

Social Status in Humans: Differentiating the Cues to
Dominance and Prestige in Men and Women

by

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Table of contents

ACKNOWLEDGEMENTS	II
TABLE OF CONTENTS	IV
LIST OF FIGURES	VII
LIST OF TABLES	IX
THESIS ABSTRACT	X
CHAPTER 1 GENERAL INTRODUCTION	1
1.1 SYNOPSIS	1
1.2 SELECTION PRESSURES ON ANIMALS AND SOCIALITY	1
1.3 ADAPTATIONS FOR GROUP LIVING	3
1.4 SOCIAL STATUS IN NON-HUMAN ANIMALS.....	4
1.5 SOCIAL STATUS IN HUMANS	5
1.5.1 Men	6
1.5.2 Women.....	7
1.6 TYPES OF SOCIAL STATUS: DOMINANCE AND PRESTIGE	7
1.7 FACES AND SOCIAL STATUS	9
1.8 OUTLINE FOR THESIS	11
CHAPTER 2 CAN DOMINANCE AND PRESTIGE BE VISUALISED IN A FACE?	12
2.1 ABSTRACT	12
2.2 INTRODUCTION	12
2.3 STUDY ONE	14
2.3.1 <i>Methods</i>	15
2.3.2 <i>Manipulation Check: Ratings of attractiveness, dominance, and prestige by the creators of the EvoFITs</i>	18
2.3.3 <i>Discussion</i>	18
2.4 STUDY TWO	18
2.4.1 <i>Methods</i>	18
2.4.2 <i>Results</i>	19
2.4.3 <i>Discussion</i>	23
2.5 STUDY THREE	23
2.5.1 <i>Methods: Rating personality characteristics</i>	24
2.5.2 <i>Results</i>	24
2.5.3 <i>Discussion</i>	29
2.6 GENERAL DISCUSSION.....	30
2.7 CONCLUSION	33
CHAPTER 3 IN THE FACE OF DOMINANCE: SELF-PERCEIVED AND OTHER-PERCEIVED DOMINANCE ARE POSITIVELY ASSOCIATED WITH FACIAL-WIDTH-TO-HEIGHT RATIO IN MEN	34
3.1 ABSTRACT	34
3.2 INTRODUCTION	34
3.3 STUDY ONE	35
3.3.1 <i>Methods</i>	35
3.3.2 <i>Results and discussion</i>	36
3.4 STUDY TWO	37

3.4.1 Methods.....	37
3.4.2 Results and discussion.....	38
3.5 STUDY THREE	39
3.5.1 Methods.....	39
3.5.2 Results and discussion.....	39
3.6 STUDY FOUR	40
3.6.1 Methods.....	40
3.6.2 Results and discussion.....	40
3.7 GENERAL DISCUSSION.....	42
3.8 CONCLUSION	43
CHAPTER 4 BRINGING STATUS INTO FOCUS: CLARIFYING THE TERMINOLOGY USED ACROSS HUMAN SOCIAL STATUS RESEARCH.....	44
4.1 ABSTRACT	44
4.2 INTRODUCTION	44
4.2.1 Benefits of social status and sex differences.....	44
4.2.2 Prestige, dominance, and individual differences.....	45
4.2.3 Defining social status	46
4.2.4 The current research	47
4.3 METHODS.....	48
4.3.1 Participants	48
4.3.2 Word List.....	48
4.3.3 Procedure	49
4.3.4 Analyses	51
4.4 RESULTS	51
4.4.1 How do the overall concepts of dominance, prestige, social dominance, and physical dominance compare to each other?.....	51
4.4.2 How do the constructs dominance, prestige, social dominance and physical dominance compare when examined within each sex?.....	53
4.4.3 How do the constructs dominance, prestige, social dominance and physical dominance compare when examined between the sexes?	55
4.5 DISCUSSION.....	64
4.5.1 High status individuals and their not-so-high status counterparts.....	64
4.5.2 The four constructs: Prestige, Dominance, Social dominance, Physical dominance	64
4.5.3 How the constructs fit together	67
4.5.4 The four constructs: Definitions in current literature and relationships with my findings.....	68
4.5.6 Future directions, applications, and limitations of this work	71
4.6 CONCLUSION	72
CHAPTER 5 PERCEIVED INTENSITY AND CLASSIFICATION OF HUMAN FACIAL EXPRESSIONS ARE INFLUENCED BY MANIPULATED FACIAL DOMINANCE.....	73
5.1 ABSTRACT	73
5.2 INTRODUCTION	73
5.2.1 Structural characteristics of dominant faces	73
5.2.2 Dominance and dynamic facial expressions	74
5.2.3 Interplay between structural dominance and expressions	75
5.2.4 Social cognition and dominant individuals.....	76
5.2.5 The current research	77
5.3 STUDY 1A	77
5.3.1 Method.....	78
5.3.2 Results	82

5.3.3 Discussion.....	86
5.4 STUDY 1B	87
5.4.1 Methods.....	88
5.4.2 Results.....	89
5.4.3 Discussion.....	95
5.5 STUDY 2	96
5.5.1 Methods.....	96
5.5.2 Results.....	97
5.5.3 Discussion.....	98
5.6 GENERAL DISCUSSION	99
5.6.1 Structural and perceived dominance interacts with dynamic expressions	99
5.6.2 Processing invariant and variant facial features.....	100
5.6.3 Implications for social interactions with dominant individuals.....	101
5.6.4 Limitations and future directions.....	102
5.7 CONCLUSION	103
CHAPTER 6 SEX DIFFERENCES IN THE PERCEIVED DOMINANCE AND PRESTIGE OF WOMEN WITH AND WITHOUT COSMETICS	105
6.1 ABSTRACT	105
6.2 INTRODUCTION	105
6.3 STUDY 1	106
6.3.1 Materials and Methods.....	107
6.3.2 Results.....	110
6.3.3 Discussion.....	113
6.4 STUDY 2	115
6.4.1 Methods.....	115
6.4.2 Results.....	116
6.4.3 Discussion.....	117
6.5 GENERAL DISCUSSION	118
6.5.1 Limitations and future studies	120
6.6 CONCLUSION	121
CHAPTER 7 GENERAL DISCUSSION	122
7.1 SYNOPSIS	122
7.2 SUMMARIES	122
7.3 A CASE FOR DOMINANCE AND PRESTIGE BEING VISIBLE IN ONES' FACE, AND BEING SEPARATE STRATEGIES TO HIGH SOCIAL STATUS.	126
7.4 DO MEN AND WOMEN CLIMB THE SOCIAL LADDER IN DIFFERENT WAYS?	128
7.4.1 Perceptions of women and men's social status	128
7.4.2 Climbing the social ladder.....	129
7.5 FUTURE DIRECTIONS, POSSIBLE FUTURE RESEARCH, AND LIMITATIONS	130
7.5.1 Mapping dominance and prestige on the face	130
7.5.2 Perceivers' behavioural changes towards high status individuals	131
7.5.2.2 Verbal and other non-verbal behavioural changes.....	132
7.5.3 Limitations	134
7.7 FINAL CONCLUSIONS	135
REFERENCES.....	136
APPENDICES.....	151
APPENDIX 1	151

List of figures

Figure 1. Example female (top row) and male (bottom row) stimuli created by participants based on descriptions of dominant (left-most column), prestigious (middle column), and attractive (right column).	16
Figure 2. Average images created by combining up to 16 stimuli (Dominant: 16 female and 14 male; Prestigious: 16 female and 13 male; Attractive: 14 female and 16 male), of female (top row) and male (bottom row) faces made by participants based on descriptions of dominant (left column), prestigious (middle column), and attractive (right column) individuals.	17
Figure 3. Male faces created based on written descriptions and rated for dominance, prestige, and attractiveness.....	22
Figure 4. Female faces created based on written descriptions and rated for dominance, prestige, and attractiveness.....	23
Figure 5. Male EvoFIT faces rated for personality characteristics	27
Figure 6. Female EvoFIT faces rated for personality characteristics	27
Figure 7. Correlation between other-perceived dominance and fWHR ratio in female and male participants. Linear trend lines are displayed.....	37
Figure 8. Correlations between self-perceived dominance and fWHR ratio in female and male participants.	38
Figure 9. Correlations between self-perceived dominance and fWHR ratio in female and male participants.	40
Figure 10. mean fWHR of male and female EvoFIT faces created to look dominant, prestigious, and attractive.....	41
Figure 11. Venn diagrams of word (N=61) categorization. The number beside each word represents the percentage difference from the next highest category. The numbers within brackets represent the number of words assigned to that category. The words which were evenly assigned to two categories are presented in the 'Equal' area underneath each Venn diagram (s = social dominance, p = physical dominance, b = both, n = neither). A) Prestige vs. Dominance in men and women as rated by both sexes, B) Physical dominance vs. Social dominance in men and women as rated by both sexes. C) Prestige vs. Dominance in men as rated by both sexes. D) Physical dominance vs. Social dominance in men as rated by both sexes. E) Prestige vs. Dominance in women as rated by both sexes. F) Physical dominance vs. Social dominance in women as rated by both sexes.	63
Figure 12. Representation of words used when characterising individuals who are: A) High status, B) Not high status, C) Prestigious or Dominant, and D) Socially dominant or Physically dominant. Words include those used to describe individuals of both sexes, men, and women. Note: While for simplicity and clarity Socially dominant and Physically dominant individuals are depicted as deriving from Dominant, data for these were obtained from a separate set of participants (see methods).	67
Figure 13. Left column: Average of 15 lowest dominance rated female (top) and male (bottom) faces. Right column: Average of 15 highest dominance rated female (top) and male (bottom) faces.....	80
Figure 14. Facial dominance manipulation of an angry male face. Left: face transformed to appear 50% lower in dominance than the unmanipulated face. Middle: unmanipulated faces. Right: face transformed	

to appear 50% higher in dominance than the unmanipulated face. Note: Participants saw images manipulated to look high and low in dominance, never the original, unmanipulated face.	81
Figure 15. Mean intensity ratings of anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.	84
Figure 16. Top: The average neutral male (20 faces) and female face (19 faces) from the Radboud face set. Bottom: Average of the same individuals posing with anger expressions (left male and female faces) versus transforms of +200% dominant (right male and female faces, based on the transform described in Study 1).	86
Figure 17. Mean reaction times for anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.	91
Figure 18. Proportion correct responses for anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.	94
Figure 19. Mean intensity ratings of anger, sad, and fear expressions where face images were labelled as either 'High Dominance' (black bars) or 'Low Dominance' (white bars).	98
Figure 20. Composite images of 45 women's faces with no cosmetics (left) and with cosmetics (right).	108
Figure 21. Example stimulus with no make-up (left) and with manipulation of added (100%) make-up (right). This figure was made by combining facial images of 3 women in the dataset so as to protect each woman's anonymity. However for the actual study, single pictures of each of the women's faces were presented to participants.	109
Figure 22. Attractiveness ratings for faces with and without cosmetics, as judged by male and female raters.	111
Figure 23. Dominance ratings for faces with and without cosmetics, as judged by male and female raters.	112
Figure 24. Prestige ratings for faces with and without cosmetics, as judged by male and female raters.	113
Figure 25. Jealousy ratings for faces with and without cosmetics, as judged by female raters. Note that jealousy ratings were recorded on a 1-7 point Likert scale.	117

List of tables

Table 1. Descriptions upon which participants based their EvoFIT faces.....	16
Table 2. Tukey HSD post-hoc analyses examining differences between Dominance (D), Prestige (P), and Attractiveness (A) between Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional stability (ES) and Openness to experience (OE).....	28
Table 3. Tukey HSD post-hoc analyses, reporting p-values, examining differences between Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional stability (ES) and Openness to experience (OE) in Dominance (D), Prestige (P), and Attractiveness (A).	29
Table 4. Mean (SEM) of fWHR, other- and self-perceived dominance across studies one through four. .	41
Table 5. Words used in previous literature to specifically describe dominance, prestige, physical dominance, and social dominance	49

Thesis abstract

Human social status has long been of interest to evolutionary and social psychologists. The question of who gets to control resources and be a leader has garnered a lot of attention from these and other fields, and this thesis examines evidence for there being two different mechanisms of achieving high status, and their correlates. The mechanisms are 1) Dominance: being aggressive, manipulative and forcing others to follow you, and 2) Prestige: possessing qualities which make others freely follow you. Chapter 1 is an introductory chapter in which I explain selection pressures, group formation, and the need for social hierarchies; I then describe the two proposed methods of attaining social status and how facial characteristics can give clues as to an individual's social status.

In Chapter 2, my first experimental chapter, I examined how faces created to appear either high in dominance or high in prestige were judged with respect to those traits as well as personality characteristics. Taking this further, in Chapter 3, I looked at how natural variation in real faces would reflect differences in other- and self-perceived ratings of dominance and prestige. Chapter 4 served to examine whether, given a set of words related to social status, I would find differences in what words were placed into dominant or prestige categories. Findings within these chapters are consistent with dominance and prestige being separable methods of attaining high status, from differences in facial appearance (Chapter 2 and 3), to personality characteristics (Chapter 2), to word usage (Chapter 4).

Once I had established that these were two distinct routes to achieving high status, I chose to focus on dominance in Chapter 5 and explored the conceptual relationships between dominance and facial expressions. I found that manipulating perceptions of dominance affected how intense expressions of anger, sadness, and fear were perceived (Chapter 5). As there has been a paucity of research in the area of women's social status, in Chapter 6, I went on to explore what effects cosmetics use in women would have on their perceived social status. I found differences in how men and women perceived women wearing cosmetics, which again points to a distinction between dominance and prestige.

My thesis then presents a broad view of the two different mechanisms for attaining high status. Using new methods not otherwise used in exploring dominance and prestige I was able to explore correlates and indicators, as well as perceptions of both strategies. These findings will allow us to determine who might be capable of attaining social status, which of the two methods they might use, as well as what implicit associations we hold about each. They will also open doors for future research into

the two strategies, and even help interpret previous research, as many previous studies simply relate to high status and do not distinguish between dominance and prestige.

Chapter 1 General Introduction

1.1 Synopsis

In this chapter I briefly discuss the selection pressures on individuals to find mates, and competition between rivals. I then discuss the importance of group-living and its costs and benefits which are followed by a brief description of the proposed mechanisms for the evolution of cooperation (including kin selection, direct, and indirect reciprocity). Consequently, I consider the importance of forming social status hierarchies in both non-human animals and in humans, and their benefits. The acquisition and drive for social status, and how it differs in men and women, is discussed. I then briefly review current evolutionary- and social- psychology research describing two different mechanisms for acquiring high status – dominance and prestige. Social status is then considered within the context of faces (i.e. different facial features appear to be important to perceptions of social status). Lastly, I discuss the outline of my thesis and give a brief summary of the content of each chapter.

1.2 Selection pressures on animals and sociality

All organisms have experienced, and continue to experience evolutionary selection pressure to reproduce, either sexually or asexually, and to pass their genes on to the next generation. In many sexually-reproducing organisms one sex tends to have the relatively more expensive gametes (e.g. large egg produced only once every given number of days) and cares for the young once they are born, while the other sex has relatively less expensive and more abundant gametes (e.g. small mobile sperm produced 'around-the-clock') and does not necessarily help with provisioning young (Bateman, 1948; Trivers, 1972). This can lead to the expensive investor being referred to as 'choosy', as choosing the right mate holds greater importance in terms of securing good genes (and potentially resources) for the resulting offspring. In many species, individuals with the less expensive gametes (commonly males) compete with each other for access to high quality resources and territory in order to be attractive to the sex with the expensive gametes (commonly females), or simply compete directly for mating opportunities. Intra-sexual selection is, broadly, competition between two same-sex individuals for a mate, with the victor usually claiming the benefits of reproduction (Dugatkin, 2009). Some notable examples include red deer males who first roar to assess each other's size, deciding whether the fight can be won, and if so proceed to butt into each other with antlers lowered – the winner gaining access to females (*Cervus elaphus*; Clutton-Brock & Albon, 1979). Another common example is that of Northern elephant seals (*Mirounga angustirostris*; Le Boeuf, 1974) males whose contests are often bloody and include grunting and hitting each other

with sharp teeth, in order to gain access to breeding opportunities with females. Additionally, many species show sexual dimorphism between males and females, with males often being much larger (in the case of the aforementioned elephant seals up to 3 times heavier) and possessing and using evolved weaponry (e.g. antlers, horns, or spikes) during their intra-sexual competition, in order to secure female reproduction (Clutton-Brock & Albon, 1979; Emlen, 2008; Le Boeuf, 1974). I have only discussed male-male competition above, as this is the most commonly observed in animal species; however female-female competition also exists in species including pipefish *Nerophis ophidion* (Rosenqvist, 1990) where females give their eggs to the males to care for and as such are the 'choosy' ones. Regardless of the type (i.e. male-male or female-female) competition for resources, territory, and ultimately mating opportunities is seen across a wide variety of species.

Where the environment is such that the prospect of securing these mating opportunities or even survival becomes increasingly difficult, perhaps due to a harsh climate or a large number of predators, organisms have evolved ways of adapting and thriving. One of these ways includes forming aggregations and/or groups which can afford protection from these predators, the environment, etc. (Rubenstein, 1978). Some well-known advantages of living in groups can include dilution effects which make specific individuals within a group less conspicuous to predators, as has been shown in marine invertebrates including caddisfly (*Rhyacophila vao*) larvae (Wrona & Dixon, 1991) and sea skaters (*Helobates robustus*; Foster & Treherne, 1981), as well as in fish like Atlantic silversides (*Menidia menidia*; Parrish, 1989) and silvery minnows (*Hybognathus nuchalis*; Landeau & Terborgh, 1986). Furthermore, having additional pairs of eyes in a group can help in predator detection and allows each member of the group to be less vigilant (Pulliam, 1973) and thus able to spend more time participating in other activities. This 'many-eyes' hypothesis has, for example, been experimentally demonstrated in starlings (*Sturnus vulgaris*; Powell, 1974) where birds in groups were found to be less vigilant than those alone, and each bird spent longer foraging. Another advantage to group living is obtaining support in hunting endeavours which can in turn provide higher yields and larger gains for the group; this has been shown in multiple species including wild dogs (*Lycaon pictus*; Creel & Creel, 1995), lions (*Pantera leo*; Stander & Albon, 1993) and has been reviewed by Packer & Ruttan (1988). In addition to the benefits of concealment and social foraging/hunting, group living can confer benefits for offspring within the group, as seen in groups which exercise alloparental care (i.e. being cared for by individuals other than the parents), which can improve offspring survival; for example banded mongooses (*Mungos mungo*; Hodge, 2005), and meerkats (*Suricata suricatta*; Clutton-Brock et al., 2001) show higher infant survival when those young are cared for by both parents and others in the group, rather than just the parents.

Of course group living is not without its problems and disadvantages. For instance, living with others inevitably means that you will be in close proximity and this can have negative consequences. One such consequence includes the sharing of pathogens. In human history, a particularly deadly example of this was the 1918 Spanish influenza (H1N1) epidemic which was spread, just like more common strains of flu virus, through coughing and sneezing and is thought to have killed approximately 50 million people and infected up to 500 million (Taubenberger & Morens, 2006). Living in densely populated and even overcrowded areas can thereby lead to a greater chance of becoming infected than if one had relatively minimal contact with others or lived a solitary lifestyle. Similar examples have been seen in other mammals (see Altizer et al., 2003 for review), and even in birds such as cliff swallows (*Petrochelidon pyrrhonota*), with those living in larger colonies suffering from higher parasite loads (i.e. fleas and swallow bugs) than those living alone, as shown through higher circulating levels of stress hormones (Raouf, Smith, Brown, Wingfield, & Brown, 2006) and increased spleen volume, a measure of immunocompetence (Brown & Bomberger Brown, 2002). Another disadvantage to group-living is increased competition for food as well as the potential increase in energy costs associated with foraging within that group (Wrangham, Gittleman, & Chapman, 1993). Hence, the larger the group the farther afield any given animal in the group has to go in order to forage. This can lead to conflicts over sharing resources and who can have access to what/how much of a given resource, which shall be discussed alongside another disadvantage - reproduction within a group (i.e. who gets to mate with who) - in section 1.4 below.

As is evident from the above discussion, group living comes with sizable costs and benefits for all individuals living within that group, and these differ widely depending on the species. However, in order for group-living to become the 'norm', individuals within that species must adopt altruistic behaviours and tendencies in order to foster cooperation, overriding or at least minimizing the appearance of simplistic selfish behaviours which are commonly attributed to genes and consequently organisms (Dawkins, 1989). In the following section I discuss several mechanisms that have facilitated the evolution of cooperation.

1.3 Adaptations for group living

One mechanism for the evolution of cooperation between individuals is that of kin selection. Kin selection theory postulates that individuals within a group will preferentially help and perform altruistic deeds towards individuals with whom they share genes, when the benefits (b) received by the recipient exceed the costs of helping (c) to the actor, and when taking into consideration the degree of relatedness (r) between the actor and the recipient; $rb > c$ (Hamilton, 1963, 1964). Simply put, the higher the relatedness, the higher the chance for inclusive fitness benefits, and the more

likely an individual is to be altruistic. Helping a sibling would therefore be more beneficial to your inclusive fitness than helping a cousin or an uncle, as a sibling shares the most genes with you.

A few years after kin selection theory was proposed, Trivers (1971) developed the theory of direct reciprocity to help explain cooperation without the two parties needing to be related. In this model an actor helps a recipient, but expects to have the help reciprocated in a future encounter. This could be considered the prototypical 'I scratch your back and you scratch mine' scenario. However, as humans we spend much of our time interacting with unknown individuals, sometimes only once, and yet are still inclined to help those individuals. We do not even have to meet an individual in order to be moved to help them, as can be seen through the countless advertisements for charities accepting donations on behalf of people half-way around the world experiencing famines, floods, etc. Charities such as the Red Cross, Save the Children, and UNICEF all rely on donations and help from those who may never be affected, or even visit the affected areas they are canvassing for.

This propensity to help those who we may never meet, or only meet once, has been termed indirect reciprocity (see Nowak & Sigmund, 2005 for review) and it occurs when an individual helps another without the direct expectation to receive help, but instead may function to increase the likelihood of maintaining a good reputation and standing within a social group, which may eventually lead to reciprocity/benefits from other actors (Nowak & Sigmund, 2005). Storing knowledge of our own reputation and outcomes of our behaviour within a group, as well as the reputation and behaviours of others has been hypothesised as a process for the evolution of human cognition and even morality (Nowak, 2006). Additionally, Dunbar's (2003) social brain hypothesis postulates that human intelligence has evolved due to the pressures of living in increasingly complex groups and societies. Furthermore, the evolution of human brain size has been linked with the sizes of groups we can maintain (Dunbar, 1993) and our memory capacity and ability to take others' perspectives (theory of mind) can influence the size of social group we participate in (Stiller & Dunbar, 2007). Thus, at some point in our evolutionary past forming groups must have been integral to our survival and reproduction, which then precipitated the altruistic tendencies, intelligence, and morality seen in modern humans.

1.4 Social status in non-human animals

While being inherently tied to cooperation, group living is not without its conflicts as outlined in section 1.2 above. When living in a group the matter of who gets what proportion and type of resources as well as who gets to reproduce with whom becomes a concern of the group, rather than simply a matter to be settled between two individuals. For instance, if there are more males than

females ready to reproduce within a group, this can foster competition between the males within that group (Kvarnemo & Ahnesjö, 1996).

However, within a group context all-out warfare between same-sex individuals leading to injuries or death can be detrimental not only for the individual but for all who take part, and even bystanders if they were to get caught up in the fray. Thus, in species where there are repeated interactions between individuals, social status hierarchies tend to form as a way of mitigating excess aggression (Buss, 2008). In these instances everyone 'knows' or quickly learns their place within the hierarchy, perhaps through several repeated, sometimes agonistic, pair-wise interactions with other group members. Once each member gathers the appropriate information to assess where they stand in relation to the other individuals within the group, and providing the group membership does not change (i.e. no individuals leave or are killed), then this ultimately results in more stability and less conflict amongst the group members.

