methodological approach to weight out potential confounders. I believe this method would be of interest in future studies of signature, and additional handwritten or graphic productions, in relation to personality characteristics. In the study reported in chapter 4, I used yellow and red cards awarded to junior soccer players as a means of characterizing different levels of aggressive behavior, and showed this aggressive behavior to be related to prenatal androgens. All the studies reported here were carried out in Uruguay, a small South American, with a population of mostly European descent (Hidalgo, Bengochea, Abilleira, Cabrera, & Alvarez, 2005), contributing to the diversification of samples in behavioral studies.

Although the present research met its aims, it also presents some unavoidable limitations. First, the samples used in three of the four studies included in this dissertation consisted exclusively of male participants coming from a highly competitive environment. Whereas the characteristics of these highly competitive subjects may have helped to reveal relationships between variables that would have otherwise go unnoticed, it will be interesting to see if the conclusions drawn from these studies would hold for the general population.

Second, with the exception of measured height, signature area and yellow and red cards, all other variables were based on self-reports. Self-reported measures are known to be affected by—among other factors—the honesty of the participants, their introspective ability, and their response bias. In fact, one of the studies took advantage of the *inaccuracy* of self-reported measures, and explored the association of the bias in self-reported height and intrasexual competition. In the future, the inclusion of additional objective behavioral measures—rather than the use of scales and inventories—would be desired.

Third, for most of the scales used in this dissertation, no validated translations were available. At least one of the scales used in this thesis—the 16-items Narcissistic Personality Inventory (NPI-16; Ames, Rose, & Anderson, 2006)—showed only a marginally acceptable reliability. Additionally, the use of validated translations would facilitate comparing the results to those obtained by other research groups.

The present research reflects but a small part of an extremely complex reality, where biological, social, cultural and situational factors interact with each other to shape an individual's psychological and behavioral traits. I believe the findings reported in this thesis constitute a valuable contribution to furthering the understanding the complex dominance and competition processes in humans.

6.3 Conclusions

The idea that psychological traits build upon ancient physiological or behavioral components is an exciting possibility. The research presented in this dissertation shows the existence of mechanisms reminiscent of self-inflation strategies observed in other mammals. Additionally, this research sheds light on the role of prenatal sex steroids on adult behavior.

In this thesis, I have shown that:

- intrasexual competition levels are positively associated with over-reporting one's own height in male junior soccer players,
- sociable dominance is related to signature size both in men and women, while narcissism is positively linked with signature size only in women,
- severity of aggressive behavior is negatively linked to prenatal testosterone levels in male junior soccer players,
- frequency of aggressive behavior is negatively correlated with prenatal testosterone levels in junior soccer players, and
- sociable dominance is positively associated with prenatal testosterone levels in junior soccer players.

6.4 Future Directions

This dissertation provides evidence of the existence of human behavioral and psychological analogues to those strategies for increasing apparent-size observed in other animals. It also offers support for a role of prenatal androgens in dominance and antagonistic behavior in humans. In addition, this research raises a number of exciting questions.

In the future it will be interesting to explore whether men consciously over-report their own height, or whether this *inaccuracy* results from a cognitive distortion. Given the reported association between height over-report and a psychological trait presented in this thesis, it will be

interesting to explore for the existence of bias in reporting one's own height in clinical samples, for instance in depressed men and women. It will be worth studying whether such a bias can be influenced by threatening or power feelings.

I have shown an association of signature size with sociable dominance and narcissism. I believe that further studies, including more robust measures of narcissism, will be of great interest. I also believe that the new approach proposed in this dissertation will prove to be useful in the analysis of psychological traits in relation to both dynamic and static psychological traits.

An association between aggressive behavior and prenatal testosterone is strongly supported by the results presented in this dissertation. In the future, it will be interesting to explore the role social cognition—e.g., empathy, emotional regulation and frustration tolerance—in modulating the role of prenatal androgens in aggressive behavior.

Although many questions remain open, it is my hope that the studies presented in this dissertation have provided new insight in relation the role of prenatal testosterone in human dominance and competition, and also shed light on the cues to these traits.

6.5 References

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