Different species use different methods of assessing, attaining, and maintaining social status within their group. Some examples include: body size, as displayed in the humbug damselfish (*Dascyllus aruanus* L.; Forrester, 1991) and the emerald coral goby (*Paragobiodon xanthosomus*; Wong, Munday, Buston, & Jones, 2004) where larger individuals are dominant to smaller ones; age/maturity in ungulates such as the bighorn sheep (*Ovis canadensis*; Pelletier, Hogg, & Festa-Bianchet, 2006), birds like boat-tailed grackles (*Quiscalus major*; Post, 1992) and fish including African cichlids (*Neolamprologus pulcher*; Taborsky & Limberger, 1981) where more mature individuals are the ones who hold the highest rank; sex of the individuals, as shown in the spotted hyena (*Crocuta crocuta*; Frank, 1986) where females are more dominant than males in almost all instances, and aggression as seen in vervet monkeys (*Cercopithecus aethiops sabaenus*; Fairbanks & McGuire, 1986) and chimpanzees (*Pan troglodytes*; Muller & Wrangham, 2004) where those higher in rank are shown to be more aggressive than those who are lower. In non-human animals, individuals highest in the hierarchy tend to monopolize and have greatest access to mating opportunities (Cowlshaw & Dunbar, 1991; Ellis, 1995) and resources (Ceacero et al., 2012; Herberholz, McCurdy, & Edwards, 2007; Thouless, 1990) within the group. In the following section I consider how social hierarchies in humans are similar and how they differ from those of non-human animals.

1.5 Social status in humans

Social status is important for both men and women, but as there are different selection pressures for each sex, I discuss each separately below.

1.5.1 Men

Compared to many non-human species, humans are not particularly sexually dimorphic but, although men possess no evolved weaponry, there is still reason to believe that intra-sexual selection for mating opportunities exists. Men, whose gametes are the relatively inexpensive ones to produce, are able to inseminate any woman who is willing to sleep with them. But that 'willingness' is exactly the problem. Women have the more expensive gametes (Trivers, 1972), spend approximately nine months pregnant, and are then required to nurse and care for the resulting offspring. So it follows that women would perhaps be the choosier sex and men would be expected to compete with each other in some way to prove their worth. This is a very simplistic view of human mate choice, and of course men also have preferences, but for the purpose of this example I will assume that women are the choosy ones, or at least the 'choosier' ones. If a man is able to woo a woman successfully, then she might consider allowing him to reproduce with her. However, with the lack of evolved weaponry, relatively low levels of aggression, and minimal sexual dimorphism, how is it that men prove their quality to potential mates?

There is speculation in the anthropological literature that as humans became increasingly sedentary and moved away from nomadic lifestyles in favour of pastoral ones there was also the increased opportunity to accumulate resources (Knauff et al., 1991). These may be in the form of wealth, property, and other means, but it is plausible that individuals with the majority of resources became the individuals with highest status in the group. Those with little to no resources would then be near the bottom of a social hierarchy. Studies have shown that in many cultures women find accumulation of resources attractive in a long-term mating partner (Buss, 1989; Shackelford, Schmitt, & Buss, 2005), likely because these resources can be used to provision their offspring and themselves; not unlike male birds' ability to provision chicks at the nest. Those who provision more and better would also be expected to attract most mates. As the ultimate goal of any organism is to pass on its genes, men with more resources and consequently higher social status should be able to attract more, higher quality mates.

Men with high social status have indeed been shown to attract younger and more attractive women (Elder, 1969; Turke & Betzig, 1985), and obtain other benefits including influence in group interactions (Bales, Strodbeck, Mills, & Roseborough, 1951; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013), and increased economic and material resources (Ball & Eckel, 1996; Ball, Eckel, Grossman, & Zame, 2001; Betzig & Turke, 1986; Hames, 1996). This has ultimately led to high status men having higher reproductive success (see review by Hopcroft, 2006; von Rueden, Gurven, & Kaplan, 2011).

However, attaining these benefits may be more complicated in human society than in other non-human animal societies and groups. This is because through the course of human evolution, we

have expanded the number of social groups we are a part of. For example, at one point in our evolutionary history we may have been a part of a fairly small family group or community, but as our societies have expanded many other groups have come into existence. We can now be part of a sports team, a musical theatre club, a member of a union, a member of a specific institution, and the list goes on. In each of these groups there may be a leadership hierarchy which is not necessarily related to monopolising reproduction, but rather resources, attention, or a number of other attributes important within that group. Additionally, one may not be able to become the leader of all their groups as others may be better suited to that role. If one *does* manage to become the leader of a group, then they are likely to receive at least some of the benefits mentioned above. However, within the scope of this thesis, the focus is more broadly on social interactions and an individual's striving for status across contexts and groups, rather than the specific groups or types of groups that an individual is a member of.

1.5.2 Women

There has been decidedly less emphasis placed on social status in women, and this is related to some researchers' stances that women have a lower drive to achieve high status (Campbell, 1999; Stockley & Campbell, 2013). This may be partially explained by the fact that it is women who tend to value status in a mating partner and this is generally not reciprocated in men, who instead prefer attractiveness and health (Shackelford et al., 2005). Additionally, women tend to exert their authority and compete with others in different ways to men (Björkqvist, 1994) which can also contribute to the widespread view of women's not striving to acquire status. For example, when a situation requires aggressive action, women are more likely to use indirect aggression such as shunning and exclusion to acquire status, and these may not be as outwardly noticeable when compared with the direct physical or verbal aggression found in men (Björkqvist, 1994; Eder, 1985; Vaillancourt, 2013). However, these different tactics might lead to the same ultimate gain— i.e. women will have more access to mates/resources (Vaillancourt, 2013). As such, status-striving in women should not be overlooked but instead more research into the nuances and intricacies of women's status accumulation needs to be performed. In this thesis I examine various aspects of women's social status including how it is affected by cosmetics use and which words can be used to categorise women's social status; these are discussed in detail in the forthcoming chapters.

1.6 Types of social status: Dominance and prestige

Thus far, I have discussed the importance of acquiring social status, gaining resources, and have briefly touched on women and men's tendency to use indirect vs. direct aggression, respectively. However, in recent social and evolutionary psychology literature two main mechanisms of status

acquisition have been proposed. Those are *dominance* and *prestige* (Cheng et al., 2013; Cheng, Tracy, & Henrich, 2010; Foulsham, Cheng, Tracy, Henrich, & Kingstone, 2010; Henrich & Gil-White, 2001), and aggression appears to be encompassed only by 'dominance'. Dominance has been likened to bullying, coercing, and forcing others to do something in order to get your way (Cheng et al., 2013; Henrich & Gil-White, 2001). Prestige, on the other hand, is related to possessing qualities and merits that make others want to follow you and accept you as leader (Cheng et al., 2013; Henrich & Gil-White, 2001).

To illustrate these two concepts I can use real-world examples. Billionaire businessman and US-presidential candidate Donald Trump might be considered a dominant individual who has recently achieved his desire of building the 'Trump International Golf Links' near Aberdeen, Scotland. Even though there was a large public outcry and attempt to boycott the project, mostly due to the golf-course being located on a site of scientific importance, Trump continued with the project and it has since been completed (Carrell, 2008). There was even speculation that Trump used the law to force local residents out of their homes so that they were not located close to his golf course and its adjacent hotels (Ward, 2011). If these claims are true, then Donald Trump has demonstrated himself to be a forceful, coercive, and dominant individual, achieving his goals despite resistance from others.

At the other extreme, someone who could be considered a prestigious individual is the current Dalai Lama. He has championed non-violence to solve conflict and as such would be an unlikely candidate to resort to force in order to get his way. He has also opened dialogue with many different institutions and faiths in a bid to create peaceful relations amongst them (The Elijah Interfaith Institute, n.d.), fostering trust and transparency - in effect the opposite of being manipulative and coercive. Finally, he has accrued much international acclaim and praise, including the Nobel peace prize in 1989 (Nobelprize.org, 2015). His many merits and qualities have led to him being almost universally acknowledged as an individual who deserves to be listened to and followed.

The stark contrast between Donald Trump and the Dalai Lama is quite evident. While both are high status individuals, holding power and influence over others, the tactics used to achieve this status are very different. While Donald Trump has, in effect, exerted his dominance in order to achieve his goals, regardless of the consequences and who it might affect, the Dalai Lama has earned his status through cooperation, and the many merits and qualities which he shows to those around him. This dichotomy between prestige and dominance appears to have an inherent 'good' vs. 'bad' quality about it, and this will be discussed further in Chapters 2, 4, and 6.

Moving away from singular examples, recent research also supports the notion of dominance and prestige being two separate means to gain status. Indeed, across studies of

undergraduate participants, dominant individuals are rated, using self- and other-report measures, as being low in agreeableness and high in aggressive and agentic behaviours, whilst prestigious individuals are rated low in aggression, and higher in prosocial and communal traits (Cheng et al., 2010; de Waal-Andrews, Gregg, & Lammers, 2014; R. T. Johnson, Burk, & Kirkpatrick, 2007). Additionally, Cheng, Tracy, Foulsham, Kingstone, & Henrich (2013) found that these two strategies were present in interactions between same-sex students completing a problem-solving task, and that both in-group and outside observers found the dominant individuals to be significantly less likable than the prestigious individuals. Even physiologically, dominant and prestigious individuals have been found to differ; men who rated themselves as more prestigious had lower testosterone than men rating themselves as more dominant (R. T. Johnson et al., 2007). Finally, both highly dominant and prestigious Tsimane men were found to have greater group influence, as well as more offspring, higher rates of extra pair copulations, and more attractive wives (von Rueden et al., 2011), however only prestigious individuals benefitted from higher nutritional status, as assessed by BMI and skin fold measurements (Reyes-García et al., 2009). These studies demonstrate that while both proposed aspects of high status (dominance and prestige) can be differentiated behaviourally and physiologically in individuals cross-culturally, they lead to the same benefits and outcomes.

1.7 Faces and social status

Thus far I have discussed the importance of group living, social status, and its relationship to dominance and prestige; however a large part of my thesis involves attributions of social status made by looking at someone's facial features. In this section I discuss more about the importance of faces and their relationship to social status.

When we come into contact with another individual, even someone we have never met before, one of the first things we see and attend to is their face. Faces are particularly eye-catching and even new-borns find them, or at least objects resembling faces, more appealing than other objects (Goren, Sarty, & Wu, 1975; Mondloch et al., 1999). Faces hold cues to how a person is feeling, through obvious mechanisms such as facial expressions. For example, if you are approached by a stranger whose brows are lowered, eyes are narrowed, and whose mouth is tight you might be inclined to think they are angry, and decide you want to give that encounter a miss. Alternatively if someone approaches you with corners of mouth upturned, eyes wide, and brows relaxed, you might be more inclined to stay and chat, as they are probably smiling and happy to see you.

While expressions can tell us a lot about someone's internal emotional state, research has also shown that a person's neutral, emotionless, face can also be used to gather information about them. For example through examining people's faces we make inferences about their health, such that those with slightly redder faces - as attributed to a higher profusion of oxygenated blood - are

rated as more healthy (Re, Whitehead, Xiao, & Perrett, 2011; Stephen, Coetzee, Law Smith, & Perrett, 2009; Stephen, Law Smith, Stirrat, & Perrett, 2009). Additional inferences we make about people from their faces can relate to their attractiveness (Jones et al., 2001; Perrett et al., 1999; Stephen & McKeegan, 2010), trustworthiness (Rule, Krendl, Ivcevic, & Ambady, 2013), and even their competence (Ballew & Todorov, 2007; Todorov, Mandisodza, Goren, & Hall, 2005), among many others. What is also notable is that these judgements can be made within 100ms and are generally consistent over time (Willis & Todorov, 2006).

Some of the inferences we make from faces also relate to their social status. For example, the aforementioned competence judgements were found to predict election outcomes in the US senate (Todorov et al., 2005) and in gubernatorial elections (Ballew & Todorov, 2007). In a separate study, children's judgements of competence based on facial images were indistinguishable from those of adults, both predicting the winners of elections much more accurately than chance (Antonakis & Dalgas, 2009), and highlighting that both are judging competence in a similar way. Being elected to the senate or as a governor is considered an influential position and elevates one's rank. As such a person's facial characteristics may dictate whether or not they appear competent to onlookers and ultimately whether they attain high status or not. Whether looking competent is a signal of dominance or prestige, or both, is a matter which has yet to be studied and in Chapter 4 I explore what words are ascribed to dominant and prestigious individuals, which may help to answer this question.

Dominance as a facial trait has been studied significantly more than prestige, and in one of the first studies of its kind Keating (1985) showed that women and men with smaller, more mature features are regarded as more dominant using Identikits (where individual facial features such as eyes, eye-brows, noses, etc. can be swapped into and out of a face to create different configurations and 'looks'). Prominent brows, a muscular and well-defined jaw, and a broader face are also correlates of dominance in men (Grammer & Thornhill, 1994; Keating, Mazur, & Segall, 1981; Mazur, Halpern, & Udry, 1994). More recently, perceived facial masculinity and maturity have also been positively correlated with the perception of dominance in men (Boothroyd, Jones, Burt, & Perrett, 2007; Keating & Bai, 1986; Oosterhof & Todorov, 2008) and women (Quist, Watkins, Smith, Debruine, & Jones, 2011), which suggests an association between the structural components of masculinity and dominance. Indeed, high testosterone levels have been associated with masculine craniofacial measures (Penton-Voak & Chen, 2004; Verdonck, Gaethofs, Carels, & de Zegher, 1999) and dominance in men (Mazur & Booth, 1998) and women (Grant & France, 2001). These findings suggest that certain facial traits can be used by perceivers to infer the dominance of an individual. In Chapter 2 I use novel software, EvoFIT, to explore differences in facial characteristics between

dominant and prestigious men and women in order to assess the similarities and differences between these two types of social status. Additionally, in Chapter 5, I examine whether dominant facial features can influence how we perceive someone's emotional expressions.

In recent years, research on facial characteristics has revealed that an individual's facial width-to-height ratio (fWHR) also affects perceptions of that person. For example, men with wider faces are perceived as less trustworthy (Stirrat & Perrett, 2010), more aggressive (Haselhuhn, Ormiston, & Wong, 2015; Trebicky, Havlíček, Roberts, Little, & Kleisner, 2013; Welker, Goetz, Galicia, Liphardt, & Carré, 2014), and even as having higher achievement drive (Lewis, Lefevre, & Bates, 2012). Fewer studies have examined how fWHR interacts with self- and other-perceived dominance and prestige, and this is what I examined in Chapter 3.

1.8 Outline for thesis

As I have alluded to above, this thesis covers many different topic areas from different perspectives, all with the broad theme of human social status. Firstly, in Chapter 2 I used a new technique and novel software (EvoFIT) for creating faces by asking participants to use written descriptions in order to create dominant and prestigious male and female faces. With this information I examined whether there were similarities and differences in facial structure as well as what personality characteristics these individuals were perceived to have. Following this, in Chapter 3 I collected face pictures from undergraduate students and explored whether self- and other-perceptions of dominance and prestige are related to fWHR. In Chapter 4 I moved away from faces and explored whether words currently employed in the literature to describe dominant and prestigious individuals would mirror how real people (undergraduate students) described these same individuals. Having established how dominance and prestige are perceived in the face and through words, Chapter 5 explored whether someone's facial dominance might be related to their emotional expressions. That is, if a person were facially dominant whether that would influence how their facial expressions were perceived. Finally in Chapter 6 I focussed exclusively on women and examined how application of make-up in female faces affects other-perceptions of their dominance and prestige. To conclude, Chapter 7 synthesises my findings in the context of what is known about social status in humans.

Chapter 2 Can dominance and prestige be visualised in a face?

2.1 Abstract

Dominance and prestige have been described in recent literature, and as described above in Chapter 1, section 1.6, as two possible pathways to attaining high social status. In a series of studies I examined whether the faces of individuals considered to be dominant differ from those who are considered to be prestigious. To do this I asked a group of participants to create faces based on written descriptions of dominant, prestigious, and attractive individuals using the computer software 'EvoFIT'. In Study 1, I asked the participants who created the faces to rate them on their dominance, prestige, and attractiveness. Attractiveness was simply used to explore whether it was related to either of the two pathways and as a 'control' description which was unrelated to social status. In Study 2, I asked another set of participants to rate each of the faces for dominance, prestige, and attractiveness. I found that faces created to appear dominant are easily identifiable as dominant in both sexes, and are rated as low in prestige and attractiveness. Similarly, faces created to look more prestigious were also considered as highest in prestige and lower in dominance and attractiveness for men, though rated as similar in attractiveness for women. In Study 3, I asked a third group of participants to rate a random subset of the faces for personality characteristics. Broadly, I found that individuals created to look dominant were seen as being low in all personality characteristics, with particularly low scores on extraversion, agreeableness and openness to experience. Prestigious individuals, on the other hand, were generally considered to be highly conscientious, emotionally stable, and agreeable. Attractive individuals of both sexes were also considered relatively high in all traits, except extraversion in female attractive EvoFITs. Overall, these results point to dominance and prestige being separable pathways to high status as it is seen in faces and there may be a link between attractiveness and prestige in women.

2.2 Introduction

Dominance and prestige, as explained in the Chapter 1, Section 1.6, have been described as two distinct methods that a person might use to gain social status (Henrich & Gil-White, 2001). To reiterate, Henrich and Gil-White (2001) suggest that dominance is associated with using aggression, forcefulness, and intimidation in order to get ones' way, while prestige is associated with showing skills and qualities that can earn followership and positive favour from others. Recent studies have provided evidence that people use one of these two strategies when in a leadership role, and that those taking the prestigious route are judged as more likeable than those taking the dominant route

(Cheng et al., 2013). Additionally, traits including aggression and agentic behaviours are positively correlated with dominance and negatively correlated with prestige, while traits including agreeableness and communal behaviours show the inverse relationship (Cheng et al., 2010; de Waal-Andrews et al., 2014). Taken together, these studies suggest that differences exist between individuals who choose one of these two proposed routes to high status over the other.

The literature demonstrating the existence of two routes to high status has yet to explore, to my knowledge, whether there are differences in the facial characteristics associated with these strategies, and this is the main focus of this chapter. Previous literature suggests that perceived dominance, especially in male faces, is associated with cues including a broader jawline, low-set brows, more masculine, mature-looking features (Keating et al., 1981; Keating, 1985; Mazur et al., 1994), as described in Chapter 1, Section 1.7. In women a specific aspect of perceived dominance, social dominance, has been associated with feminine features, while physical dominance has been associated with masculine features (Quist et al., 2011). However, whether there are certain facial features associated with prestige, and how those might differ from the facial features associated with dominant individuals have yet to be investigated.

Many studies involving the use of faces currently use faces gathered from databases which have been created especially for this purpose (e.g. PICS: pics.stir.ac.uk; Radboud face set: Langner et al., 2010). The people in these images provide consent and their faces are photographed. These studies tend to ask participants to rate the individual faces for certain traits (e.g. Jones et al., 2001; Little, Apicella, & Marlowe, 2007). Alternatively, other studies opt not to use facial photographs but rather faces manipulated using computer graphics. For example, once rated for a trait such as dominance, 'high' and 'low' scoring images of individuals' faces can be 'averaged' to create a single 'high' dominance or 'low' dominance image using computer programs such as Psychomorph (Tiddeman, Burt, & Perrett, 2001). On many occasions, including in Chapters 5 and 6 of this thesis, these computer generated images go on to be rated by others for various qualities including attractiveness, masculinity, dominance, etc. (e.g. Debruine et al., 2006; Little & Hancock, 2002; Watkins & Jones, 2012).

Other methods of creating unique stimuli include a technique in which different sets of features, a nose or eyebrows for example, are placed onto a face sequentially in order to create an overall appearance (Identi-Kit; e.g. Keating, 1985), or by using software, such as Facegen (Singular Inversions Inc.), which allows a user to create computer-generated faces and specify exact features and facial expressions (e.g. Oosterhof & Todorov, 2008, 2009). Again these techniques are most commonly used to create a set of faces which are then presented to participants and rated for specific characteristics or attributes. That is, these faces already possess certain characteristics (e.g.

high and low masculinity) and participants then make judgements on which of the qualities already present are important in certain trait judgements (e.g. a picture shows a man has a broad jaw, therefore he may appear more dominant than a man with a narrower jaw).

In the following studies, I used EvoFIT software (Frowd, Hancock, & Carson, 2004) to allow participants to create faces using written behavioural descriptions of a person. This software generates faces based on evolutionary algorithms and has been used by police in the generation of faces based on witness recognition of criminals (Frowd et al., 2004). In the software, participants are presented with a set of images randomly generated by the program. By selecting an image based on an instruction to select a face most like the trait to be judged, the program generates new faces based on the participant's past choices, building a face that combines traits of faces consistently seen as representative of the trait being judged over successive choices. Because the stimuli are generated by the participants this forgoes the need for participants to rate already existing stimuli on specific traits.

To guide the creation of face images, I used descriptions based on definitions of dominant and prestigious people which have been used in existing literature (Cheng et al., 2013, 2010; Henrich & Gil-White, 2001). Using this technique allowed participants to create same-sex faces which could vary on many facial characteristics at once allowing participants to holistically create what they believed to be highly dominant and prestigious faces. Additionally, I asked each person to create a highly attractive member of the opposite sex. My aims were three-fold: 1) to explore whether EvoFIT software could reliably be used to create faces based on written descriptions; 2) to examine whether faces created to differ in status and attractiveness using these written descriptions would be perceived as different from each other by naïve participants; and 3) to ascertain whether these faces would vary in their personality characteristics (the big 5: conscientiousness, agreeableness, emotional stability, openness to experiences, and extraversion; Goldberg, 1993), reflecting personality associations with dominance and prestige. Attractiveness was included in order to explore its relationship with prestige and dominance, in addition to being a 'control' description, i.e. one that was not manipulated with respect to social status.

2.3 Study One

In Study 1, I had participants create dominant, prestigious, and attractive faces using EvoFIT and additionally tested to see if the participants themselves thought that the images they had created captured the relevant traits.

2.3.1 Methods

2.3.1.1 Participants

Thirty two university students (18 female; age $M = 22.7$, $SE = 1.01$) participated in the creation of the EvoFIT stimuli for course credit or monetary compensation.

2.3.1.2 Procedure

Participants were asked to create faces using EvoFIT software (Frowd et al., 2004). EvoFIT software allows the user to 'evolve' a face by selecting a face from a series of faces presented to them. Briefly, given a starting grid of 18 faces (6 faces per row and 3 faces per column) randomly generated to have different face shapes, participants are asked to choose which face has roughly the correct proportions (length and width) of the face they are imagining. Next, they are shown another 18 faces in the same fashion, and over 4 consecutive screens (during which they pick 2 of the faces per screen) are asked to narrow those 18 to 6 faces which are the closest to the one they are imagining (i.e. overall likeness). After this step, participants are asked to choose only one of those 6 as the closest matching face, and then are presented with a grid of 18 faces with different textures added to it. They are then asked to refine a face through one generation, at the end of which they are asked how like the person they imagined it was on a 1-10 Likert scale with 1 being the least accurate and 10 being the most accurate match. Following this, there is another generation of evolution of a face in which features are refined further, leaving a single face as the image described.

In this study I asked participants to create the face of dominant and prestigious same-sex individuals as well as an attractive opposite-sex individual, based on short written descriptions (Table 1). Faces were created from a pre-existing set of white female faces (age 40-49) and white male faces (aged 36-45). Hair style was identical for all female EvoFITs and all male EvoFITs (see Figure 1 for example stimuli created by participants).

Table 1. Descriptions upon which participants based their EvoFIT faces.

Condition	Description
Dominant	An approximately 36-45 year old male/female. He/she is an extremely dominant individual. This person likes to be in control and to get their way. They will use force, coercion, and intimidation to achieve their goals if necessary.
Prestigious	'An approximately 36-45 year old male/female. He/she is a highly valued, prestigious and influential individual. He/she has many valued skills and qualities and others follow her freely. This ultimately leads to his/her achieving his/her goals.
Attractive	'An approximately 36-45 year old male/female. He/she is very attractive. Someone you would consider going out with. You find this person ideally attractive.



Figure 1. Example female (top row) and male (bottom row) stimuli created by participants based on descriptions of dominant (left-most column), prestigious (middle column), and attractive (right column). Each face was created by a single participant.

Once informed consent was obtained from each participant, they completed a short standardised demographic questionnaire including age and sex. They were then given a sheet of paper containing instructions for all three conditions, including the associated description (Table 1), and were instructed to use EvoFIT to create each face in order. Each participant saw the conditions presented in a semi-random order such that not all participants were asked to make a dominant face first, followed by a prestigious, and then attractive face. The two other order combinations were attractive/dominant/prestigious, and prestigious/attractive/dominant. Participants were asked to stop once the program had reached the 'holistic tools' section, which allows for the manipulation of

each face on a series of 7 different component factors including ‘masculinity’, ‘pleasantness’, ‘threatening’, ‘face width’, etc. This step was omitted for this study, as changing these features could affect facial expressions, facial hair, and other parameters not pertaining to facial structure. A total of 94 EvoFITs were created through this process: 14 female and 18 male attractive; 17 dominant females and 14 dominant males; and 13 prestigious males and 18 prestigious females. One male prestigious EvoFIT was not saved due to technical failure, and one participant did not have enough time to complete their female dominant EvoFIT (see Figure 2 for composite images).

Once participants had finished making all three faces, they were asked to complete a brief online questionnaire to ascertain how closely they thought their EvoFIT faces corresponded to their preconceived mental representation, for each condition. That is, each participant was asked to rate the face they made from the dominant description on a 1 to 7-point Likert scale on how dominant they thought the face was, with 1 being ‘not very dominant’, and 7 being ‘very dominant’. Similarly they rated the face they made from the prestigious description for prestigiousness, and the face they made from the attractive description on attractiveness.



Figure 2. Composite images created by combining multiple images from different participants to show the average traits across participants (Dominant: 16 female and 14 male faces; Prestigious: 16 female and 13 male faces; Attractive: 14 female and 16 male faces), of female (top row) and male (bottom row) faces made by participants based on descriptions of dominant (left column), prestigious (middle column), and attractive (right column) individuals.

2.3.2 Manipulation Check: Ratings of attractiveness, dominance, and prestige by the creators of the EvoFITs

For the dominant EvoFITs, one-sample t-tests revealed that both male ($M = 6.21, SD = .8, t(13) = 10.33, p < .001$) and female ($M = 5.23, SD = .97, t(16) = 5.25, p < 0.001$) participants rated their faces significantly above the mean of 4 on the 7-point Likert scale. For the prestigious EvoFITs, one-sample t-tests revealed that both male ($M = 5.6, SD = 1.12, t(12) = 5.20, p < 0.001$) and female ($M = 5.7, SD = .29, t(17) = 5.72, p < .001$) participants rated their faces significantly above the mean of 4 on the 7-point Likert scale. For the attractive EvoFITs, one-sample t-tests revealed that both male ($M = 6.36, SD = .74, t(13) = 11.8, p < .001$) and female ($M = 5.33, SD = .97, t_{17} = 6.23, p < .001$) participants rated their faces significantly above the mean of 4 on the 7-point Likert scale.

For all three traits (dominance, prestige, and attractiveness), these results show that male and female participants rated the faces they created significantly higher than average on the relevant scale, indicating that they felt the image they had created was in line with the description present.

2.3.3 Discussion

In Study 1, I found that participants successfully used EvoFIT to create faces varying in dominance, prestige, and attractiveness based on written descriptions. Additionally, in a manipulation check, I found that creators found the dominant faces they created looked more dominant, the prestigious faces looked more prestigious, and the attractive faces looked more attractive than average. Therefore, EvoFIT appears to be a viable, and novel, tool for creating faces differing in dominance, prestige, and attractiveness that does not require participants to select component parts or rate pre-existing faces, but allows them to create faces exhibiting certain traits (i.e. dominance) as a whole.

2.4 Study Two

In Study 2, I examined how the EvoFIT faces created to look dominant, prestigious, and attractive in Study 1 would be judged by new raters. If status was perceptible in faces created using EvoFIT, then I expected to see dominant faces rated as highest in dominance, prestigious faces rated as highest in prestige, and attractive faces rated as neither high in dominance nor prestige but high in attractiveness.

2.4.1 Methods

2.4.1.1 Participants

A set of 69 university undergraduates as well as online portal system users (19 men; age $M = 29.0, SE = 1.17$) rated each EvoFIT for dominance, prestigiousness, and attractiveness. This was an online study created using Qualtrics Software (www.qualtrics.com; Qualtrics Labs Inc., Provo, UT).

2.4.1.2 Procedure

After completing the standardized questionnaire described above, each participant was randomly presented with one EvoFIT at a time and was instructed to rate it for how dominant, prestigious, and attractive they thought that EvoFIT was on a 7-point Likert scale (1 being very low, and 7 being very high) for all three traits simultaneously. Male and female faces were presented in blocks by sex, so participants saw all EvoFITs of one sex before the other; however the order of sex was randomized across participants. In total all participants rated all 94 EvoFITs.

2.4.2 Results

2.4.2.1 Ratings of the EvoFIT faces for dominance, prestige, and attractiveness by online participants

First I performed a 3 (EvoFIT face trait: dominant, prestigious, or attractive) x 3 (EvoFIT rating: dominance, prestige, or attractiveness) x 2 (sex of face: male or female) x 2 (sex of participant: male or female) mixed-factor repeated-measures ANOVA. Sex of rater was included as dominance differs between the two sexes, as mentioned in Chapters 1 (section 1.5.2), and investigated further in Chapter 3. Where sphericity could not be assumed, a Greenhouse-Geisser correction was used. There was no main effect of sex of participant, $F(3.90, 7.53) = .15, p = .42, \eta_p^2 = .008$ and there were no significant interactions between this variable and any others (all F 's $< 3.04, p > .08$) except a significant interaction between sex of face, EvoFIT rating, and sex of participant, $F(1.65, 109.87) = 6.39, p = .004, \eta_p^2 = .09$. In order to explore the interaction I split the data by EvoFIT rating and performed three separate 3 (EvoFIT face trait: dominant, prestigious, or attractive) x 2 (sex of face: male or female) x 2 (sex of participant: male or female) mixed-factors repeated-measures ANOVAs, one for each rating.

I hypothesized that asking men to rate other male faces for attractiveness, regardless of whether the EvoFIT faces were created to look attractive, dominant, or prestigious, may lead to different results than asking women to rate female EvoFIT faces on their attractiveness. That is, if men are unwilling to rate men's attractiveness objectively, perhaps due to prejudices about appearing less masculine which are not otherwise conferred on women when rating other women's attractiveness, then I would expect to see differences in ratings of attractiveness between men and women, and this may explain the significant interaction seen above between sex of face, EvoFIT rating, and sex of participant.

When looking at EvoFIT ratings of attractiveness, the main effect of sex of participant was not significant, $F(1,67) = 3.13, p = .08, \eta_p^2 = .05$. The only significant interaction was found between sex of participant and sex of face, $F(1, 67) = 8.90, p = .004, \eta_p^2 = .12$. The other interactions between EvoFIT ratings and sex of participant, and a three way interaction between EvoFIT ratings, sex of

participant, and sex of face were not significant (both F 's < .05, p 's > .86). I then averaged attractiveness scores between the three different EvoFIT face traits for each sex, and performed independent-samples t-tests to look at whether there were differences in ratings of attractiveness between the sexes. That is, I took female dominant, prestigious and attractive EvoFIT faces rated for attractiveness and averaged them to yield one score. I then did the same for male faces and looked at how these scores differed between male and female raters. There were no differences in ratings of male faces, $t(67) = .32, p = .72, r = .04$ but there were differences in ratings of female faces, $t(67) = 2.81, p = .006, r = .32$, with women rating the female faces as higher in attractiveness than men. This suggests that it was not men and women rating male EvoFIT faces differently, but rather that women on average rated all female EvoFIT faces higher in attractiveness than men.

When I examined EvoFIT ratings of dominance, there was no main effect of sex of participant, $F(1,67) = .11, p = .75, \eta_p^2 = .002$. There were no significant interactions between sex of participant and EvoFIT rating, or sex of face (all F 's < .32, p 's > .88). The same was true when I examined EvoFIT ratings of prestige. There was no significant main effect of sex of participant, $F(1,67) = .01, p = .93, \eta_p^2 < .001$ and there were no significant interactions with this variable (all F 's < .95, p 's > .35). These results suggest that the only difference relating to sex of participants is when rating faces for attractiveness and not when rating dominance or prestige. Since it is dominance and prestige which are the main focus of this chapter, I opted to remove sex of participant from further analyses. Even when keeping sex of participant in the analyses as a between-subjects factor the results reported below do not change.

I performed a repeated-measures ANOVA as described above: a 3(EvoFIT face trait: dominant, prestigious, or attractive) x 3 (rating: dominance, prestige, or attractiveness) x (2 sex of face: male or female) repeated measures ANOVA. There were main effects of EvoFIT face trait, $F(1.3, 85.9) = 79.70, p < .001, \eta_p^2 = .54$, rating, $F(1.6, 109.1) = 8.42, p = .001, \eta_p^2 = .1$, sex of face, $F(1, 68) = 20.51, p < .001, \eta_p^2 = .23$ as well as significant interactions between EvoFIT face trait and sex of face, $F(1.8, 121.5) = 6.33, p = .003, \eta_p^2 = .85$, rating and EvoFIT face trait, $F(2.1, 140.2) = 143.75, p < .001, \eta_p^2 = .68$, and rating and sex of face, $F(1.6, 107.5) = 19.9, p < .001, \eta_p^2 = .23$. All of these interactions were qualified by a significant 3-way interaction between rating, EvoFIT face trait, and sex of face, $F(2.8, 190.8) = 17.08, p < .001, \eta_p^2 = .20$. Thus I split the data by EvoFIT face trait for further analyses to explore differences in ratings within each face type.

2.4.2.2 Dominant EvoFIT faces

First, I performed a 3 (EvoFIT rating: dominance, prestige, or attractiveness) x 2 (sex of face: male or female) repeated-measures ANOVA to examine ratings of dominance, prestige, and attractiveness given to faces created to look dominant. Again where sphericity was not assumed, a Greenhouse-

Geisser correction was used. The ANOVA revealed a significant main effect of EvoFIT rating, $F(2, 136) = 88.60$, $p < .001$, $\eta_p^2 = .57$, and a significant main effect of the sex of face, $F(1, 68) = 29.80$, $p < .001$, $\eta_p^2 = .31$. However these were qualified by a significant interaction between sex of face and EvoFIT rating, $F(1.6, 112.1) = 35.43$, $p < .001$, $\eta_p^2 = .34$. I then split the data by sex of face and looked at male and female faces separately. For male faces, I found that there was a significant effect of EvoFIT rating, $F(1.8, 124.9) = 101.21$, $p < .001$, $\eta_p^2 = .60$ and follow-up Tukey HSD analyses revealed that male EvoFIT faces created to look dominant were rated as significantly higher in dominance than attractiveness ($p < .001$) or prestigiousness ($p < .001$; Figure 3).

For female faces, there was also a significant effect of EvoFIT rating, $F(1.7, 117.2) = 43.14$, $p < .001$, $\eta_p^2 = .39$ and follow-up Tukey HSD analyses revealed that the female EvoFIT faces created to look dominant were rated as significantly higher in dominance than attractiveness ($p < .001$) and prestige ($p < .001$; Figure 4). These results suggest that both male and female EvoFIT faces created to look more dominant look significantly more dominant than they do attractive or prestigious. Visual inspection of Figures 3 and 4 reveal that differences in ratings between the male and female high dominance faces were differences in magnitude and not direction.

2.4.2.3 Prestigious EvoFIT faces

Secondly, I performed a 3 (EvoFIT rating: dominance, prestige, or attractiveness) x 2 (sex of face: male or female) repeated-measures ANOVA to examine ratings of dominance, prestige, and attractiveness given to faces created to look prestigious. The ANOVA revealed a significant main effect of EvoFIT rating, $F(1.6, 111.5) = 3.26$, $p = .52$, $\eta_p^2 = .05$, and a main effect of the sex of face, $F(1, 68) = 12.87$, $p = .001$, $\eta_p^2 = .16$. However these were qualified by a significant interaction between sex of face and EvoFIT rating, $F(1.5, 104.8) = 6.38$, $p = .005$, $\eta_p^2 = .09$. I then split the data by sex of face and looked at male and female faces separately. For male faces, I found that there was a significant effect of EvoFIT rating, $F(1.7, 122.2) = 3.45$, $p = .04$, $\eta_p^2 = .05$ and follow-up Tukey HSD analyses revealed that male EvoFIT faces created to look prestigious were rated as higher in prestige than both dominance ($p = .02$) and attractiveness ($p = .02$; Figure 3).

For female faces, there was also a significant effect of EvoFIT rating, $F(1.4, 97.9) = 4.37$, $p = .026$, $\eta_p^2 = .06$ and follow-up Tukey HSD analyses revealed that those female EvoFIT faces created to look prestigious were rated as higher in prestige than dominance ($p < .001$), but similarly high in attractiveness ($p = .93$; Figure 4). These results suggest male faces created to look prestigious look significantly more prestigious than they do dominant or attractive, while female faces created to look prestigious look significantly more prestigious than they do dominant, but similarly attractive as prestigious.

2.4.2.4 Attractive EvoFIT faces

Finally, I performed a 3 (EvoFIT rating: dominance, prestige, or attractiveness) x 2 (sex of face: male or female) repeated-measures ANOVA to examine ratings of dominance, prestige, and attractiveness given to faces created to look attractive. The ANOVA revealed a significant main effect of EvoFIT rating, $F(1.7, 118.9) = 14.75, p < .001, \eta_p^2 = .18$, and a main effect of the sex of face, $F(1, 68) = 6.25, p = .02, \eta_p^2 = .08$. However these were qualified by a significant interaction between sex of face and rating, $F(1.8, 120.1) = 4.89, p = .012, \eta_p^2 = .07$. I then split the data by sex of face and looked at male and female faces separately. For male faces, I found that there was a significant effect of status, $F(2, 136) = 6.90, p = .001, \eta_p^2 = .09$ and follow-up Tukey HSD analyses revealed that male EvoFIT faces created to look attractive were rated as more attractive than dominant ($p = .04$) but there was no difference, or a slight trend with attractive EvoFITs rated as more attractive than prestigious ($p < .1$; Figure 3).

For female faces, there was also a significant effect of EvoFIT rating, $F(1.6, 109.6) = 16.06, p < .001, \eta_p^2 = .19$ and follow-up Tukey HSD analyses revealed that those female EvoFIT faces created to look attractive were rated as less dominant ($p < .001$), but similar in prestige ($p < .20$; Figure 4). These results suggest that male faces created to look attractive look significantly more attractive than dominant or prestigious.

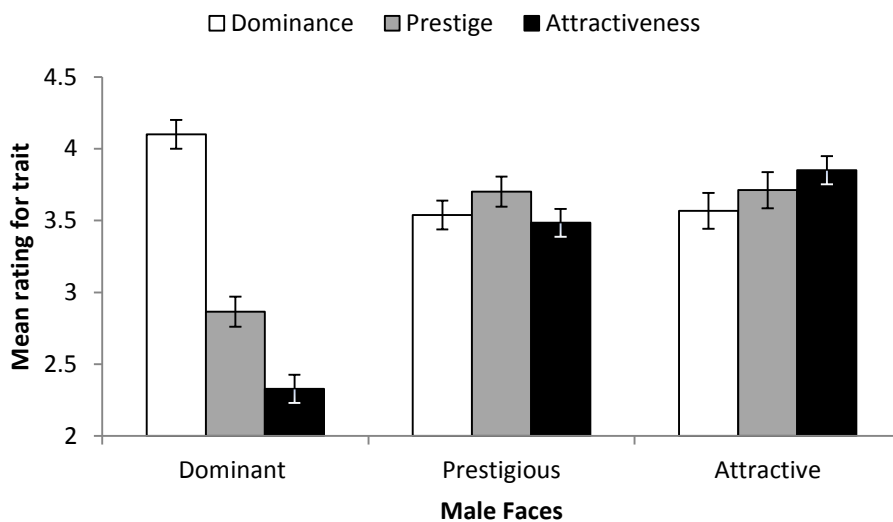


Figure 3. Male faces created based on written descriptions and rated for dominance, prestige, and attractiveness.

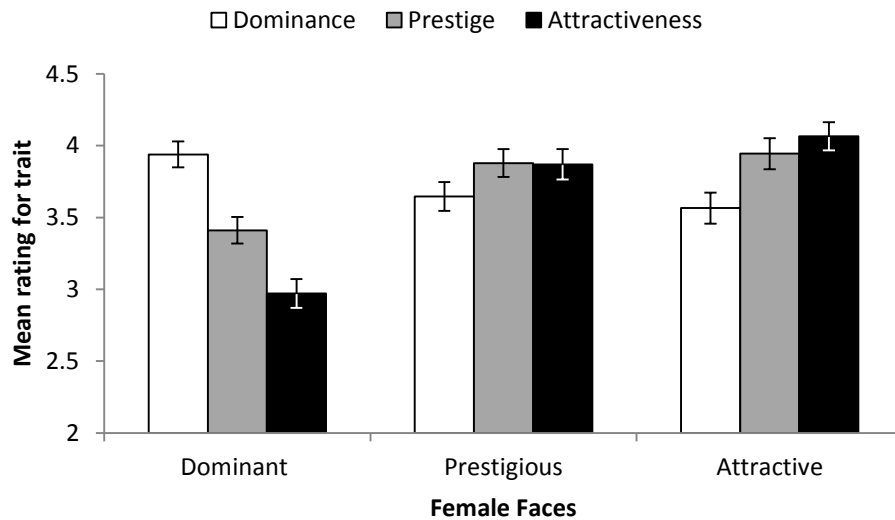


Figure 4. Female faces created based on written descriptions and rated for dominance, prestige, and attractiveness.

2.4.3 Discussion

In Study 2, I tested whether participants judging EvoFIT faces created to look dominant, prestigious, or attractive, would rate them differently with respect to these three traits. I found that dominant male and female faces were rated high in dominance and low in both attractiveness and prestige. Thus, my results suggest that dominance is recognizable in a face and is distinct from both attractiveness and prestige. For prestigious male faces, I found that they were rated significantly lower in dominance and attractiveness, while prestigious female faces were rated similarly high for attractiveness but low in dominance. These findings suggest that prestige is related to attractiveness in women. Finally, I found that attractive male and female faces were rated as high in attractiveness, male attractive faces were rated as marginally lower in prestige, and both male and female attractive faces were rated as significantly lower in dominance. This again suggests that attractive faces appear more prestigious than they do dominant, but attractive faces are also negatively associated with dominance.

2.5 Study Three

In Study 2, I found that social status and attractiveness can be gleaned from faces created to look dominant, prestigious, and attractive. In Study 3, I aimed to extend these findings and explore whether participants would also find personality characteristics (extraversion, agreeableness, conscientiousness, emotional stability/neuroticism, and openness to experience) to differ between the three types of faces. As has been shown before when examining male varsity athletes,

individuals who were rated high in dominance were also rated as high in extraversion but low in agreeableness, with no other personality trait exhibiting significance (Cheng et al., 2010). Conversely, individuals rated as high in prestige were rated as high in conscientiousness (Cheng et al., 2010). Following this pattern of attribution, EvoFIT faces created to look dominant and prestigious were expected to show similarities to the findings outlined above.

2.5.1 Methods: Rating personality characteristics

2.5.1.1 Participants

Forty one university undergraduate psychology students (10 men; age $M = 21.2$, $SE = .83$) participated for course credit to rate EvoFITs for personality characteristics in an online study.

2.5.1.2 Stimuli

Of the 94 original EvoFIT images, 15 female and 15 male images were randomly selected for this study. Within each sex, 5 images were used based on the attractive description, 5 from the description of prestigious individuals, and 5 from the description of dominant individuals.

2.5.1.3 Procedure and measures

Once participants had completed a short demographic questionnaire, they were shown an EvoFIT and asked to rate it on the big 5 personality characteristics (extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience), as used in the Ten Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). Briefly, 10 word-pairs were presented (i.e. Extraverted, enthusiastic) under each EvoFIT, and a participant had to rate each face for that personality trait on a Likert scale from strongly disagree (1) to strongly agree (7). Participants saw all EvoFITs of one sex before being presented the other, however within one sex all images were presented in a random order, and the order of sexes was randomised. In total 300 ratings were received (15 faces x 2 sexes x 10 personality word pairs), and using the TIPI scoring each face yielded a score for the 5 personality traits.

2.5.2 Results

2.5.2.1 Ratings of the EvoFITs for personality characteristics, by online participants

First, I performed an overall 3 (EvoFIT face trait: dominant, prestigious, or attractive) x 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability, or openness to experience) x 2 (sex of face: male or female) x 2 (sex of participant: male or female) mixed-factor repeated-measures ANOVA. Where sphericity could not be assumed, a Greenhouse-Geisser correction was used. There was no significant main effect of sex of participant, $F(1, 39) = 1.78$, $p = .19$, $\eta_p^2 = .04$, and no significant interactions between this variable and any others (all F 's < 2.5, p 's >

.09). Sex of participant was removed from the analyses and they were repeated. However, even if sex of participant were included in the analyses it did not change the results of the ANOVA reported below.

There was no significant main effect of sex of face, $F(1,40) = .09, p = .77, \eta_p^2 = .001$, however there was a main effect of EvoFIT face trait, $F(2,80) = 71.00, p < .001, \eta_p^2 = .64$ and a main effect of personality, $F(3.1,123.9) = 20.73, p < .001, \eta_p^2 = .34$. There was no significant interaction between sex of face and EvoFIT face trait, $F(2,80) = .50, p = .61, \eta_p^2 = .01$, or sex of face and personality, $F(3.2,127.6) = 1.71, p = .16, \eta_p^2 = .041$; however, there was a significant interaction between EvoFIT face trait and personality, $F(5.6,222.4) = 13.22, p < .001, \eta_p^2 = .25$. There was also a significant 3-way interaction between sex of face, EvoFIT face trait, and personality, $F(8,320) = 2.69, p = .007, \eta_p^2 = .06$ (Figure 5 and 6). In order to explore this interaction I split the data by EvoFIT face trait.

2.5.2.2 Dominant EvoFITs

I performed a 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability, or openness to experience) x 2 (sex of face: male or female) repeated-measures ANOVA to examine differences in personality and sex for the dominant EvoFIT faces. I found a significant main effect of personality trait, $F(3.4,134.8) = 28.81, p < .001, \eta_p^2 = .42$, no main effect of sex of face, $F(1,40) = .42, p = .52, \eta_p^2 = .01$, and no interaction between personality trait and sex of face, $F(3.1, 124.9) = 1.44, p = .23, \eta_p^2 = .04$ (Figure 5 and 6). As shown in Figures 5 and 6, and corroborated by Tukey HSD tests, dominant faces were rated least agreeable ($p < .001$) and most conscientious ($p < .001$), regardless of sex (table 2 and 3). There were no differences in ratings for extraversion and emotional stability ($p = .28$) while dominant faces were rated as slightly lower in extraversion than openness to experience ($p = .025$). Thus, in terms of overall personality, dominant faces were perceived to be very low in agreeableness relative to other traits, and highest in conscientiousness.

2.5.2.3 Prestigious EvoFITs

I performed a 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability, or openness to experience) x 2 (sex of face: male or female) repeated-measures ANOVA to examine differences in personality and sex for the prestigious EvoFIT faces. I found a significant main effect of personality trait, $F(3.2,126.2) = 17.00, p < .001, \eta_p^2 = .30$, no main effect of sex of face, $F(1,40) = .10, p = .75, \eta_p^2 = .003$, but a significant interaction between personality trait and sex of face, $F(4, 160) = 2.99, p = .02, \eta_p^2 = .07$ (Figure 5 and 6). To further explore the interaction I split the data by sex of face.

In male faces there was a significant effect of personality, $F(2.6, 104.9) = 9.28, p < .001, \eta_p^2 = .19$. As shown in Figure 5, and corroborated by Tukey HSD tests, conscientiousness was rated highest in prestigious men, however it was not rated significantly differently from emotional stability ($p =$

.64). The lowest rated traits were extraversion and openness to experience, which did not differ from each other ($p = .9$). Agreeableness was also similar to extraversion ($p = .1$) and slightly, but significantly higher than openness to experience ($p = .02$; Tables 2 and 3).

In female faces, there was a significant effect of personality, $F(4,160) = 10.3, p < .001, \eta_p^2 = .21$. As shown in Figures 6, and corroborated by Tukey HSD tests, conscientiousness was rated as highest in prestigious women, however it was not rated significantly differently from agreeableness ($p = .67$). The lowest rated was extraversion, which was significantly lower than the next lowest trait, openness to experience ($p = .02$), though openness to experience did not differ from the next lowest, emotional stability ($p = .39$; Tables 2 and 3).

Thus, in terms of overall personality, prestigious men are perceived as highest in conscientiousness and emotional stability while prestigious women are rated as highest in conscientiousness and agreeableness. Both prestigious men and women are perceived as lowest in extraversion, with men also being perceived as lower in openness to new experience.

2.5.2.4 Attractive EvoFITs

I performed a 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability, or openness to experience) x 2 (sex of face: male or female) repeated-measures ANOVA to examine differences in personality and sex for the attractive EvoFIT faces. I found no significant main effect of personality trait, $F(2.6,105.2) = 2.15, p = .11, \eta_p^2 = .05$, no main effect of sex of face, $F(1,40) = .83, p = .37, \eta_p^2 = .02$, but a significant interaction between personality trait and sex of face, $F(4, 160) = 2.97, p = .02, \eta_p^2 = .07$ (Figure 5 and 6). To further explore the interaction I split the data by sex of face.

In men there was no significant effect of personality trait, $F(3.1,126.4) = 1.45, p = .23, \eta_p^2 = .04$ (Figure 5). This suggests that all 5 personality traits were rated similarly for attractive male faces. However, in female faces there was a significant effect of personality trait, $F(2.7,106.5) = 3.25, p = .03, \eta_p^2 = .08$. Upon inspection of Figure 6, and as corroborated by Tukey HSD analyses, in women's attractive faces, extraversion was rated lowest and significantly lower than both conscientiousness ($p = .001$) and openness to experience ($p = .002$) and marginally lower than agreeableness ($p = .1$; Tables 2 and 3).

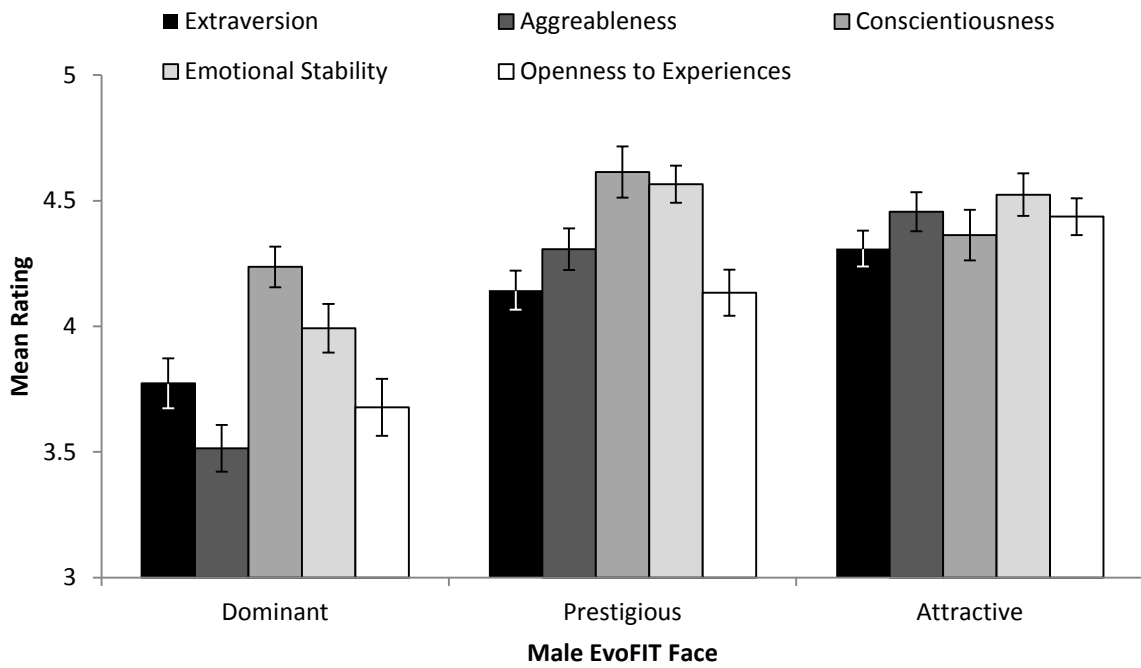


Figure 5. Male EvoFIT faces rated for personality characteristics

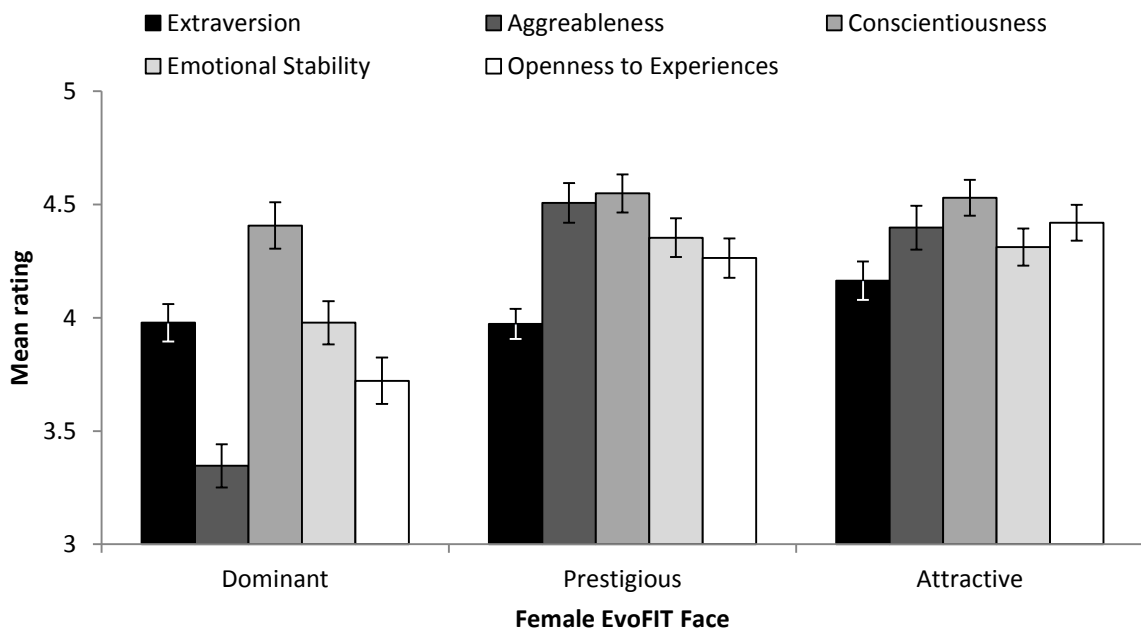


Figure 6. Female EvoFIT faces rated for personality characteristics

Table 2. Tukey HSD post-hoc analyses examining differences between Dominance (D), Prestige (P), and Attractiveness (A) between Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional stability (ES) and Openness to experience (OE)

	Male Faces					Female Faces				
	E	A	C	ES	OE	E	A	C	ES	OE
D vs P	.003	<.001	.002	<.001	<.001	.961	<.001	.148	.008	<.001
D vs A	<.001	<.001	.361	.001	<.001	.069	<.001	.223	.006	<.001
P vs A	.130	.200	.086	.731	.022	.045	.244	.785	.650	.154

In addition to examining differences in personality attributes *within* each type of EvoFIT face (e.g. how extraversion differed from agreeableness in dominant faces), I also explored how personality characteristics would differ *between* the 3 types of faces (e.g. differences in extraversion between dominant, prestigious, and attractive faces). As the 3-way interaction above yielded a significant interaction, I split these data by sex of face first, and then by personality characteristic.

2.5.2.4 Male EvoFITs

When exploring male EvoFITs I performed a 3 (EvoFIT face trait: dominant, prestigious, or attractive) x 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability, or openness to experience) repeated measures ANOVA. There was a significant main effect of EvoFIT face trait, $F(2,80) = 40.13, p < .001, \eta_p^2 = .50$, and a significant main effect of personality trait, $F(4, 160) = 10.98, p < .001, \eta_p^2 = .21$. However these main effects are qualified by a significant interaction between EvoFIT face trait and personality trait, $F(8,320) = 5.59, p < .001, \eta_p^2 = .12$ (Figure 5). To explore this interaction I split the data by personality trait, in order to compare differences in each personality trait between the different conditions.

Repeated measures ANOVAs revealed significant differences between the three EvoFIT faces when examining extraversion, $F(2,80) = 11.60, p < .001, \eta_p^2 = .23$, agreeableness, $F(2,80) = 34.73, p < .001, \eta_p^2 = .47$, conscientiousness, $F(2,80) = 5.86, p = .004, \eta_p^2 = .13$, emotional Stability, $F(2, 80) = 19.16, p < .001, \eta_p^2 = .32$ and openness to experience, $F(2,80) = 20.01, p < .001, \eta_p^2 = .33$. Tukey HSD analyses revealed where the differences lied and are reported in table 2 and table 3.

In terms of personality types, dominant individuals seem to be rated lowest in all traits considered, and look to be particularly low in extraversion, agreeableness, and openness to experience. Prestigious individuals were rated as highest in conscientiousness and emotional stability while attractive individuals were most open to experience, extraverted, and agreeable.

2.5.2.5 Female EvoFITs

When examining female EvoFITs, I first performed a 3 (EvoFIT face trait: dominant, prestigious, or attractive) x 5 (personality trait: extraversion, agreeableness, conscientiousness, emotional stability,

or openness to experience) repeated measures ANOVA. There was a significant main effect of EvoFIT face trait, $F(2,80) = 35.21, p < .001, \eta_p^2 = .47$, and a significant main effect of personality trait, $F(4, 160) = 10.98, p < .001, \eta_p^2 = .22$. However these main effects are qualified by a significant interaction between EvoFIT face trait and personality trait, $F(8,320) = 12.75, p < .001, \eta_p^2 = .24$ (Figure 6). To explore this interaction I split the data by personality trait, in order to compare differences in each personality trait between the different EvoFIT face types.

Repeated measures ANOVAs revealed a non-significant trend between the three EvoFIT faces when examining extraversion, $F(2,80) = 2.52, p = .09, \eta_p^2 = .06$, and no significant differences were found for conscientiousness, $F(2,80) = 1.47, p = .23, \eta_p^2 = .04$. There were significant differences in agreeableness, $F(2,80) = 47.25, p < .001, \eta_p^2 = .54$, emotional stability, $F(2,80) = 6.48, p = .002, \eta_p^2 = .14$, and openness to experience, $F(2,80) = 23.15, p < .001, \eta_p^2 = .37$, across EvoFIT face types. Tukey HSD analyses revealed where the differences lied and are reported table 2 and table 3.

Thus, in terms of personality types, dominant individuals were rated lowest in most traits considered, and were particularly low in agreeableness, emotional stability, and openness to experience. Prestigious individuals were rated as highest in agreeableness and conscientiousness, while attractive individuals were most extraverted and open to experience.

Table 3. Tukey HSD post-hoc analyses, reporting p-values, examining differences between Extraversion (E), Agreeableness (A), Conscientiousness (C), Emotional stability (ES) and Openness to experience (OE) in Dominance (D), Prestige (P), and Attractiveness (A).

	Male Faces			Female Faces			Both sexes		
	D	P	A	D	P	A	D	P	A
E vs A	.030	.103	.206	<.001	<.001	.095	<.001	<.001	.077
E vs C	<.001	<.001	.624	.002	<.001	.001	<.001	<.001	.023
E vs ES	.097	<.001	.062	.000	.002	.249	.282	<.001	.066
E vs OE	.369	.920	.083	.023	.002	.002	.025	.030	<.001
A vs C	<.001	.031	.326	<.001	.667	.175	<.001	.052	.806
A vs ES	<.001	.004	.418	<.001	.075	.366	<.001	.362	.904
A vs OE	.130	.023	.831	.004	.037	.857	<.001	.005	.990
C vs ES	.022	.639	.102	<.001	.045	.012	<.001	.062	.696
C vs OE	<.001	.002	.456	<.001	.005	.269	<.001	<.001	.816
ES vs OE	.033	<.001	.414	.060	.387	.366	.004	.001	.916

2.5.3 Discussion

In Study 3, I found that there were differences in both male and female EvoFIT faces with respect to their perceived personality characteristics. Broadly, individuals created to look dominant were seen as being low in all personality characteristics, with particularly low scores on extraversion, agreeableness and openness to experience. Prestigious individuals, on the other hand, were

generally considered to be highly conscientious, emotionally stable, and agreeable. Attractive individuals of both sexes were also considered relatively high in all traits, except extraversion in female attractive EvoFITs.

2.6 General discussion

Across three studies, I examined whether the characteristics of dominance and prestige could be captured using novel techniques and software (EvoFIT) such that these traits were perceivable in participant-generated faces, and whether such traits would affect judgements of personality attributes. In Study 1, I found that participants could reliably make faces of dominant, prestigious, and attractive individuals based on written descriptions, and rated each of these faces higher than average for that trait. In Study 2, a new set of participants rated dominant faces as more dominant and less attractive and prestigious, while prestigious faces were rated as both highly attractive and prestigious, but not dominant. In Study 3, I found differences in ratings of personality characteristics, with dominant EvoFIT faces scoring low on most traits, including agreeableness and openness to experience, while faces created to look prestigious and attractive scored highly in most personality traits.

Previous literature has suggested that there are two discrete methods of attaining high status, namely dominance and prestige (Cheng et al., 2013, 2010; Henrich & Gil-White, 2001). While the former is related to force and intimidation in order to climb to the top of one's social ladder, the latter has to do with possessing skills and merits which cue others to one's worth, and status is freely conferred (Henrich & Gil-White, 2001). While a great deal of work has been done on perceptual dominance in faces (Keating et al., 1981; Keating, 1985; Mueller & Mazur, 1996; Oosterhof & Todorov, 2008), these are the first studies to explore differences in facial structure between perceptually dominant and prestigious individuals. Additionally, I employed a novel technique which does not involve changing only specific features of the face (such as with Identikit), or using pre-existing faces rated for dominance as stimuli, but rather allows for the creation of faces representing particular attributes (i.e. dominance) holistically.

These studies are the first to show that dominance and prestige are both distinguishable in faces such that dominant-looking faces are not associated with looking prestigious and prestigious-looking faces are not associated with looking dominant. This adds support to the notion that there are two different behavioural styles for gaining high status, which are also somehow exhibited through, and perceivable in, an individual's static facial features.

Increases in testosterone during puberty lead to skeletal growth of the jaw and face (Penton-Voak, 2004; Verdonck, Gaethofs, Carels, & de Zegher, 1999), and wider-faced men have been shown to appear more dominant (Alrajih & Ward, 2014; Keating et al., 1981). Additionally,

wider-faced men, or those with higher facial width-to-height ratios (fWHR) have been shown to be more deceptive and aggressive, as well as less trustworthy (Carré, McCormick, & Mondloch, 2009; Haselhuhn & Wong, 2012; Stirrat & Perrett, 2010) and these are characteristics associated with dominant individuals (Cheng et al., 2013, 2010; Henrich & Gil-White, 2001). Upon inspection of Figure 2, the average dominant man has a broader jaw than the prestigious and attractive averages. Thus it appears that there are reliable cues in the face (some of which were previously described in Chapter 1, section 1.7) and which are also corroborated in these studies, signalling that an individual is dominant (in this case specifically for men) and might be more likely to act in dominant ways. In Study 4 of Chapter 3 I specifically examine fWHR differences between the EvoFIT faces created to look dominant, prestigious, and attractive empirically.

In addition to exploring how participants rated EvoFIT faces based on their dominance, prestige, and attractiveness, I also collected ratings of the big 5 personality characteristics of EvoFITs of both sexes. I did not find, as previous studies have found, that dominance is positively correlated with perceived extraversion (Cheng et al., 2010). In fact, I found that dominant male EvoFIT faces were rated as lower in extraversion than prestigious and attractive faces, while dominant female EvoFIT faces were rated as similarly extraverted as prestigious faces. However, as the original study was performed based on round-robin judgements between fellow male athletes (i.e. team-mates), it might be that being on a team requires an individual to be assertive, energetic, and generally sociable. Additionally it is expected that male athletes on the same team would know each other reasonably well and be privy to information in addition to simply their dominance, which participants viewing these EvoFIT faces would not have had about these fictional faces. Thus, it is possible that extraversion might be a trait which is exhibited in the actions and behaviours of dominant people, as either positive or negative interaction with others is inevitable when trying to attain high status, but is not necessarily associated with dominant appearing facial traits.

I did find that dominant faces were rated as lower in agreeableness than the prestigious and attractive faces, in line with a negative correlation between dominance and agreeableness that has previously been shown (Cheng et al., 2010). This suggests that something about dominant male and female faces can cue perceivers to their agreeableness. It is possible that my definition of dominance, as defined using previous literature, may have affected the way in which these faces were created, as words including 'coercion' and 'intimidation' do not portray a likeable, empathic, or trustworthy (i.e. agreeable) individual. As men with high fWHR, who are also considered high in dominance, have been described as deceptive and less trustworthy (Haselhuhn & Wong, 2012; Stirrat & Perrett, 2010), these results corroborate the link between dominant facial features and disagreeable personality characteristics.

Less is known about, and no-one to my knowledge has yet studied, the perceived facial features of prestigious individuals. As I have shown in Study 2, it is clear that prestigious appearing faces differ from those of dominant appearing faces but the specific ways in which they do are hard to define. It may be that prestigious individuals do have a certain appearance, and some studies suggest that competence, perhaps a marker of skill as would be expected for prestigious individuals, is discernible in faces (Antonakis & Dalgas, 2009; Todorov et al., 2005). It might also be the case that while dominance is something evident in a person's face, prestige has less to do with *possessing* specific facial features and characteristics, and reflects instead that it is *lacking* those features which make a person's face appear dominant.

In addition, prestige appears to be related to attractiveness, as prestigious individuals of both sexes were more attractive than dominant individuals. As stated above for agreeableness, this may in part be due to the descriptions of the faces provided to the original participants, with dominant individuals described as coercive while prestigious individuals were described as highly valued. Inherent in these descriptions may be 'negative' traits for dominance versus 'positive' traits for prestige, which can in turn have an impact on the attractiveness of the EvoFITs created. As with the 'beautiful is good' halo effect (Dion, Berscheid, & Walster, 1972), the same may be true in reverse 'what is good is more likely to be beautiful'. Thus, prestigious individuals exhibit positive traits, one of which may be attractiveness.

It is important to note that in both Study 2 and Study 3 the ratings given to each EvoFIT face were neither at bottom (1) nor at ceiling (7) as rated on a 7-point Likert scale. This means that there was room for ratings to either increase or decrease; however there was also enough variation between ratings for large differences to be seen (i.e. dominant male faces rated at 4.1 for dominance but 2.3 for attractiveness). The reason why prestigious faces rated for prestige or attractive faces rated for attractiveness were not above the mean (a rating of 4 on a 7-point Likert scale; see Figure 4) may be due to the nature of judging neutral faces. As we are commonly used to seeing images of others who are exhibiting an expression (commonly smiling), posing in some way, or tilted away from the camera, asking participants to rate faces with no expression, staring directly into the camera, and with exactly the same hairstyle means that those images may not look particularly appealing. In addition, as I was interested in differences either within an EvoFIT face type (i.e. how ratings of dominance, prestige, and attractiveness differ for a face created to look dominant) or in specific ratings between EvoFIT face types (i.e. ratings of extraversion between the three faces) the fact that some traits did not reach the mean of 4 did not affect my interpretation or importance of the overall findings.

2.7 Conclusion

Using novel methodology (EvoFIT) to create faces, I have expanded upon, and corroborated previous literature suggesting that perceptually dominant individuals possess certain facial characteristics. Furthermore, these dominant characteristics differed from individuals who were created to appear more prestigious or attractive. In addition, I have shown that perceived personality attributes also differed markedly between dominant and prestigious individuals, again suggesting that these social status cues are dissociable and perceivable in an individual's face.

Chapter 3 In the face of dominance: Self-perceived and other-perceived dominance are positively associated with facial-width-to-height ratio in men

This chapter is adapted from published manuscript:

(Mileva, V. R., Cowan, M. L., Cobey, K. D., Knowles, K. K., & Little, A. C. (2014). In the face of dominance: Self-perceived and other-perceived dominance are positively associated with facial-width-to-height ratio in men. *Personality and Individual Differences*, 69, 115-118.)

3.1 Abstract

In recent research, facial width-to-height ratio (fWHR) has garnered considerable attention because it has been linked with different behavioural characteristics (e.g., achievement drive, deception, aggression). In this chapter I examined whether other-perceptions and self-perceptions of dominance are related to fWHR. In Study 1, I found that other-perceived dominance was positively associated with fWHR, but only in men. In Studies 2 and 3, using two different self-perceived dominance scales, and two different samples of participants, I found that fWHR was positively related to self-perceived dominance, again only in men. There was no relationship between fWHR and self-perceived prestige scores. Additionally, in Study 4 which is not published alongside Studies 1 through 3, I examined whether there were significant differences in fWHR in the EvoFIT faces described in Chapter 2 created to appear dominant, prestigious, and attractive. I found that dominant individuals of both sexes had higher fWHR than prestigious and attractive individuals. Consistent with previous work, I found that there was no sexual dimorphism in fWHR across the first three studies. However, there was sexual dimorphism in study 4 with female faces having lower fWHR than male faces. Together these results suggest that fWHR may be a reliable cue to dominant social behaviour, at least in men.

3.2 Introduction

In our everyday lives we use others' facial characteristics to make inferences about how they might behave. One facial trait that has been the focus of much recent research is facial width-to-height-ratio (fWHR) as described in Chapter 1, Section 1.7. Differences in fWHR have been associated with reproductive success (Loehr & O'Hara, 2013), achievement drive (Lewis et al., 2012), aggression (Carré et al., 2009; Carré & McCormick, 2008; Lefevre & Lewis, 2014; Trebicky et al., 2013), cheating (Haselhuhn & Wong, 2012), trustworthiness (Stirrat & Perrett, 2010), and even with homerun performance in baseball (Tsujiyama & Banissy, 2013). Additionally, fWHR has been shown to be sexually dimorphic (Carré & McCormick, 2008; Weston, Friday, & Liò, 2007). However, in contrast to this seemingly consistent body of evidence, there are studies which have not found associations

between fWHR and these variables. For example, multiple studies have suggested that there is no sexual dimorphism in fWHR (Gómez-Valdés et al., 2013; Lefevre et al., 2012; Özener, 2012) and that it is not related to aggression (Deaner, Goetz, Shattuck, & Schnotala, 2012; Gómez-Valdés et al., 2013; Özener, 2012).

This mixed pattern of findings suggests that more research is necessary to clarify the utility of fWHR as a perceptual cue to individual differences in behaviour. Furthermore, a potentially important distinction, which has not been readily made in this field, is the difference between self-perceptions and other-perceptions of behavioural traits and their association with fWHR. What a person thinks about themselves might differ from how others perceive them. The aforementioned behaviours such as aggression, achievement drive, and cheating can be encompassed by the overarching trait of 'dominance' (Cheng et al., 2013). However, only one study to my knowledge, has looked at fWHR and self-perceived dominance, and no association was found between these two variables (Carré & McCormick, 2008). More recent studies suggest that men with higher fWHR also score higher on the psychopathic trait of 'fearless dominance' (encompassing low anxiety, fearlessness, and social influence) (Anderl et al., 2016; Geniole, Keyes, Carré, & McCormick, 2014); however as this trait suggests, it contains factors not only attributed to dominance/influence but other, more indirectly related concepts including fearlessness and low anxiety. Other work by Haselhuhn and Wong (2012) has found that men with higher fWHRs feel more powerful in their everyday lives and that this sense of power positively related to their unethical behaviour. Although power and dominance are distinct constructs, it is likely that they may be related, suggesting that fWHR may also be positively associated with dominance in men.

In my research I aimed to extend the above findings for the concept of 'dominance' by conducting four separate studies examining several questions: A) is other-perceived dominance associated with fWHR?; B) is self-perceived dominance (using 2 different self-report scales) associated with fWHR?; C) can faces created using only descriptions of dominance, prestige, or attractiveness (see Chapter 2) also exhibit differences in fWHR; and D) is fWHR sexually dimorphic?

3.3 Study One

3.3.1 Methods

3.3.1.1 Participants

One hundred (50 female, age $M = 20.6$, $SE = .27$) undergraduate university students were photographed with a neutral expression.

3.3.1.2 Ratings

Faces were then rated for dominance by a set of 19 online participants (10 male, age $M = 26.4$ $SE = .99$) with reports made on a 1-7 point Likert scale with 1 being 'low' and 7 being 'high' in dominance. Images were shown in a random order.

3.3.1.3 Measurements

Using the program ImageJ (Rasband, W.S., NIH, <http://imagej.nih.gov/ij/>) fWHR was calculated as specified in previous literature (Carré et al., 2009; Carré & McCormick, 2008). Briefly, the distance between the right and left zygions was used to measure width, and the distance between the brows and upper lip were used to measure height. This process was performed twice per face and the mean of both scores was used in subsequent analyses. An independent researcher coded 5 of the faces and inter-rater reliability was high: $r(3) = .84$.

3.3.2 Results and discussion

I first conducted a hierarchical regression to test the main effects of gender and fWHR, and the interaction term, on other-perceived dominance scores. This overall model was significant, $F(2, 97) = 3.94$, $p = .02$ and there was a significant main effect of participant sex, $t = 2.41$, $p = .02$, but not of fWHR, $t = 1.44$, $p = .16$, on other-perceived dominance scores. Given the overall effect, I proceeded to conduct correlational analyses for men and women separately.

There was no correlation between fWHR and other-perceived dominance scores in female participants, $r(48) = -0.11$, $p = .45$, however these variables were significantly positively correlated in male participants, $r(48) = .34$, $p = .02$ (Figure 7). Independent samples t-tests revealed that there were no significant differences in fWHR between the sexes, $t(98) = .06$, $p = .95$, $r = .01$, but there was a difference in other-perceived dominance $t(98) = 2.40$, $p = .02$, $r = .24$ (Table 4). These results suggest other-perceived dominance is related to fWHR in men, and in the following studies I explored whether self-perceived dominance was also related to fWHR.

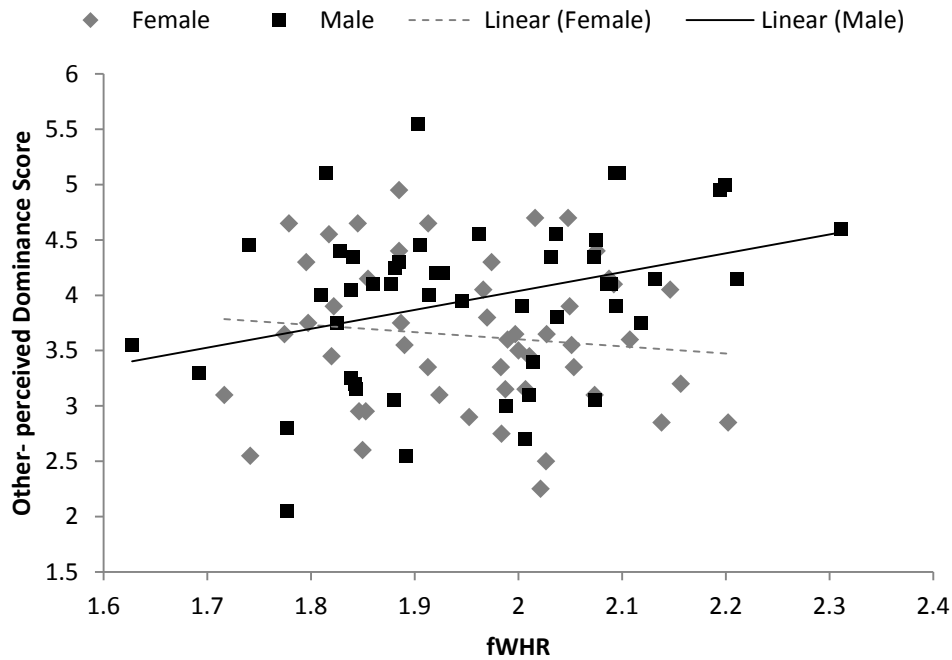


Figure 7. Correlation between other-perceived dominance and fWHR ratio in female and male participants. Linear trend lines are displayed.

3.4 Study Two

3.4.1 Methods

3.4.1.1 Participants

Sixty (29 female; age $M = 21.9$, $SE = .92$) undergraduate students participated for course credit, or monetary reimbursement.

3.4.1.2 Procedure

Participants posed for a 2D face photograph with a neutral expression. Subsequently, they were asked to complete a standard demographic form. Finally participants answered a short self-perceived dominance questionnaire (modified from IPIP; <http://ipip.ori.org/ipip/>; Goldberg, 1999). This modified version of the dominance questionnaire contained all 11 statements included in the original (i.e. “try to surpass others' accomplishments” and “impose my will on others”) with the addition of an extra statement: ‘I get my own way’, to make 12 statements in total. Additionally, in the original questionnaire 10 out of the 11 statements were positively scored while in my modified version every second statement had the wording altered such that it could be negatively scored (i.e. from ‘I try to outdo others’ to ‘I do not try to outdo others’), leading to 6 positively- and 6 negatively-scored statements. This was done to prevent acquiescence bias. Each statement was rated on a 5-point Likert scale with 1 being ‘very inaccurate’ and 5 being ‘very accurate’ (Cronbach’s Alpha = .64).

To calculate the dominance score for each participant I added all positively-scored statements and subtracted all negatively-scored statements, yielding a dominance score that could range from +24 to -24.

3.4.1.3 Measurements

fWHR was calculated as described above on two separate occasions. These two scores were averaged, and the mean was used for analysis. An independent researcher coded 5 of the faces and inter-rater reliability was high: $r(3) = .97$.

3.4.2 Results and discussion

I began by conducting a hierarchical regression to test the main effects of gender and fWHR, and the interaction term, on self-perceived dominance scores. This overall model was marginally significant, $F(2, 55) = 3.04, p = .06$, and there was a significant main effect of fWHR, $t = 2.36, p = .02$, but not of sex, $t = .60, p = .55$, on self-perceived dominance scores. Given the near significance of the overall model, I proceeded to conduct correlational analyses for men and women separately.

There was no correlation between fWHR and self-perceived dominance scores in female participants $r(27) = .16, p = .42$ (Figure 8), however these two variables were significantly positively correlated in male participants $r(29) = .45, p = .02$ (Figure 8). Independent-samples t-tests revealed that there were no significant differences in fWHR, $t(58) = .56, p = .58, r = .07$, and self-perceived dominance, $t(56) = .71, p = .48, r = .09$, between men and women (Table 4). These results suggest that while men and women may not differ in fWHR, this face metric is associated with self-perceived dominance only in men.

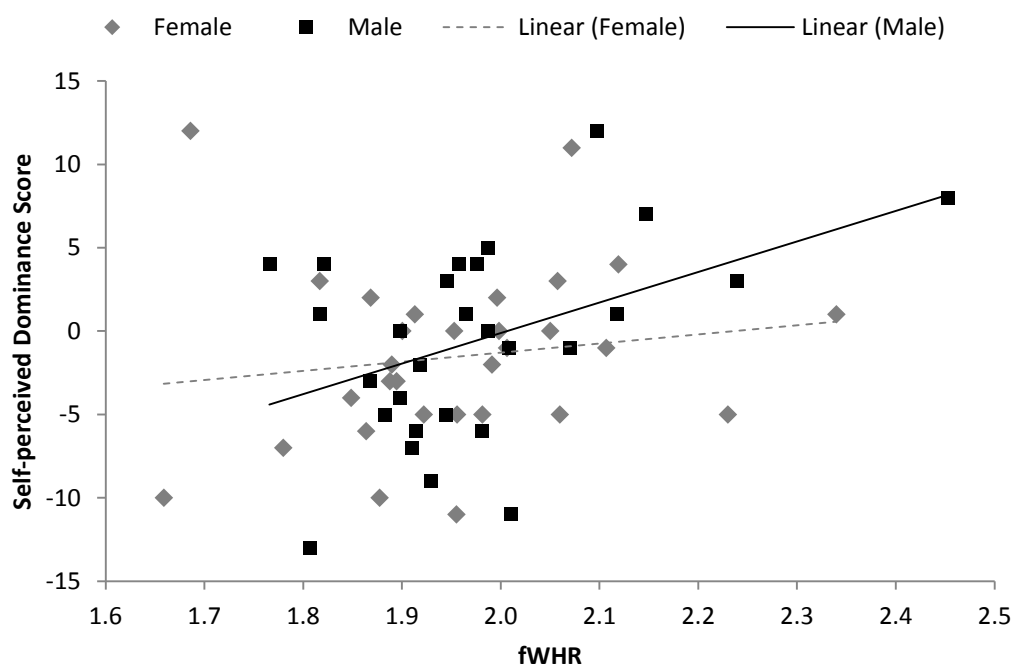


Figure 8. Correlations between self-perceived dominance and fWHR ratio in female and male participants.

3.5 Study Three

3.5.1 Methods

3.5.1.1 Participants

Fifty (29 female; age $M = 20.5$, $SE = .82$) undergraduate students participated in this stimuli collection for course credit, or monetary reimbursement.

3.5.1.2 Procedure

The same procedures as Study 2 were followed for photograph collection. In addition to the photographs, participants were asked to answer some standardized questionnaires. They were also asked to complete the prestige-dominance questionnaire (Cheng et al., 2010) which includes questions such as “members of my peer group respect and admire me” and “I try to control others rather than permit them to control me”.

3.5.1.3 Measurements

Once more fWHR was calculated as described above on two separate occasions, these two scores were averaged, and the mean was used in subsequent analyses. Again, inter-rater reliability in a set of 5 photographs was high: $r(3) = .98$.

3.5.2 Results and discussion

I began by conducting a hierarchical regression to test the main effects of gender and fWHR, and the interaction term, on self-perceived dominance scores. This overall model was non-significant, $F(2, 47) = 1.80$, $p = .18$, and there was no main effect of sex, $t = .88$, $p = .39$. The main effect of fWHR in this model was marginal, $t = 1.66$, $p = .10$. Given that I had a modest sample size and the effects were in the same direction as those described above, I proceeded to conduct correlational analyses for men and women separately.

There was no correlation between fWHR and self-perceived dominance scores in female participants, $r(27) = .03$, $p = .88$ (Figure 9), however these two variables were significantly positively correlated in male participants, $r(19) = .51$, $p = .02$ (Figure 9). Self-perceived prestige scores were not correlated with fWHR in female participants, $r(27) = -.02$, $p = .91$, or in male participants, $r(19) = -.02$, $p = .92$. Independent samples t-tests revealed that there were no significant differences in fWHR, $t(48) = .19$, $p = .85$, $r = .03$, or self-perceived dominance, $t(48) = .90$, $p = .37$, $r = .12$, between men and women (Table 4). As in study 2, these results suggest that while men and women may not differ in fWHR, this face metric is associated with self-perceived dominance only in men.

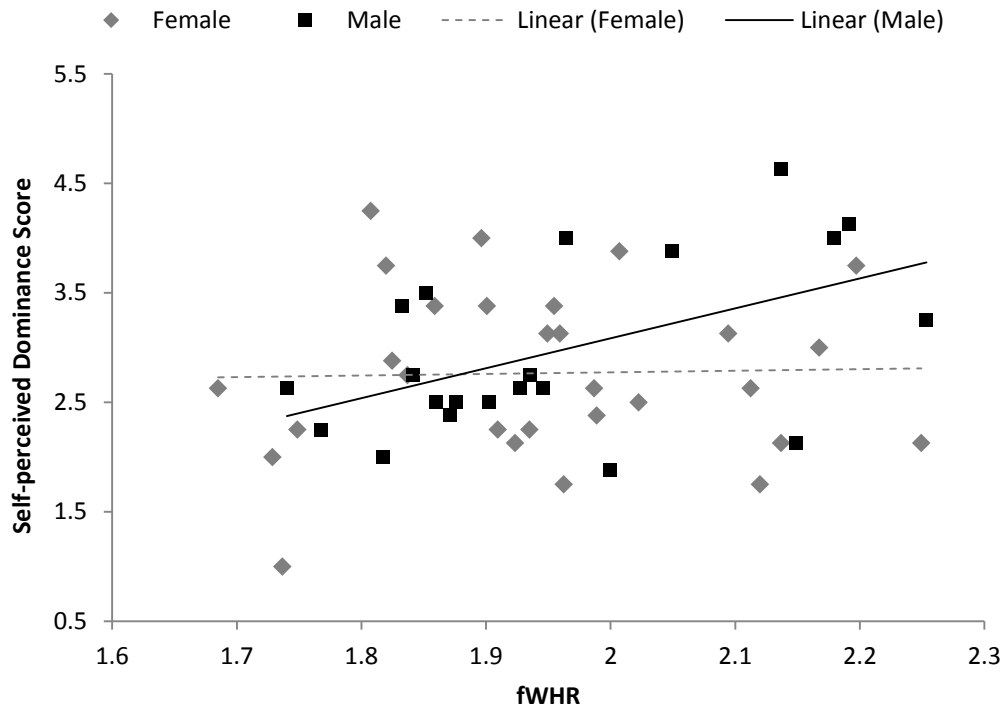


Figure 9. Correlations between self-perceived dominance and fWHR ratio in female and male participants.

3.6 Study Four

3.6.1 Methods

3.6.1.2 Participants and creation of stimuli

Participants and the procedure for creating of the EvoFIT images can be found in Chapter 2, section 2.3.1.

3.6.1.3 Measurements

Once again fWHR was calculated and performed twice, as described above, and inter-rater reliability in a set of 6 photographs was high $r(4) = .87$.

3.6.2 Results and discussion

In order to explore whether dominant EvoFIT faces had higher fWHR than prestigious or attractive faces I performed a 2 (sex of face: male, female) x 3 (EvoFIT face trait: dominant, prestigious, attractive) repeated measures ANOVA. There were significant main effects of both sex of face, $F(1,12) = 83.54, p < .001, \eta_p^2 = .87$ and EvoFIT face trait, $F(2,24) = 14.59, p < .001, \eta_p^2 = .55$ but these were qualified by a significant 2-way interaction between sex of face and EvoFIT face trait, $F(2,24) = 4.45, p = .02, \eta_p^2 = .27$. Female faces also had significantly lower fWHR on average than male faces, $t(17) = 7.46, p < .001, r = .87$; Table 4. In order to explore the interaction I split the data by sex.

In male EvoFIT faces there was a significant main effect of EvoFIT face trait, $F(2,24) = 14.05$, $p < .001$, $\eta_p^2 = .54$ (Figure 10), with dominant faces having the highest fWHR. Follow-up Tukey HSD tests showed that while dominant male faces had significantly higher fWHR than prestigious and attractive faces ($p < .001$), the prestigious and attractive faces did not differ significantly ($p = .36$).

In female EvoFIT faces there was also a significant main effect of EvoFIT face trait, $F(2, 26) = 4.48$, $p = .02$, $\eta_p^2 = .26$ (Figure 10), with dominant faces having the highest fWHR. Similar to the male faces, follow-up Tukey HSD analyses showed that dominant female faces had significantly higher fWHR than prestigious ($p = .04$), and attractive faces ($p = .01$), though prestigious did not differ from attractive significantly ($p = .74$).

These results suggest that even using written descriptions of faces can lead to those faces created to look dominant having higher fWHR than faces not created to appear dominant, and corroborates the findings from Study 1, 2, and 3 examined real faces. I also observed that female faces differed on fWHR in the same way as male faces, if not to the same degree, which could be due to the use of the same descriptive paragraph to create both female and male dominant individuals.

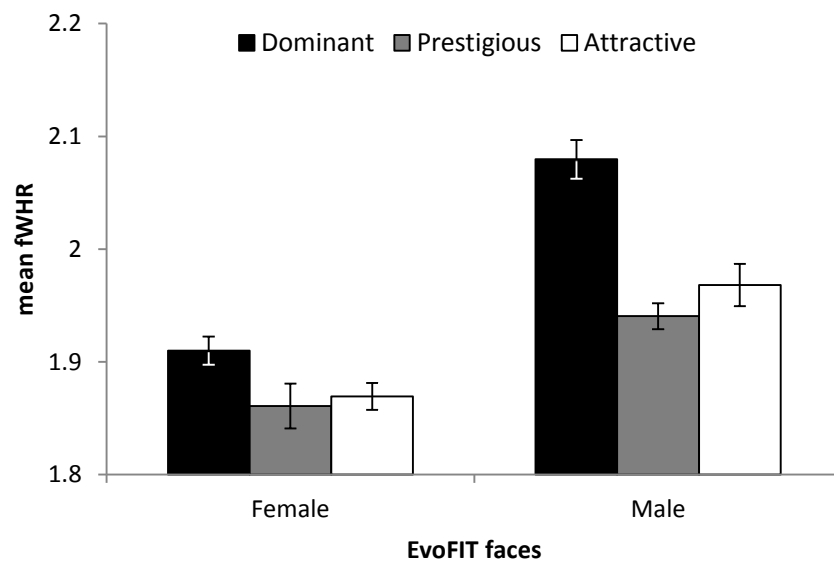


Figure 10. Mean fWHR of male and female EvoFIT faces created to look dominant, prestigious, and attractive.

Table 4. Mean (SEM) of fWHR, other- and self-perceived dominance across studies one through four.

	Women	Men
fWHR (Study 1)	1.96 (0.02)	1.96 (0.02)
fWHR (Study 2)	1.96 (0.03)	1.98 (0.02)
fWHR (Study 3)	1.95 (0.03)	1.96 (0.03)
fWHR (Study 4)	1.88 (0.01)	1.98(0.01)
Other-Perceived Dominance (study 1)	3.63 (0.09)	3.97 (0.10)
Self-Perceived Dominance (study 2)	-1.59 (1.00)	-0.55 (1.07)
Self-Perceived Dominance (study 3)	2.77 (0.14)	2.97(0.17)

3.7 General discussion

In Study 1, I found that fWHR was related to other-perceived dominance in men. In two additional studies, with two different sets of participants, and using two different scales measuring self-perceptions of dominance, I found that male participants with higher fWHR rated themselves as more dominant than those with lower fWHR. However, I found no relationship between fWHR and prestige in either sex. In the first three studies fWHR was not found to be sexually dimorphic, corroborating previous research (Gómez-Valdés et al., 2013; Lefevre et al., 2012; Özener, 2012). I note that while these samples sizes are modest, the effects appear consistent across the three studies. In a fourth study I found that male and female faces created using EvoFIT software to appear dominant based only on written descriptions also had higher fWHR than their prestigious and attractive counterparts.

Of particular interest is that fWHR is related to self-perceptions and other-perceptions of dominance in men only (in Study 1, 2, and 3). This suggests that fWHR is important in male dominance even though there were no sex differences in fWHR in these three studies, or self-perceived dominance across Study 2 and 3. Additionally, the findings in Study 3 and 4 that fWHR was unrelated to prestige, a prosocial way of attaining high status (Henrich & Gil-White, 2001), suggests that fWHR is important with respect to dominance, and not other status-related traits. One potential mechanism which may explain why fWHR affects male self-perceptions of dominance is how others behave toward them. If certain behavioural qualities which signal dominance, such as achievement drive (Lewis et al., 2012), aggression (Carré et al., 2009; Carré & McCormick, 2008; Lefevre & Lewis, 2014; Trebicky et al., 2013), cheating (Haselhuhn & Wong, 2012) and trustworthiness (Stirrat & Perrett, 2010), are visible in people's faces through their fWHR, as Study 1 suggests, then actions towards these individuals may differ. This could in turn lead to altered behaviour from the faces' owners in response to how they are treated by others (Haselhuhn, Wong, & Ormiston, 2013). However, it is also possible that men with a higher fWHR act and feel inherently more dominant, perhaps as a result of increased testosterone (Lefevre, Lewis, Perrett, & Penke, 2013).

These results provide a new perspective for examining how fWHR might relate to social behaviour. Until now much research in this area has centred on others' social perceptions of certain aspects that may relate to dominance (including aggression and achievement drive). This research specifically examines dominance as a holistic trait and, more importantly, is among the first to suggest that male self-perceptions relate to observable cues in one's face. Since publication of this chapter, more research has corroborated these results in a mate-choice setting; men with higher fWHRs are perceived as more dominant and but also more attractive as a short-term partner than men with low fWHRs (Valentine, Li, Penke, & Perrett, 2014). It is unclear why women's fWHR did not

affect their self-perceived dominance or how others perceive them in studies one through three, though it may be the case that women use different strategies to achieve high status, and do not rely on aggression or forceful tactics (Björkqvist, 1994) which are inherently related to dominance. The reason for the differences found in fWHR between dominant, prestigious, and attractive female EvoFIT faces in Study 4, as well as the sexual dimorphism may be due to the same description of dominance being used for both sexes, while as women may not use the same methods to achieve or be perceived as dominant and prestigious (as discussed in Chapter 4). Thus, using a modified description or even providing no written description, of dominance and prestige for men and women may yield different results.

Given the lack of sexual dimorphism in fWHR in Study 1, 2 and 3, future research should explore whether female fWHR relates to any other behavioural traits apart from dominance. The lack of relationship between fWHR and dominance in women across the first three studies is consistent with the aforementioned work by Haselhuhn and Wong (2012). These authors found that men, but not women, with higher fWHRs feel more powerful in their everyday lives and that this sense of power positively related to their unethical behaviour.

3.8 Conclusion

With these four studies, I demonstrated that male other- and self-perceptions of dominance relate to their fWHR. In addition, I provided further evidence that fWHR is not a sexually dimorphic trait using real facial images. These findings highlight the potentially important role of fWHR in elucidating our understanding of individual differences in human dominance behaviour.

Chapter 4 Bringing status into focus: Clarifying the terminology used across human social status research

4.1 Abstract

Four major constructs sit at the forefront of human social status research: prestige, dominance (discussed in Chapter 1, section 1.6), social dominance and physical dominance. However, their definitions vary between research fields and even between studies within a field. In an attempt to clarify the terminology, I asked participants to imagine high status individuals who fit into these 4 constructs and to allocate descriptive words to each. I compiled detailed descriptions for each construct, in both sexes and specifically addressed: 1) How the four constructs compared to each other; 2) How they compared within each sex; and 3) How they compared between the sexes. These findings suggest that only prestige and dominance are perceived as separate constructs and that perception of men and women's social status differ. These findings will allow researchers interested in human social status to more precisely compare between existing studies, as well as refine questionnaires and methodologies in future research.

4.2 Introduction

4.2.1 Benefits of social status and sex differences

As discussed in Chapter 1 (section 1.5.1), being high in one's social circle is known to impact success. To briefly reiterate, high social status in men has been associated with benefits including greater influence and input in group interactions (Bales et al., 1951), as well as increased access to wealth (Ball & Eckel, 1996; Ball et al., 2001), food (Betzig & Turke, 1986; Hames, 1996) and younger, more attractive female partners (Elder, 1969; Turke & Betzig, 1985). Many studies have found that high status also leads to higher reproductive success (see review by Hopcroft, 2006; von Rueden, Gurven, & Kaplan, 2011). Thus, for a man, being of high status is important and can confer direct benefits.

As touched upon in Chapter 1 (section 1.5.2), less is known about potential reproductive or resource benefits for high status in women. Reproduction is more costly for women, whose gamete production, gestation, and (typically) parental care responsibilities are greater than men's (Trivers, 1972). As a consequence, affiliating with other women, obtaining resources, and securing protection can be of great importance. However, because resources are linked to high social status in men, many studies suggest that women can obtain these resources indirectly via pairing with high status partners (Buss & Barnes, 1986; Kenrick, Sadalla, Groth, & Trost, 1990); indeed women have been shown to prefer high status men to low status men (Li, Bailey, Kenrick, & Linsenmeier, 2002). This tendency for women to prefer men of high status may also help to explain why some researchers

suggest men's striving to obtain high status is considerably higher than women's (Buss, 2008; Campbell, 1999; Wilson & Daly, 1985). Men have also been found to be more outwardly aggressive in their status striving, and are even willing to expend economic resources (Huberman, Loch, & Önçüler, 2004; Kaplan & Hill, 1985; M. Powell & Ansic, 1997) as well as take physical risks (Byrnes, Miller, & Schafer, 1999) in order to gain social status.

These data do not suggest that women do not strive for high social status, only that there may exist a sex difference in status striving. It is clear that women also seek status, with adolescent girls, for example, willing to pursue high status and popularity even at the expense of losing close friends (Eder, 1985). Additionally, in college-aged students, women were shown to be concerned with their status, and both sexes rated women's status consistently, providing some evidence that status in women is a discernible and stable construct (Anderson, John, Keltner, & Kring, 2001). Also, Jokela and Keltikangas-Järvinen (2009) showed that, in a cohort of Finnish women followed since 1980, adolescents who scored highly on self-rated leadership (perhaps a precursor to status) were more likely to have a child (and subsequent children) by 39 years of age than those who did not score highly on leadership. Thus, men strive to possess status, and through doing so may attract high quality female partners and acquire other survival-related resources. Women, in contrast, may use men's status as a basis for choosing a partner, and their own status to form alliances and bonds with other individuals. Additionally, in the western world, where there is greater equality in opportunity between the sexes, high status women may acquire resources directly to care for themselves and any dependent offspring.

The sexes also appear to differ in the methods they use to attain high status. For example, as discussed in Chapter 1 (Section 1.5.2), women tend to form social hierarchies through indirect means (e.g. gossiping, shunning, etc.) and are less likely than men to use overt aggression to achieve high status (Björkqvist, 1994; Campbell, 1999; Eder, 1985; Vaillancourt, 2013). This does not imply that men are unable to use indirect means to attain high status, or that women are incapable of aggressive interactions with others. However, there appear to be broad sex differences in the relative occurrence of these strategies (reviewed in Björkqvist, 1994; Campbell, 1999). Since men and women can both reach high-ranking positions, it appears likely that similar outcomes are possible through the use of distinct methods.

4.2.2 Prestige, dominance, and individual differences

Current literature suggests that there are two main pathways through which individuals may gain social status: dominance and prestige (Henrich & Gil-White, 2001). As explained in Chapter 1 (Section 1.6), Henrich & Gil-White (2001) propose that the dominance route is associated with the use of antagonistic behaviours including coercion towards others, and effectively bullying rivals into

submission, while the prestige route involves exhibiting skills and qualities sought after by the community. Both strategies will lead an individual to attain high status; however, prestigious people tend to be respected while dominant people are feared (Henrich & Gil-White, 2001). Evidence and support for these separable pathways can be found in Chapter 1 (Section 1.6).

4.2.3 Defining social status

The studies above support the notion that dominance and prestige are two dissociable avenues in the bid to gain social status and I provide further support in Chapter 2 and Chapter 3 of this thesis where I found differences in personality traits and facial structure between dominant and prestigious individuals. However, this distinction becomes less clear when one further examines the subsequent definitions associated with the terms prestige and dominance. For instance, some studies and researchers divide dominance into physical dominance and social dominance and find differences between the two. Namely, studies have found that women with more feminine faces are rated as more socially dominant, while both women and men with masculine faces are rated as more physically dominant (Watkins, Jones, & DeBruine, 2010; Watkins, Quist, Smith, DeBruine, & Jones, 2012). The definitions used to describe physical and social dominance within these studies were taken from Puts, Gaulin, & Verdolini (2006) in which physical dominance was described as the ability to win a “fistfight”, while social dominance was described as being a respected “leader”. This definition of social dominance was originally used by Mazur, Halpern, & Udry, (1994) to simply denote dominance; however, in the context of the dominance and prestige literature mentioned above, such a definition appears to be more in line with prestige (Henrich & Gil-White, 2001).

Independently, Kalma, Visser, & Peeters (1993) used terms including aggressive dominance and social dominance in their research and in these definitions social dominance encompasses readiness for social interaction and ability to lead, while aggressive dominance is again related to physical and domineering qualities. How exactly social and physical dominance relate to the concept of prestige and how they are subsumed by the concept of dominance, have yet to be established.

At an even broader level the term ‘status’ itself has been used to refer to “an individual [who] is respected, admired, and highly regarded by others” in a recent study (Fragale, Overbeck, & Neale, 2011, pp. 767). This quality was compared with individuals who were powerful, where power described someone who “can control others' outcomes by granting or withholding valued resources” (Fragale, Overbeck, & Neale, 2011, pp. 767). Similar terms like ‘social power’ have also been used (Carney, Hall, & LeBeau, 2005; Hall, Coats, & LeBeau, 2005). Again the definitions used to describe status and power are similar to those used to describe prestige and dominance respectively, by Henrich & Gil-White (2001).

To complicate matters further, nuances in the different ways men and women use to attain high status may be obscured by the specific terminology used. For example, as women are less likely to physically aggress in order to gain high status and are more likely to gossip, exclude, shun, and manipulate others instead (Björkqvist, 1994; Campbell, 1999; Eder, 1985), their ability to win a fist-fight (physical dominance as described by Watkins et al., 2012) would not be as important as, say, their ability to manipulate and coerce others (dominance as described by Henrich & Gil-White, 2001). A series of unresolved issues remain in the interpretation of the array of findings on this topic. For example, would women's social dominance be interpreted as prestige, and would that in turn be interpreted similarly in men? Given that researchers themselves have trouble using one definition, it begs the question of what participants are in fact rating/assessing in a study which asks them to rate others for 'dominance'. Many studies ask participants to rate others for dominance using their 'gut instinct' without having been given specific instructions as to what dominance is (e.g., Jones, DeBruine, Little, Watkins, & Feinberg, 2011; Marsh, Yu, Schechter, & Blair, 2009; Oosterhof & Todorov, 2008; Sutherland et al., 2013, and Chapters 3, 5, and 6 of this thesis). The lack of consistency in the use of these terms is clearly problematic, and becomes even more concerning when attempting to draw parallels and conclusions between successive studies on this topic.

4.2.4 The current research

Given the wide array of definitions present in the literature, and the number of studies which provide no definitions to participants, my aim was to examine what words (both novel and those used in previous studies) people associate with each of the main social status concepts (prestige, dominance, social dominance, and physical dominance). I asked male and female raters to imagine either 1) dominant and prestigious individuals or 2) socially and physically dominant individuals, of each sex. They were then asked to decide whether certain words and attributes were more characteristic of one of the two concepts they were presented with, characteristic of both of the concepts equally, or characteristic of neither. To my knowledge no other study has attempted to differentiate between these four terms. Ultimately, this information will help to streamline and validate existing nomenclature used in this field, as well as to allow researchers to make direct comparisons between studies which have previously used varying definitions. Overall, I set out to test three related questions: 1) How do the four constructs relate to one another? 2) Do the four constructs differ within the sexes? 3) Since women and men accrue status differently, do words used to describe these constructs differ between the sexes?

4.3 Methods

4.3.1 Participants

In total 230 individuals (79 men, age $M = 26.3$, $SE = .54$) participated in this study. One hundred and seven participants (37 men, age $M = 26.6$, $SE = 1.25$; 70 women, age $M = 26.8$, $SE = 1.38$) completed condition one, examining “dominance” and “prestige”. One hundred and twenty three participants (42 men, age $M = 28.0$, $SE = 1.34$; 81 women, age $M = 24.9$, $SE = .87$) completed condition two, examining “social dominance” and “physical dominance”. Participants were recruited from the undergraduate psychology pool, the staff and student online portal system, and through social media websites including Twitter and Facebook. The only prerequisites were that individuals identified as being fluent in English and were over 16 years of age.

4.3.2 Word List

Using previous literature as a guide, I first compiled a set of words which have been used to describe dominant, prestigious, socially dominant, or physically dominant individuals (Table 5). Subsequently, I also included all five personality traits derived from the TIPI (Gosling et al., 2003) and their opposites (e.g. extroverted - introverted) as these terms have been used in recent social status literature (Cheng et al., 2010) and in Chapter 2 of my thesis. Finally, I included novel words, which to my knowledge are not present in the literature (e.g., arrogant, funny, destructive, intelligent, pretentious, rich, etc.), but that I reasoned could help in examining the nuances of these four related concepts, both in men and women, as well as add to the research into possible descriptors for these concepts. In total 61 words were incorporated (words selected appear in Figures 11 and 12).

Table 5. Words used in previous literature to specifically describe dominance, prestige, physical dominance, and social dominance

Word	Dominant	Prestigious	Physical dominance	Social dominance	Article(s)
Intimidating	+				(Cheng et al., 2010; Henrich & Gil-White, 2001)
Aggressive	+				(Henrich & Gil-White, 2001; R. T. Johnson et al., 2007)
Influential	+	+		+	(Cheng et al., 2013; Watkins, Jones, et al., 2010; Watkins et al., 2012)
Leader	+	+		+	(Bryan, Webster, & Mahaffey, 2011; Cheng et al., 2010; Kalma et al., 1993; Watkins, Jones, et al., 2010; Watkins et al., 2012)
Powerful	+	+	+	+	(Bryan et al., 2011; Cheng et al., 2013; Henrich & Gil-White, 2001)
Manipulative	+				(Cheng et al., 2010; Henrich & Gil-White, 2001)
Cooperative		+			(Cheng et al., 2010)
Moral		+			(Cheng et al., 2010)
Respected		+			(Cheng et al., 2010; Henrich & Gil-White, 2001)
Knowledgeable		+			(Henrich & Gil-White, 2001)
Direct eye-gaze	+				(Mazur et al., 1980)
Happy	+			+ ^a	(Hareli, Shomrat, & Hess, 2009; Knutson, 1996)
Masculine	+		+ ^b		(Boothroyd et al., 2007; Bryan et al., 2011; Kruger & Fitzgerald, 2011; Watkins et al., 2012)
Feminine		+		+ ^b	(Kruger & Fitzgerald, 2011; Watkins et al., 2012)
Committed	-	+			(Boothroyd et al., 2007; Cheng et al., 2013)
Angry	+			+ ^a	(Hareli et al., 2009; R. T. Johnson et al., 2007; Knutson, 1996)
Skilful		+			(Cheng et al., 2013)
Trustworthy	-				(Oosterhof & Todorov, 2008)
Commanding	+	-			(Snyder, Kirkpatrick, & Barrett, 2008)
Loud Spoken	+	-			(Snyder et al., 2008)
Physically Weak			-		(Bryan et al., 2011)
Physically Strong			+		(Bryan et al., 2011)
Tall			+		(Bryan et al., 2011)

Note. A plus (+) denotes a positive association between the word and status category, while a minus (-) denotes a negative association between the word and status category.

^aThe authors use social dominance and dominance interchangeably.

^bThese results were found in women.

4.3.3 Procedure

This study was conducted online using Qualtrics survey software (www.qualtrics.com; Qualtrics Labs Inc., Provo, UT). Participants completed one of two online conditions – either classifying words used to describe dominant vs. prestigious individuals (condition one), or classifying words used to describe physically dominant vs. socially dominant individuals (condition two).

Initially, regardless of which condition participants were placed in, all participants were instructed to complete a standard demographic questionnaire (i.e., age, sex). Subsequently, participants received the following instructions: ‘For the next few questions we want you to imagine [men/women] you know who are dominant and [men/women] you know who are prestigious. These [men/women] may be friends, classmates, colleagues or even family members. There may be some things dominant [men/women] do that are similar to prestigious [men/women], but they may also differ in a number of ways. Think about the [men/women] you know who are dominant and compare them in your head to the [men/women] you know who are prestigious.’ Note that all participants completed this task for men and women separately; the order of this presentation was randomized between participants. Once this description had been read, the next page contained the following instruction: ‘Still thinking about [men/women] you know who are dominant versus prestigious, sort the words listed below based on whether they apply to a dominant [men/woman], a prestigious [men/woman], both to dominant and prestigious [men/women] or to neither dominant or prestigious [men/women].’. Note that in condition two, dominance and prestige were replaced with physical dominance and social dominance. Participants then categorized each of the 61 words into just one of the four possible categories (either one of the two status options, both status options, or neither status option) presented. For example, a participant in condition one categorizing the word ‘skilful’ could only place it into one of either ‘dominant’, ‘prestigious’, ‘both’ or ‘neither’ categories.

The words were grouped together for presentation purposes in lists broadly pertaining to physical attributes (15 words; i.e., attractive, tall, masculine), personality characteristics (10 words; i.e., extroverted, open to new experience, not agreeable), and behavioural characteristics (36 words; i.e., mean, impatient, loud spoken). These 3 categories were presented to participants in a random order. Once participants had completed the ratings for both sexes they were presented with a debriefing page. This design provided a between-subjects comparison of words applying to dominant vs. prestigious and physically dominant vs. socially dominant individuals, and a within-subjects comparison of how the classification of words may differ within each condition based on the sex of the individual they were being applied to.

4.3.4 Analyses

Once all ratings had been received, the number of times each word was classified into each of the four categories was calculated. A percentage was then calculated for each word which represented the proportion of times it was categorised by participants into one of the four categories (See Appendix 1). Words which had their highest percentage in the 'dominance', 'physical dominance', 'social dominance' or 'prestige' categories were included in the analysis while words categorised as mainly 'both' or 'neither', or which had a tie between two categories, were excluded. To test how similar 'physical dominance' and 'social dominance' were to 'dominance', and how similar 'social dominance' was to 'prestige', chi-square analyses were carried out. For each comparison, two tests were completed. The first chi-square test involved combining the unique words of both lists and coding them against the words which overlapped in the two lists, to compare whether there were more overlapping or unique words. This was done in order to determine how independent the two lists were of each other. The second involved coding the unique words of one list against the unique words of the other list to compare whether one had more unique words than the other. This was done to determine whether one construct was defined using significantly more words than the other. The results of the chi-square tests were then used to guide a qualitative analysis on the unique and overlapping words, in order to gain greater insight into the characterisation and nuances of the four constructs.

4.4 Results

Venn diagrams were constructed to allow for easy visualization of the results (See Figure 11). Each word was categorised under one of the constructs, both, or neither, and words which received a larger proportion of the total votes appear higher in the list. The number beside each word depicts the percentage difference between its placement into that category and the next highest category.

4.4.1 How do the overall concepts of dominance, prestige, social dominance, and physical dominance compare to each other?

4.4.1.1 Prestige versus social dominance

Firstly, I examined the relationship between words categorized as 'prestigious' and those categorized as 'socially dominant'. I found that 29% of words in the 'social dominance' category overlapped with words in the 'prestige' category and a chi-square test demonstrated that the two categories were significantly different ($\chi^2 = 7.14$, $df = 1$, $p = .008$). A further chi-square test demonstrated that prestige and social dominance had a similar number of unique words (7 unique words versus 5 unique words; $\chi^2 = .33$, $df = 1$, $p = .564$). Together, this suggests that the two categories are independent constructs. I subsequently

conducted a qualitative assessment of the words classified as 'socially dominant' and 'prestigious'. Seven and nine words, respectively, were categorized into these constructs. In total, just two words overlapped between the terms while five words proved to be classified uniquely to 'social dominance' and seven words were categorized uniquely to 'prestige'. The two words overlapping the constructs (agreeable and smiles often) suggest that both terms describe an individual with a likeable or charming external demeanour; however, an important distinction can be made when one further qualitatively examines traits unique to 'prestigious' and 'socially dominant individuals'. The former appears to be associated with positive social traits (e.g., patient, cooperative, trustworthy, caring, conscientious, moral) while the latter can be viewed as comprising outward traits which can be used to actively achieve a desired outcome (e.g., highly expressive, manipulative, funny). It appears then, that while prestigious and socially dominant individuals may both use social means to achieve their goals, that they are presumed to do so using different tactics (Figure 11A and 11B). Where prestigious individuals might be nurturing and empathic of others, leading to higher status, socially dominant individuals might use their humour, and outward mannerisms in order to manipulate others and acquire leadership positions.

4.4.1.2 Dominance versus physical dominance

I next examined how the classification of words into the constructs 'dominance' and 'physical dominance' related. I found that 67% of 'physically dominant' words overlapped with words in the 'dominance' category. A chi-square test found that this was not a significant difference ($X^2 = 2.57$, $df = 1$, $p = .109$), demonstrating support for the hypothesis that 'dominance' and 'physical dominance' are similar concepts. A further chi-square test demonstrated that 'dominance' had marginally significantly more unique words than 'physical dominance' ($X^2 = 3.60$, $df = 1$, $p = .058$), suggesting that the concept of 'dominance' may be subsuming the concept of 'physical dominance'. I then examined the data qualitatively to discern what words were categorized similarly and what words applied uniquely to each construct. In total, 6 words were classified as 'physically dominant' and 12 words as 'dominant'. Qualitative examination of the words classified in each category indicated that 4 words overlapped, meaning that only 2 words were classified as unique to 'physical dominance' and 8 words were classified as unique to 'dominance'. When examining the two words which apply only to 'physical dominance' (tall and masculine) it is clear that these words can be distinguished from the words categorized as 'dominant' in that they are physiological traits which are measured and do not possess an explicit socially communicative component. By contrast, the words unique to 'dominance' appear to encompass dispositional traits (e.g., loud spoken, intimidating, manipulative, arrogant, not agreeable) that are independent from stature or physical measures. Terms that overlapped between the constructs tended

to be negatively valenced behaviours (aggressive, angry, intimidating) with the exception of one physical measure (physically strong; Figure 11A and 11B).

4.4.1.3 Dominance versus social dominance

Further tests were carried out to determine the similarity between 'social dominance' and 'dominance'. I found that 14% of 'socially dominant' words also overlapped with words in the 'dominance' category, and a chi-square test demonstrated that the two categories were significantly different ($X^2 = 14.22$, $df = 1$, $p < .001$). A further chi-square test demonstrated that there was not a significant difference in number of unique words classified to 'social dominance' and 'dominance' (6 unique words versus 11 unique words; $X^2 = 1.47$, $df = 1$, $p = .225$). Examining the relationship between these words qualitatively indicated that only one word was common to both constructs (manipulative). Words that differed between the constructs appear to suggest that 'dominant' individuals are more hostile (e.g., aggressive, intimidating, destructive, mean) than 'socially dominant' individuals, who tended to be regarded more positively (e.g., highly expressive, funny, intelligent). This suggests that 'dominance' is perhaps more negatively valenced than 'social dominance' but that both dominant and socially dominant individuals may use devious means to achieve their goals given that they share the trait manipulative (Figure 11A and 11B).

4.4.2 How do the constructs dominance, prestige, social dominance and physical dominance compare when examined within each sex?

4.4.2.1 Prestige versus social dominance

To examine this question, the data were split by ratings of male and female social status. There were no overlapping words between 'male prestige' and 'male social dominance'. A chi-square test demonstrated that there was not a significant difference in the number of unique words categorised as prestigious and socially dominant (7 unique words versus 5 unique words; $X^2 = .33$, $df = 1$, $p = .564$). Examining the words categorized into each of these constructs qualitatively suggests that 'prestigiousness' is associated with relatively more positive internal/personality traits (e.g., moral, trustworthy, cooperative, caring) while 'male social dominance' tended to be associated with outward, but more indirect behaviours (e.g., manipulative, funny, highly expressive; Figure 11C and 11D).

The equivalent comparison among women revealed that 36% of words used to describe female 'prestige' perhaps overlapped with words used to describe female 'social dominance'. A chi-square test demonstrated that the two categories were significantly different ($X^2 = 6.37$, $df = 1$, $p = .012$). A further chi-square test demonstrated that there was not a significant difference in number of unique words

between 'prestige' and 'social dominance' (7 unique words versus 8 unique words; $X^2 = .07$, $df = 1$, $p = .796$). One distinction between female 'social dominance' and 'prestige' was that the former was associated with promiscuous dress while the latter was associated with conservative dress. Interestingly, both constructs also described women as 'feminine'. Female 'social dominance' was similarly associated with terms reflecting dynamic behaviours (e.g., direct eye gaze, smiles often, highly expressive, funny) suggesting that socially dominant women may achieve their status through more interactive means, though perhaps still indirectly (i.e. not through aggressive or 'in-your-face' overt means). In contrast, 'female prestige' was associated with more internal personality characteristics (e.g., trustworthy, cooperative, patient), which provides evidence that 'prestigious women' are perceived to not need to actively display particular behaviours communally to the same extent to achieve their high status (Figure 11E and 11F).

4.4.2.2 Dominance versus physical dominance

Of the words used to describe male 'physical dominance' 60% overlapped with words used to describe male 'dominance', a chi-square test demonstrated that the two categories were marginally significantly different ($X^2 = 3.77$, $df = 1$, $p = .052$). A further chi-square test demonstrated that there was a marginally significant difference in number of unique words between dominance and physical dominance ($X^2 = 3.60$, $df = 1$, $p = .058$). In total, two unique words were classified as 'physically dominant' versus eight as 'dominant'. Again, male 'physically dominant' words that were unique from male 'dominant words' tended to be bodily traits (e.g., tall, physically strong) rather than behavioural traits (e.g., arrogant, angry, loud spoken; Figure 11C and 11D).

Of the words used to describe female 'physical dominance' 80% of words overlapped with words used to describe female 'dominance'. A chi-square test demonstrated that the two categories were not significantly different ($X^2 = 2.57$, $df = 1$, $p = .109$). A further chi square test demonstrated that there was a significant difference in number of unique words between dominance and physical dominance (9 unique words versus 1 unique words: $X^2 = 6.40$, $df = 1$, $p = .011$). This suggests that female 'physical dominance' was only unique in the sense that it encompassed a single physical trait (tall), while female 'dominance' was again characterized by certain unique behavioural components (e.g., loud spoken, intimidating, impatient) in addition to those components shared between the two constructs (e.g., aggressive, angry; Figure 11E and 11F).

4.4.2.3 Dominance versus social dominance

In total, one word (manipulative) overlapped with words used to describe male 'social dominance' and male 'dominance', an overlap of 20%. A chi-square test demonstrated that the two categories were significantly different ($X^2 = 11.27$, $df = 1$, $p = .001$). A subsequent chi-square test demonstrated that there was not a significant difference in number of unique words between male social dominance and dominance (4 unique words versus 10 unique words; $X^2 = 2.57$, $df = 1$, $p = .109$). Qualitative analysis of words classified as representing 'dominant' men revealed a number of negatively valenced behavioural traits (e.g., aggressive, impatient, intimidating) were common whereas more positive or charming behavioural traits encompassed the construct of a 'socially dominant' men (e.g., funny, intelligent, highly expressive; Figure 11C and 11D).

Similar results were obtained when I examined these traits among women. In total, just 8% of words used to describe 'female dominance' overlapped with words used to describe 'female social dominance' (only manipulative) and a chi-square test demonstrated that the two categories were significantly different ($X^2 = 20.17$, $df = 1$, $p < .001$). A further chi-square test demonstrated that there was not a significant difference in number of unique words between dominance and social dominance (12 unique words versus 11 unique words) ($X^2 = .04$, $df = 1$, $p = .835$). Qualitative analysis of the unique words categorized suggests that female 'social dominance' is viewed as feminine while female 'dominance' is viewed as masculine. As with the male comparison the two can therefore be seen as unique routes to achieve status. Female 'social dominance' was associated with traits indicative of a woman who might easily garner attention (e.g., smiles often, highly expressive, funny, promiscuously dressed, rich) and is controlled in her behaviour (e.g., agreeable, emotionally stable; Figure 11E and 11F).

4.4.3 How do the constructs dominance, prestige, social dominance and physical dominance compare when examined between the sexes?

I first examined the relationship between male and female prestige. I found that 86% of words used to describe male 'prestige' overlapped with words used to describe female 'prestige'. There were 6 overlapping words and 6 unique words in total indicating that there was not a significant difference in the number of words in each category. In terms of unique words, male prestige had one unique word compared to five unique words in the female prestige category. A chi-square test demonstrated that this was not a significant difference ($X^2 = 2.67$, $df = 1$, $p = .102$). The words categorized as unique to female 'prestige' tended to reflect controlled traits (e.g., conservatively dressed, emotionally stable, conscientious). Prestigious women were described additionally with positive traits (e.g., feminine, smiles

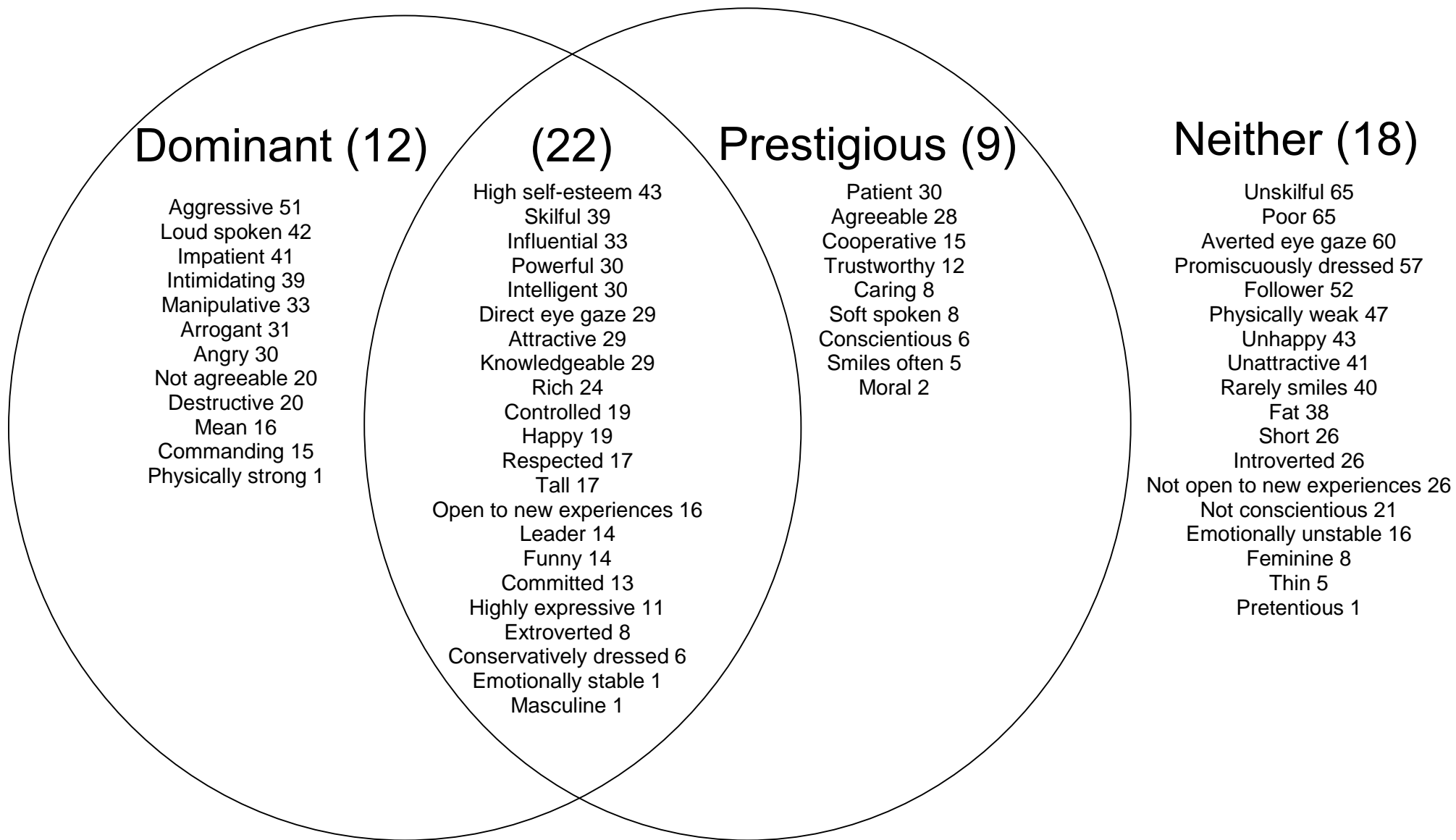
often). This positive association is not entirely exclusive to female 'prestigiousness' since male 'prestigiousness' was also associated with a unique positive trait (moral; Figure 11C and 11E).

I then proceeded to examine the relationship between words categorized as 'dominant' for men and women. There was a significant overlap between words used to describe 'male dominance' and words used to describe 'female dominance' ($X^2 = 6.23$, $df = 1$, $p = .013$). All of the words in the 'male dominance' category were also used in the 'female dominance' category. Given that all of the words in 'male dominance' overlapped with those in female dominance a chi-square test could not be performed. There were two words unique to female 'dominance': physically strong and masculine. Thus, strength and masculinity in women may be a particular sign of dominance given the dimorphism in these traits between the sexes (Figure 11C and 11E).

I then examined the relationship between 'physical dominance' in men and women. Here, I found that 60% of words used to describe male 'physical dominance' overlapped with words used to describe female 'physical dominance' however a chi-square test demonstrated that the two categories were not significantly different ($X^2 = .14$, $df = 1$, $p = .705$) as 'physical dominance' only contained 5 words for both men and women. Furthermore, male 'physical dominance' and female 'physical dominance' were equal in terms of unique words therefore a chi-square test was not performed; both categories had two unique words. The terms masculine and angry were unique to female 'physical dominance', while the terms intimidating and impatient were unique to male 'physical dominance'. This suggests that a woman who is 'physically dominant' is seen as being, perhaps internally, irate, which does not appear to generate a social response, whereas a 'physically dominant' man evokes fear in others (Figure 11D and 11F).

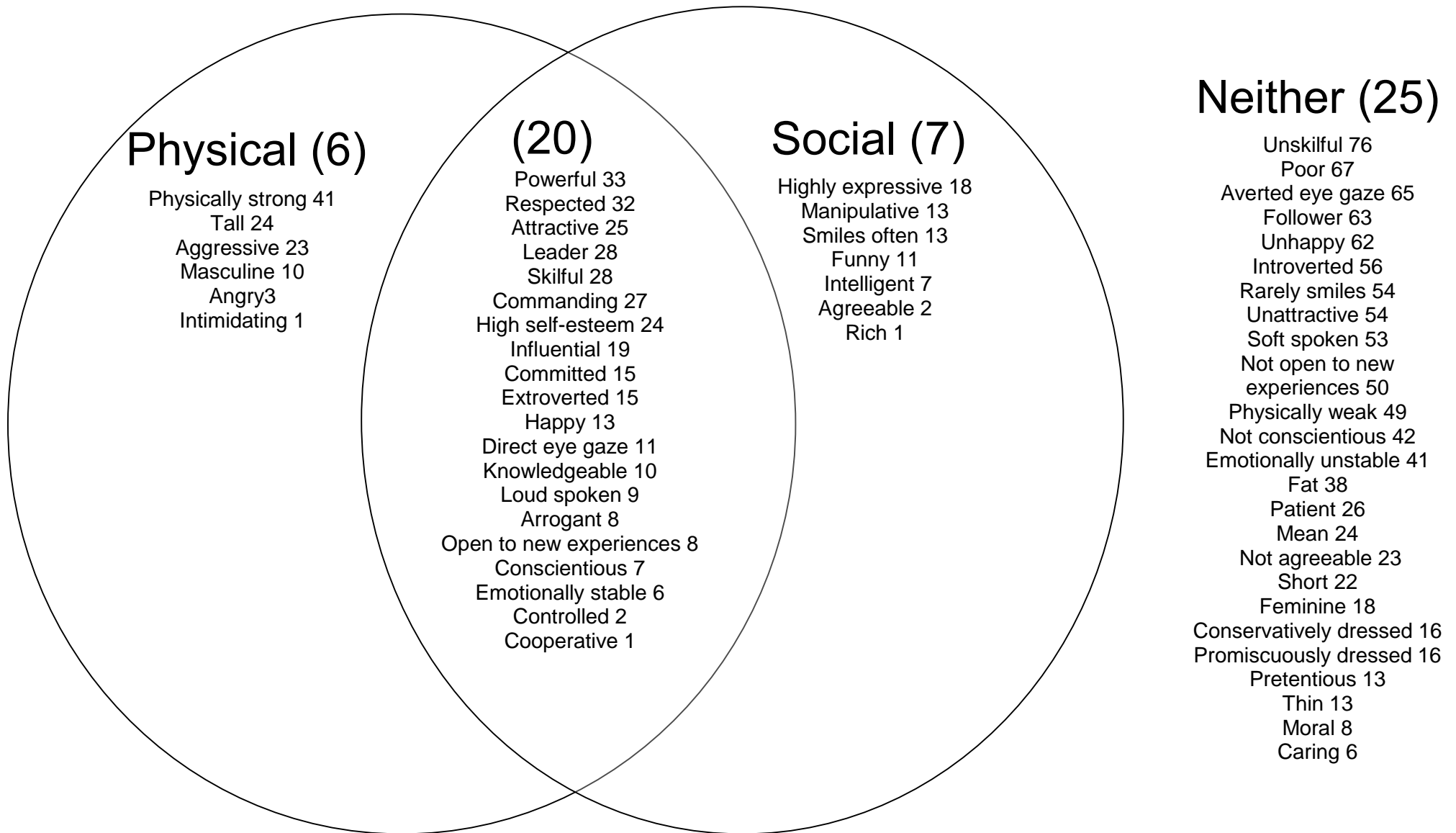
Finally, I examined the relationship between male 'social dominance' and female 'social dominance'. I found that all of the words in male 'social dominance' were present in female 'social dominance' and a chi-square test demonstrated that the two categories were not significantly different ($X^2 = .33$, $df = 1$, $p = .564$). As male 'social dominance' had no unique words to compare to the 7 unique words used to describe female 'social dominance', a chi-square test could not be performed. A qualitative analysis of the words classified as solely female 'social dominance' suggest that these terms describe a woman who may be likely to easily attract attention (e.g., feminine, promiscuously dressed, rich, direct eye gaze) and is particularly confident (e.g., emotionally stable, open to new experience, agreeable; Figure 11D and 11F).

A



Equal:

B



Equal: Impatient (d,b), Trustworthy (b,n), Destructive (p,n)

C

Dominant (11)

Aggressive 45
Impatient 44
Intimidating 38
Manipulative 35
Arrogant 33
Destructive 32
Angry 24
Loud spoken 23
Mean 20
Not agreeable 16
Commanding 15

(26)

Skilful 42
Direct eye gaze 39
High self-esteem 38
Attractive 37
Knowledgeable 35
Influential 35
Intelligent 28
Rich 27
Masculine 26
Controlled 25
Powerful 24
Funny 23
Happy 23
Conservatively dressed 19
Open to new experiences 18
Respected 18
Leader 17
Tall 17
Highly expressive 17
Physically strong 17
Committed 15
Conscientious 7
Emotionally stable 6
Extroverted 4
Smiles often 4
Pretentious 2

Prestigious (7)

Agreeable 31
Patient 29
Trustworthy 15
Moral 13
Cooperative 10
Soft spoken 3
Caring 2

Neither (17)

Poor 67
Averted eye gaze 62
Unskilful 60
Promiscuously dressed 59
Follower 51
Feminine 45
Unhappy 44
Rarely smiles 42
Unattractive 40
Physically weak 38
Fat 34
Short 32
Not open to new experiences 25
Not conscientious 24
Introverted 23
Emotionally unstable 22
Thin 7

Equal:

D

Physical (5)

- Physically strong 23
- Aggressive 20
- Tall 9
- Impatient 5
- Intimidating 4

(23)

- Attractive 38
- High self-esteem 38
- Respected 37
- Skilful 35
- Powerful 34
- Leader 31
- Commanding 29
- Influential 23
- Direct eye gaze 23
- Extroverted 22
- Happy 22
- Open to new experiences 20
- Committed 18
- Masculine 17
- Loud spoken 16
- Emotionally stable 15
- Knowledgeable 13
- Conscientious 13
- Cooperative 11
- Arrogant 9
- Trustworthy 6
- Agreeable 5
- Controlled 1

Social (5)

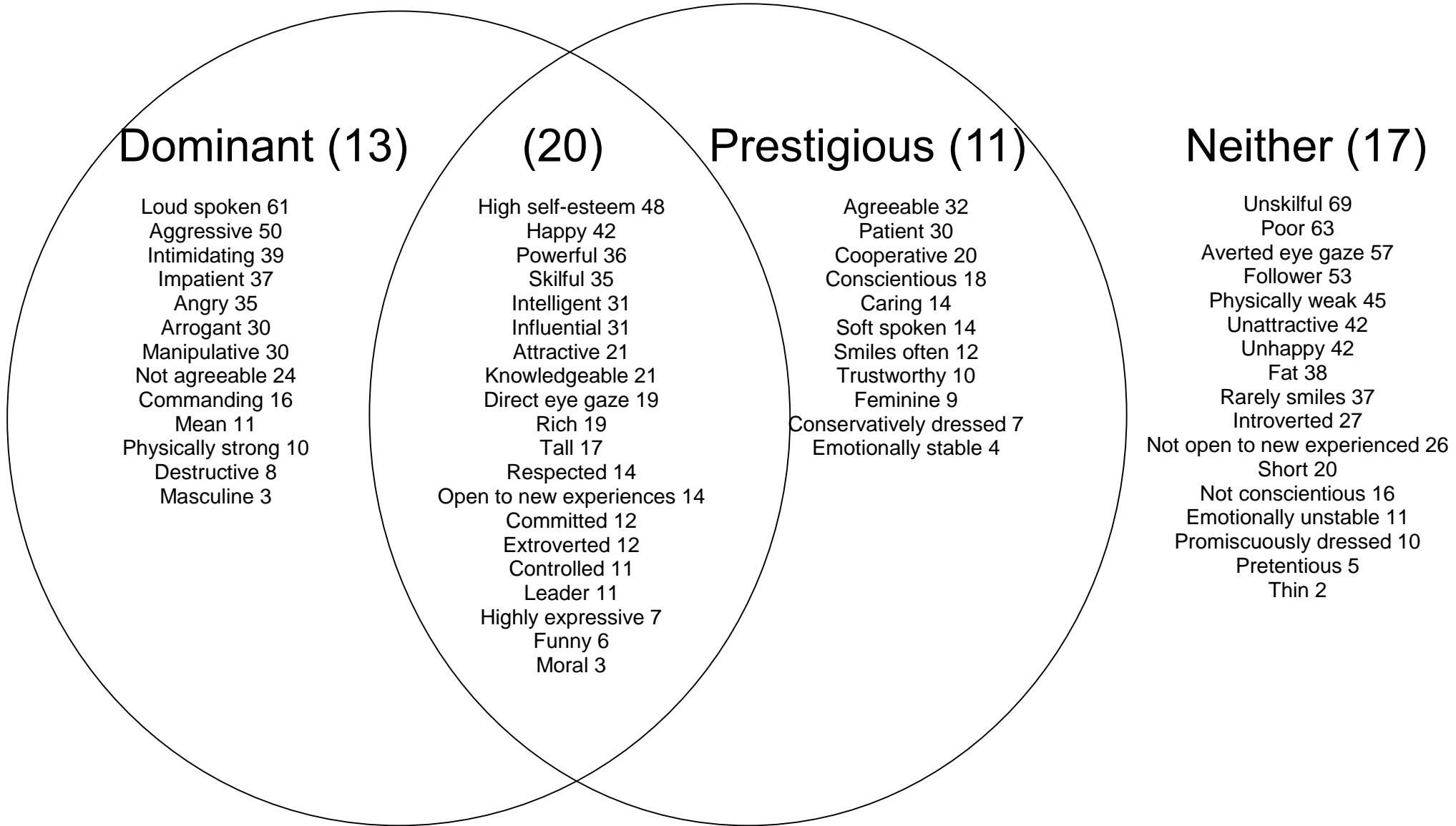
- Highly expressive 14
- Funny 7
- Manipulative 5
- Intelligent 3
- Smiles often 3

Neither (27)

- Unskilful 76
- Poor 71
- Averted eye gaze 65
- Unattractive 62
- Rarely smiles 60
- Unhappy 59
- Feminine 57
- Soft spoken 54
- Follower 54
- Physically weak 53
- Introverted 52
- Not open to new experiences 51
- Fat 51
- Emotionally unstable 48
- Not conscientious 48
- Short 33
- Not agreeable 30
- Promiscuously dressed 27
- Mean 26
- Thin 21
- Conservatively dressed 19
- Patient 19
- Pretentious 17
- Moral 7
- Caring 4
- Angry 4
- Rich 4

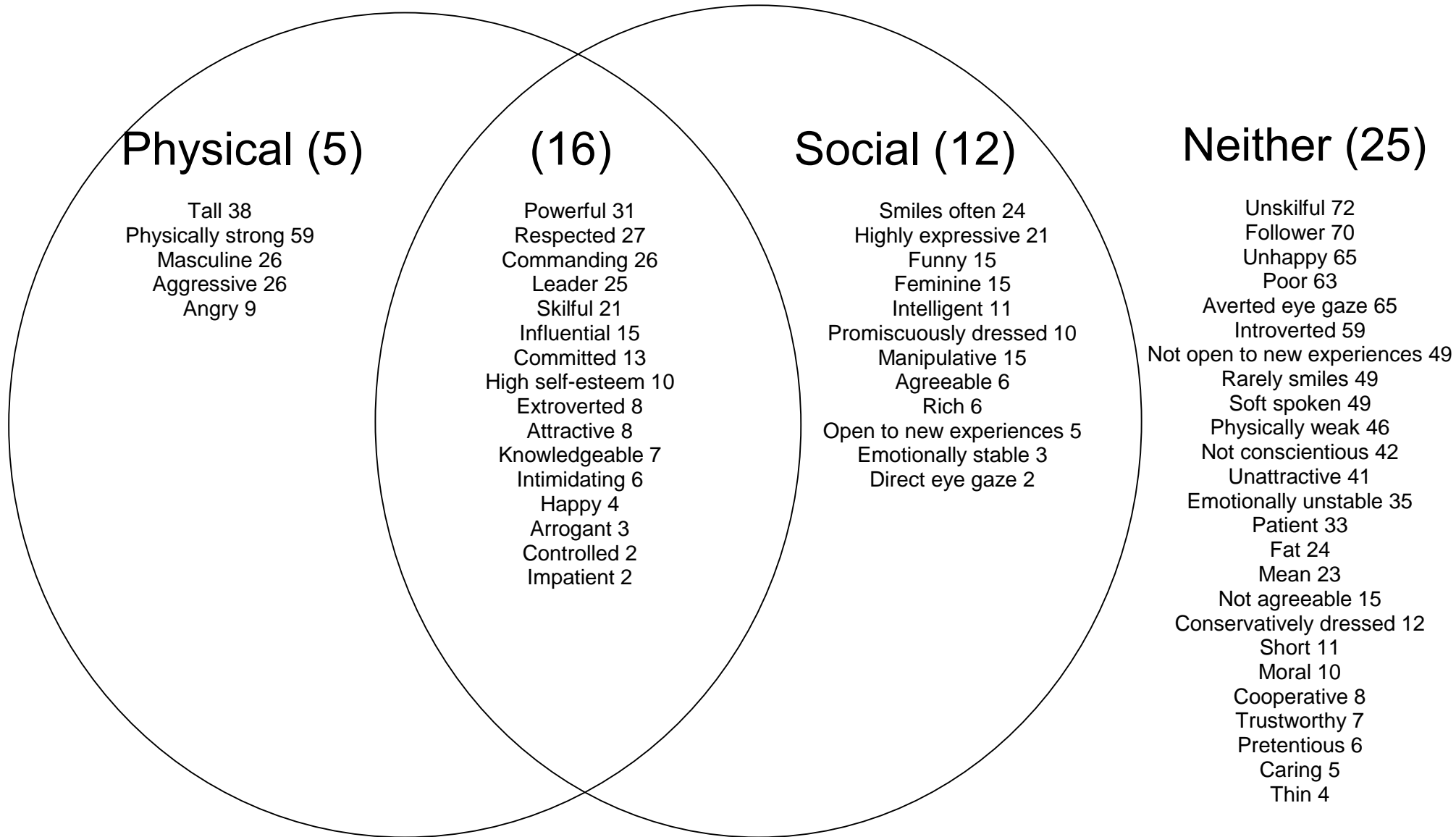
Equal: Destructive (p, n)

E



Equal:

F



Equal: Loud-spoken (s, n), Destructive (p,n), Conscientious (b,n)

Figure 11. Venn diagrams of word (N=61) categorization. The number beside each word represents the percentage difference from the next highest category. The numbers within brackets represent the number of words assigned to that category. The words which were evenly assigned to two categories are presented in the 'Equal' area underneath each Venn diagram (s = social dominance, p = physical dominance, b = both, n = neither). A) Prestige vs. Dominance in men and women as rated by both sexes, B) Physical dominance vs. Social dominance in men and women as rated by both sexes. C) Prestige vs. Dominance in men as rated by both sexes. D) Physical dominance vs. Social dominance in men as rated by both sexes. E) Prestige vs. Dominance in women as rated by both sexes. F) Physical dominance vs. Social dominance in women as rated by both sexes.

4.5 Discussion

4.5.1 High status individuals and their not-so-high status counterparts

In this chapter, I examined four widely used social status constructs (prestige, dominance, physical dominance, and social dominance; e.g. Bryan, Webster, & Mahaffey, 2011; Henrich & Gil-White, 2001; R.T Johnson et al., 2007; Puts et al., 2006) and the extent to which they overlapped or differed. Specifically, in two conditions (1: prestige vs. dominance, or 2: social dominance vs. physical dominance) I asked participants to imagine either men or women who fit into these constructs. In each condition they were asked to assign words from a list based on whether that word fit squarely into one of the two constructs, whether it fit into both constructs, or whether it fit into neither construct. Participants completed this task when imagining men and women separately. This allowed us to create detailed descriptions of which qualities high status individuals possess.

Beginning very broadly with words pertaining to high status individuals, those which were shared between the dominance and prestige category, included qualities of leadership, power, skill, expressiveness, intelligence, and overall influence (Figure 12A). Words which were classified as neither dominant or prestigious included mostly undesirable characteristics including being a follower, unskilled, poor, physically weak, as well as lacking in conscientiousness and emotional stability. Thus, there is a large dichotomy between the words used to describe an individual of high social status compared with an individual who is not of high social status (Figure 12B).

Within each sex, differences emerged between high and low status individuals. High status men were thought to be masculine, physically strong, conscientious, and pretentious, among others while these traits were not associated with high status women. High status women were also thought to be moral while men were not (Figure 12A). Feminine was a word used to describe men who were not considered of high status, while pretentious was a word used to similarly describe women (Figure 12B). Thus, being seen as a high status man might bring to mind specific words or traits which are not compatible with perceptions of high status women.

4.5.2 The four constructs: Prestige, Dominance, Social dominance, Physical dominance

I also explored each of the four specific constructs separately. As my results suggest, characteristics of prestige for both sexes included mostly prosocial traits, including the terms patient, cooperative, agreeable, and trustworthy. These intrinsic qualities paint a picture of a respected individual who is genuine, thoughtful, and pleasant to others while at the same time exuding authority and prowess. In contrast, dominance for both sexes included the traits aggressive, impatient, manipulative, and

arrogant. Combined, these traits describe an individual who is also powerful and influential, though not particularly kind, genuine, or likeable (Figure 12C).

I then examined prestige in men and women independently and found that men were described as being moral while women were described as feminine, conscientious, smiley, and emotionally stable (Figure 12C). Some of the words used for describing a prestigious woman are also used to describe a high status man (i.e., conscientious, smiles often, conservatively dressed). The same was true when examining how qualities of dominance differ between the sexes. That is, men had no additional words which fit into dominance than those shared by both sexes; however, women's dominance contained the words physically strong and masculine. Both of these words were used to describe a high status man without making a distinction as to whether he is dominant or prestigious. Consequently, while all high status men might be masculine and physically strong, only dominant women were considered the same. Similarly, while all high status men might be thought of as conscientious, emotionally stable, conservatively dressed, and likely to smile more often, only prestigious women were considered as such. These findings and word classifications provide empirical evidence for a more nuanced distinction of social status in women than in men, with more words classified to a specific construct than simply into the high status category.

To speculate, one possible explanation for these findings may be that even though women believe high status is a desirable quality for men to possess as mates (Buss & Barnes, 1986), the converse may not necessarily be true for women (i.e. high status women are not more or less desirable as mates). Thus, it may be that as long as a man is of high status, regardless of whether that is acquired through dominance or prestige, he will be associated with positive qualities including conscientiousness, smiling often, and being emotionally stable. For women, being of high status does not seem to be as important or desirable by mates (Buss & Barnes, 1986), and thus positive qualities such as conscientiousness may only apply to, or align with, the more positively valenced social status (prestige) which has been shown to imply cooperation and affiliation in previous self-ratings studies (Cheng et al., 2010).

Within the framework of dominance, I examined the two constructs of physical and social dominance as these have also been widely used in the literature. My results suggest that all physically dominant individuals, regardless of sex, were associated with traits such as physically strong, aggressive, and tall. Socially dominant individuals, on the other hand, had traits including being highly expressive, funny, manipulative, and intelligent (Figure 12D). These two facets of dominance appear to be at odds, as physical dominance describes an individual whose status hinges upon bodily appearance. In contrast,

social dominance describes an individual whose behaviour dictates their status; the brains (social dominance) versus the brawn (physical dominance).

Additionally, I found differences when examining each sex independently. For instance, physically dominant men were considered to be impatient, destructive, and intimidating, while physically dominant women were considered masculine and angry. However, when simply taking into consideration dominant women, they too were thought to be impatient, destructive, and intimidating. When looking solely at social dominance, many more words fit exclusively into this category for women than men. These words included some which may be considered as inherently associated with, or applicable to, women, such as feminine and promiscuously dressed; however others included agreeable, rich, open to new experiences, and emotionally stable which can apply to both sexes but are only seen in female social dominance (Figure 12D). Thus it again appears that women's social dominance is more nuanced and complex than men's, and may add some support to the hypothesis that women are more likely to compete through non-physical means.

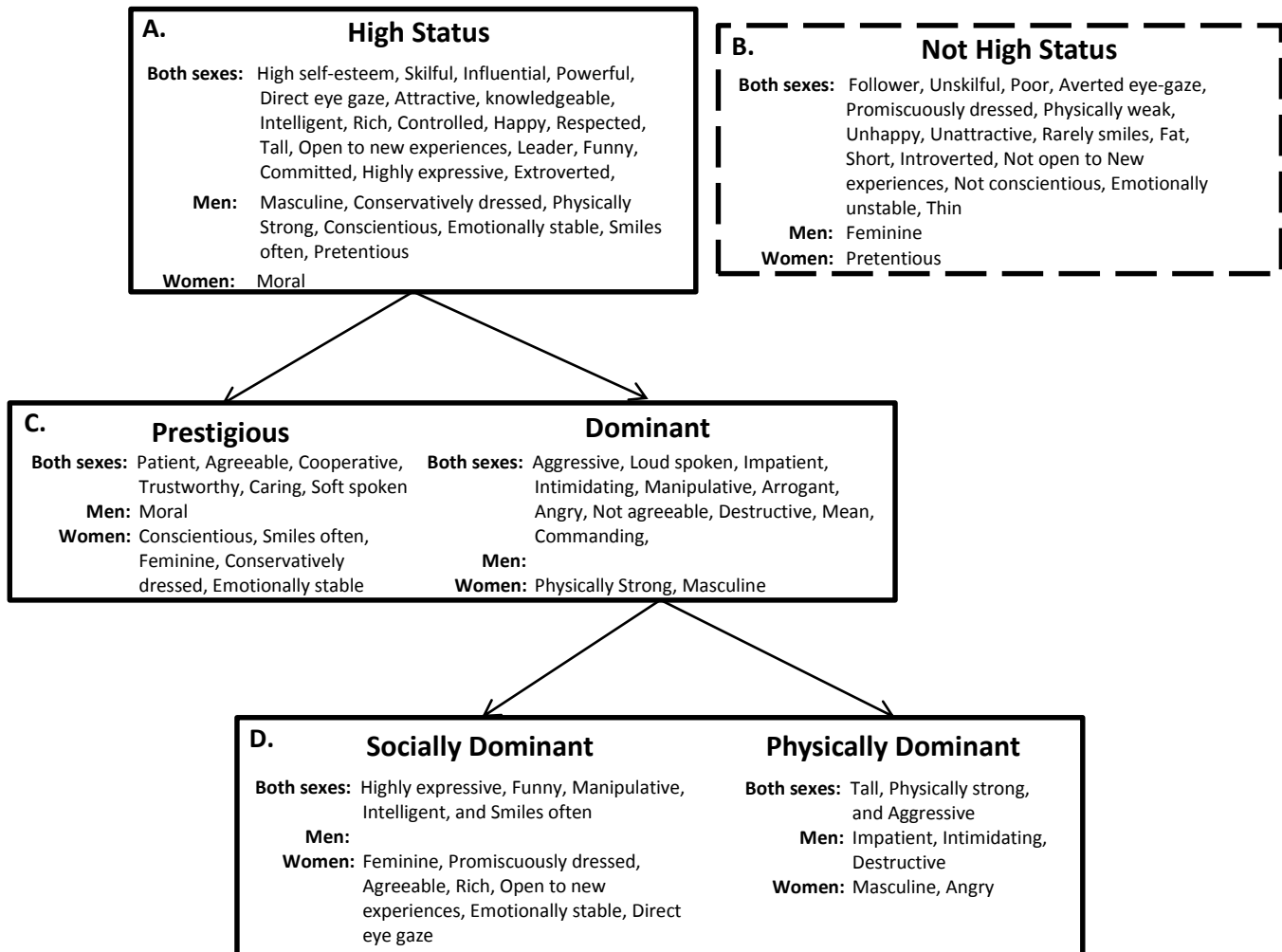


Figure 12. Representation of words used when characterising individuals who are: A) High status, B) Not high status, C) Prestigious or Dominant, and D) Socially dominant or Physically dominant. Words include those used to describe individuals of both sexes, only men, and only women. Note: While for simplicity and clarity Socially dominant and Physically dominant individuals are depicted as deriving from Dominant, data for these were obtained from a separate set of participants (see methods).

4.5.3 How the constructs fit together

The constructs I investigated in this chapter have all been used in the literature (e.g. Cheng et al., 2013; Henrich & Gil-White, 2001; Puts et al., 2006; Watkins et al., 2010); however, how they relate to one-another is somewhat hard to ascertain given the lack of clear definitions in the diversity of fields where the terms occur. I aimed to examine whether there were similarities and differences between the constructs with respect to the number and types of words used to define each construct.

Firstly, I examined whether prestige was a similar construct to social dominance. I reasoned that this may be the closest match as there were no overlapping terms between physical dominance and

prestige in both sexes and within each sex. In men these findings suggest that prestige and social dominance are separate entities, with no overlapping words between social dominance and prestige. Three of the seven words used to describe prestigious men were used to describe both socially and physically dominant men, while the last four prestigious words described qualities possessed by neither socially nor physically dominant men. For women, out of 11 words, prestige and social dominance shared four words, with six words fitting into neither social and physical dominance, and one word placed equally into both and neither categories. Taken together this information implies that men's prestige is not related specifically to their social dominance, with the two being differentiated concepts. In contrast, in women it appears that some attributes do overlap between prestige and social dominance, though the majority do not. As such it cannot be said that they are completely independent concepts, but they are also not able to be classified as the same. While overlapping words (i.e., agreeable, feminine, and emotionally stable) do exist, the majority of positive internal traits such as cooperative, trustworthy, and patient are not shared and solely describe prestige in women.

Secondly, I reasoned that social and physical dominance would fit under the umbrella term 'dominance'. Out of eleven words describing male dominance, over half were also found in either physical dominance (four words), social dominance (one word), or both (three words) while three fit into neither. In women, a similar pattern is observable. Out of thirteen dominance words four fit into physical dominance, one in social, and four in both physical and social, while four words fit into neither category. Thus, for both men and women, over half of the words used to describe socially dominant, physically dominant, or both socially and physically dominant individuals are also present in the general category of 'dominant'. However, it also appears that the concept of dominance for both men and women is more closely related to physical than to social dominance. Additionally, as some of the words describing dominance were not represented in either physical or social dominance in both men and women (e.g., mean and not agreeable), it may be that other constructs exist within the dominance framework which have not yet been discussed.

4.5.4 The four constructs: Definitions in current literature and relationships with my findings

These data lend support to previous findings that high status individuals, regardless of how they rose to high status, are considered to be influential, extroverted, and powerful (Cheng et al., 2013; Henrich & Gil-White, 2001). Regarding prestige, current definitions describe prestigious individuals as "respected for their skills, success, and knowledge" (Cheng, Tracy, & Henrich, 2010, p. 305; see also Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Henrich & Gil-White, 2001) while dominant individuals are not.

However, my findings differ markedly with respect to these definitions of prestige. I found that all high status people are perceived to be skilful, knowledgeable, respected, and intelligent. Importantly, my findings are consistent regardless of whether I examine men or women, suggesting that these are robust qualities of high status individuals. Words which could instead be used to explicitly refer to a prestigious person may include some of the internal traits listed in Figure 12C. Thus, other than encompassing the shared high status qualities of influential, respected, and powerful, a definition specifically of a prestigious person could include 'someone who is patient, cooperative, soft-spoken, and trustworthy'. Indeed, descriptions used in other studies suggest a prestigious person "speaks in a relaxed and confident manner ... rarely becoming emotional or raising his voice and usually not even standing up to speak" (Snyder, Kirkpatrick, & Barrett, 2008, p.442), which appear to be more directly in line with my definition of a patient, soft-spoken individual than the definition of prestige in Henrich & Gil-White (2001). Additionally, sex differences should be taken into consideration when describing a prestigious individual of a particular sex (Figure 12C). Finally, Cheng et al. (2010) designed a questionnaire intended to differentiate between prestige and dominance; however prestigious statements included 'my peer group respect and admire me' and 'my unique talents and abilities are recognized by others', though my findings suggest that these are perceived qualities of a high status individual more generally, regardless of how they acquired their status.

Dominance is defined in some literature as "the use of intimidation and coercion to attain a social status based largely on the effective induction of fear"(Cheng, Tracy, & Henrich, 2010, p. 305; see also Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Henrich & Gil-White, 2001), and a dominant individual is a "strong and almost intimidating leader... occasionally pounding his fist on the table or raising his voice to make a point" (Snyder, Kirkpatrick, & Barrett, 2008, p. 441). Similar to these definitions, I found that words including manipulative, intimidating, aggressive, loud-spoken, and impatient were all used to describe dominant individuals of both sexes. Interestingly, I observed sex differences in the allocation of dominance words. Women were perceived as masculine when dominant and feminine when prestigious, while men were always considered masculine regardless of how they reached high status, and high status men were never considered feminine. Similarly, men were always considered to be physically strong, while only dominant women were perceived in that way. This again points to sex differences in the ways men and women achieve high status; men are perceived to more consistently use their masculinity and strength regardless of whether it is through prestige or dominance, while women are perceived to use these outward traits when acting dominantly.

When looking specifically at social dominance, a definition used in multiple evolutionary psychology studies has included “tells other people what to do, is respected, influential, and often a leader” (Puts, Gaulin, & Verdolini, 2006, p.287; see also Watkins, Jones, & DeBruine, 2010). As previously discussed, being respected, influential, and having leadership qualities, are all qualities associated with high status people in general while being commanding has been associated with both physical and social dominance. As such, this definition is more indicative of high status individuals who have a slight lean toward dominance than individuals exhibiting social dominance. Meanwhile in previous social psychology studies, socially dominant individuals have been described as ‘powerful’ and a ‘leader’ (Bryan et al., 2011) which fits well within my framework for overall high status people but not necessarily solely into social dominance.

Finally, when exploring physical dominance, definitions include “someone who would be likely to win a fistfight with another person of the same sex” (Watkins et al., 2010, p. 968; see also Puts et al., 2006) with others suggesting physically dominant individuals display the following characteristics: masculine, tall, muscular, and strong (Bryan et al., 2011). These definitions fit into my physical dominance framework, with individuals possessing outward, bodily characteristics indicative of might and formidability.

From the above, it seems that definitions of physical dominance have the most consistently and reliably used terminology in the literature, as words used to describe these individuals are easily observed (i.e., tall, masculine, strong). Definitions of social dominance and especially prestige look to have been intertwined with the more general definitions used to describe individuals of high status (i.e., respected, skilful). Thus, it may be important to use caution when interpreting data from studies examining differences between prestige and dominance; the results may be rooted in an uneven dichotomy. Additionally, I found that both social and physical dominance differ and many studies have also noted these differences. Most of the words used in both social and physical categories are also subsumed by the more general definition of dominance, as might be predicted, and as such studies pertaining only to dominance may be missing subtle differences between individuals. Indeed, a recent study has suggested financial dominance as a possible sub-category (Bryan et al., 2011) of dominance, Kalma et al. (1993) suggest there is another form of dominance that they call aggressive dominance, while Anderl et al. (2016) and Geniole et al. (2014) discuss fearless dominance as a subscale of psychopathy. These alternatives warrant future research.

4.5.6 Future directions, applications, and limitations of this work

Having information about people's perceptions of the constructs of dominance and prestige can allow researchers to adopt a stable terminology regardless of the field of study. For example, when compiling questionnaires aimed at discerning an individual's self-perceived social status, choosing specific words will enable researchers to acquire fine-grained and reliable answers, which would be difficult using current terminologies. Similarly, these words would be equally useful when examining perceptions of other's social status.

Knowing the way in which these constructs are perceived is also important for researchers' ability to synthesize currently published literature. For example, knowing that in certain studies the definition of social dominance may have invoked people's perceptions of high status people in general, can be useful when comparing it to studies in which prestige has also been described with words descriptive of high status people; these findings may be more directly comparable than previously assumed. In order to make further literature comparable, it would be worth examining other constructs which I have not explored here. Words like 'power' and 'status' which have been used in social psychology literature may be two interesting constructs to explore in this way.

While I used previously published literature to compile the word list, one potential limitation to this research is that I may have missed certain words which may be relevant to this debate. Words including 'competent' may be important, as this word has been associated with voting decisions (Todorov et al., 2005) and thus is linked to status; however, I used words including skilful and intelligent which, when combined, have a similar meaning and can be considered more nuanced. In future research related to social status, it would be worth asking participants to write as many words as they can think of that pertain to either of the two strategies, rather than supply them with a word list. Another potential limitation is that participants recruited for this study were from Western societies, and notions of these constructs may differ cross-culturally (Henrich, Heine, & Norenzayan, 2010).

Additionally, in these studies I did not look at the data with respect to participant sex, which may play a role when judging others' social status, as this variable would have further complicated the analyses while my main interest was in how the general population views these separate social status categories. Future studies, and a further possibility for exploring these data would be to look at how both male and female participants judge male and female prestigious, dominant, socially dominant, and physically dominant individuals separately, and how these categorizations then compare to one another.

4.6 Conclusion

I asked two sets of participants to imagine highly prestigious and dominant individuals, or highly socially and physically dominant individuals, and assign words to each of these constructs. Through their answers, I was able to explore differences and refine the terminology of these constructs. To summarize: 1) the constructs of prestige and dominance differ markedly, whereby prestigious individuals possess intrinsic prosocial traits while dominant individuals possess less likeable, outwardly traits. Exploring the two constructs subsumed by dominance, socially dominant individuals are astute, expressive, and manipulative, while physically dominant individuals are aggressive and strong. 2) The constructs differed in similar ways within each sex as described above for all individuals. 3) Between each sex, the constructs differed in that women's prestige and social dominance included many more words than men's, perhaps indicating a more nuanced representation of social status among women than men. To conclude, through this chapter, social status research could utilise more descriptive and concrete representations of individuals who fit within each of these constructs, and information pertaining to both men and women. Additionally, research in the area can now use a greater set of words to define these constructs, and this will allow current and future research in this burgeoning field to become more parsimonious and more readily comparable.

Chapter 5 Perceived intensity and classification of human facial expressions are influenced by manipulated facial dominance

5.1 Abstract

Human expressions are dynamic and can vary in intensity, while structural aspects of facial appearance remain relatively stable over time. In the first two studies of this chapter, I investigated whether manipulating perceived dominance, a structural characteristic, influenced the perception of facial expressions by exploring changes in perceived intensity (Study 1a) and speed of recognition (Study 1b) of these expressions. By manipulating angry, sad, and fearful faces to be high and low in structural dominance, I found that high dominance faces were rated as appearing significantly angrier, and less sad and fearful than the low dominance faces (except fear in female faces). I also found that angry faces high in dominance were recognised significantly faster, and more accurately than angry faces low in dominance. In a subsequent study which did not involve manipulating facial dominance (Study 2) I instead manipulated perceptions of dominance by telling participants that the faces were rated as either high or low in dominance by peers. Individuals described as dominant were perceived as having more intense anger expressions. Overall these results indicated that manipulating dominance (either through manipulating facial features or written descriptions of faces) affects the perception and recognition of facial expressions, and I suggest that the mechanism behind this association is psychological (i.e. how we view and relate to dominant individuals) rather than structural (i.e. structural facial characteristics mimicking emotional expressions). This effect may have ramifications for social interaction, whereby a person's facial dominance could affect how quickly perceivers pick up on their emotional expressions, how accurately they interpret them, and how intense they judge those expressions to be.

5.2 Introduction

5.2.1 Structural characteristics of dominant faces

The structural aspects of facial appearance are relatively stable across time, and include traits such as feature size and configuration; these can be related to face categories such as male versus female, and to individual identity. However, other traits such as trustworthiness and dominance are also readily extracted from facial appearance (Oosterhof & Todorov, 2008), and reliable judgements of static facial characteristics (i.e. trustworthiness, aggressiveness, attractiveness, etc.) can be made within 100 ms

(Willis & Todorov, 2006). Humans therefore appear to be able to use static structural aspects of faces in order to make rapid and decisive judgements about aspects of their owners' personalities.

Given that judgements of dominance seem to be reliably made on the basis of facial appearance alone, there must be some distinct, structural aspects in faces which are associated with this trait. As touched upon in Chapter 1, section 1.7, Keating (1985) showed that women and men with smaller, more mature features are regarded as more dominant. Prominent brows, a muscular and well-defined jaw, and a broader face are also correlates of dominance in men (Grammer & Thornhill, 1994; Keating et al., 1981; Mazur et al., 1994). More recently, perceived facial masculinity and maturity have also been positively correlated with the perception of dominance in men (Boothroyd et al., 2007; Oosterhof & Todorov, 2008) and women (Quist et al., 2011), which suggests an association between the structural components of masculinity and dominance. Indeed, high testosterone levels have been associated with masculine craniofacial measures (Penton-Voak & Chen, 2004; Verdonck et al., 1999) and dominance in men (Mazur & Booth, 1998) and women (Grant & France, 2001). Thus, some link between testosterone and dominance may explain why structural masculinity is tied to perceptions of dominance.

As I discussed in Chapter 1, section 1.7 and Chapter 3, recent research has suggested that more masculine, highly dominant-looking men (i.e. those with higher facial width to height ratios; fWHR) behave more aggressively (Carré et al., 2009; Carré & McCormick, 2008; R. T. Johnson et al., 2007), are less trustworthy (Stirrat & Perrett, 2010), more deceptive (Haselhuhn & Wong, 2012), and are perceived as having a higher achievement drive (Lewis et al., 2012). In Chapter 3, I also found that men with higher fWHRs judged themselves and were judged to be more dominant. Judgements of dominance based on facial structure therefore seem to have validity: facial dominance appears to be associated with behavioural dominance.

5.2.2 Dominance and dynamic facial expressions

Unlike static facial features, human facial expressions are dynamic and can be used to convey emotion and intentions to others quickly, without the need for words. Previous research suggests that there are seven basic human facial expressions: happy, angry, sad, fearful, surprise, disgust, and contempt (Ekman, 1992), which contain a wealth of information about how a person feels. This information can be used by perceivers; for example, one would respond differently when approached by an angry person as opposed to a sad person. Using cues from contractions of different facial muscle groups, expressions can be accurately coded using the Facial Action Coding System (FACS; Ekman, 1992; Ekman & Friesen, 1978). In addition to these distinct movements of specific muscle groups, expressions may differ in the intensity in which they are expressed. Modulating the intensity of an expression allows for a more

detailed, incremental mode of non-verbal communication. For example, a person can display relative degrees of happiness or anger varying from only slightly happy or angry, to very happy or angry. Facial expressions have been widely studied (Darwin, 1872; Ekman & Friesen, 1971; Ekman, 1993) and our perceptions of human expressions, and their perceived meanings, appear to be quite consistent cross-culturally (Ekman & Friesen, 1971; Elfenbein & Ambady, 2002).

Recently, studies have shown that displays of emotional expressions may affect dominance attributions, and suggest that men who display anger, happiness, and neutral expressions are more likely to be judged as highly behaviourally dominant and be conferred high status than those expressing sadness or shame (Hareli et al., 2009; Knutson, 1996; Tiedens, 2001). In women, some studies find anger to be associated with low dominance (Brescoll & Uhlmann, 2008) while others with high dominance (Hareli et al., 2009). Sadness and fear expressions are both associated with low behavioural dominance in men and women (Hareli et al., 2009; Knutson, 1996). However, these sex-differences appear to be mediated by a person's perceived behavioural dominance and affiliativeness, with individuals of higher dominance expected to look more angry, and less happy, regardless of sex (Hess, Adams, & Kleck, 2005). Taken together, these studies suggest that visually perceived facial expressions of emotion influence judgements about whether or not someone is likely to be a dominant or a submissive individual.

5.2.3 Interplay between structural dominance and expressions

The above studies explored the effects of facial expressions on judgements of behavioural dominance; the opposite interaction – how attributions of facial dominance might influence judgements of emotional expressions – has received comparatively little research. In one relevant study, Becker, Kenrick, Neuberg, Blackwell, and Smith (2007) found that decisions about emotional expressions were influenced by the sex of the face displaying the expression; participants responded faster, and were more accurate at detecting angry expressions on male faces, and happy expressions on female faces. To the extent that masculinity and dominance are related, these data certainly hint that someone's facial dominance might drive the way in which their emotional expressions are perceived; however, manipulating sex is not equivalent to manipulating facial dominance. That is, manipulating sex necessarily implies changing a person's identity; in effect altering all the attributions which differ between men and women, including, but not limited to masculinity or dominance. This makes it difficult to assess which facial characteristics in particular are more likely to account for these findings than others. However, an individual's facial dominance may sit somewhere along a continuum (from low dominance to high), and changing its position (i.e. manipulating the degree of facial dominance) does

not necessarily change that individual's identity. Indeed, no research to date has investigated what varying structural dominance in a face may do to perceptions of facial expressions.

5.2.4 Social cognition and dominant individuals

As discussed above, dominant individuals are perceived by others as appearing more aggressive, and angry than non-dominant individuals. In recent social psychology literature, and as described in Chapter 1 section 1.6, the concept of human dominance has been described as the use of force, coercion, and intimidation to attain higher status (Cheng, Tracy, & Henrich, 2010; Henrich & Gil-White, 2001). Indeed, in Chapter 4 I found similar descriptors of dominance in both men and women. Further, research from evolutionary psychology has shown that individuals whose faces appear highly dominant do gain eventual high status, leadership, and business success (Mazur & Mueller, 1996; Mueller & Mazur, 1996, 1997; Rule & Ambady, 2008, 2009, 2011). Therefore certain attitudes may exist towards these individuals and it seems likely that knowing who is dominant (e.g. who is likely to be angry, masculine, forceful, etc.) and who is not would be adaptive for perceivers, as it might influence their decision of whether to approach and interact with these individuals or whether to avoid them. Research by Chen & Bargh (1999) found that in a response-time task participants were much quicker to press a lever labelled 'avoid' when coupled with a negatively valenced word such as 'war' than with a positively valenced word such as 'aquarium'. This research suggests that avoidance/approach responses are quite reflexive and affected by our attitudes and beliefs towards certain concepts. Furthermore, error management theory (EMT) predicts that individuals will tend to err on the side of caution as the costs are lower to mistakenly assume something which is harmless is harmful than to assume something harmful is harmless (Haselton & Buss, 2000; D. D. P. Johnson, Blumstein, Fowler, & Haselton, 2013).

Thus, being in the presence of a dominant individual may trigger specific attitudes which can lead to unconscious behavioural responses, such as avoidance. For example, being approached by a broad-faced, large-browed individual might cause you to feel threatened and thus decide to avoid that individual. If this is the case, coupling structural features of (facial) dominance with, for example, anger expressions might be expected to elicit an even greater attitude change and subsequent behavioural response. Additionally, EMT may predict that even if a perceiver was uncertain whether an individual was dominant or not, they may act in the same way. These implications are discussed fully in the general discussion.

5.2.5 The current research

I performed two studies to examine whether manipulating expressive faces with respect to structural dominance would result in the differential perception of certain emotions. I also investigated the potential reasons and mechanisms which might be implicated in such associations. To this end, I used images of real faces, of both sexes, which were transformed to be either high and low in perceptual dominance. In Study 1a I investigated whether the perceived intensity of expressions (angry, sad, and fearful) changed as a consequence of the individuals' perceived facial dominance, while in Study 1b I examined the speed of classification of these expressions. I used the expressions of anger, sadness, and fear as I believe that these are most likely to be linked to dominance interactions than other expressions (i.e. dominant people exhibiting anger while perhaps submissive/low dominant people exhibiting sadness and fear). In Study 2, I did not manipulate perceptual dominance but instead told participants that faces they were looking at were rated as either high or low in dominance by peers, thus manipulating the contextual cues of each face rather than facial features.

5.3 Study 1a

In Study 1a, I investigated whether the perceived intensity of anger, sadness, and fear expressions would change when a face was manipulated to appear high or low in dominance. Such an interaction could arise for a number of theoretical reasons. First, it seems likely that if there were an association it may be due to a learned conceptual association between dominance and anger. One may have learned that anger is often associated with behavioural dominance. More specifically, a dominant-looking face may result in the *automatic* activation of concepts related to dominance, which in turn influence judgements about expression intensity. As behavioural dominance has been described with words including force, aggression, and intimidation (Cheng et al., 2010; Henrich & Gil-White, 2001, and Chapter 4 of this thesis) a face high in perceptual dominance may be associated with behavioural dominance and thus be detected by others as a threat, signalling the potential to be aggressive or exhibit anger. As men with higher fWHR have been found to be more aggressive (Carré & McCormick, 2008; R. T. Johnson et al., 2007), associations between a dominant person's behaviour (e.g., anger) might drive intensity ratings of their expressions.

Secondly, the interaction could arise from more explicit and intentional, consciously generated, inferences that one might make about an individual given the expression worn on their face; having experienced an environmental association between anger and behavioural dominance, and when given

some time to reflect, one come to the conscious conclusion that someone with an angry expression is a dominant individual, which will of course influence one's assessment of his or her dispositions.

Finally, an interaction may be due to structural similarities between facial dominance and certain facial expressions. For example, it may be that dominant faces are perceived as such because the features of these faces actually physically resemble those features which are characteristic of angry facial expressions. In other words, the structure of a face rated highly for dominance, may be physically similar to the structure a face tends to adopt when it expresses anger. Recently, Said, Sebe, & Todorov (2009) showed that neutral faces which were perceived as 'threatening' also looked angry, and Oosterhof and Todorov (2009) found that the structural components of trustworthy-looking faces make those faces appear happier, while those with untrustworthy-looking faces appear angrier. Becker et al., (2007) also found that masculine faces looked angry while feminine faces looked happy. These studies suggest an interaction between facial structure and perceived expression intensity. Consequently, if these findings were due to the faces possessing structural traits physically resembling certain emotional expressions, then manipulating a face to appear more dominant would be equivalent to making the face look more angry, which would influence judgements of expression intensity. The same could be true of sadness and fear, with low dominance faces somehow being structurally similar, and therefore enhancing these expressions.

In this series of studies, I aimed to test whether there was an association between structural dominance and expression perception, and whether that link was likely to be structurally or conceptually driven. If an association were present I predicted that faces of both men and women high in perceptual dominance would be rated as looking angrier by participants, than their low dominance counterparts (regardless of the mechanism). Finally, I postulated that as someone high in behavioural dominance may be less likely to show weakness and vulnerability, the intensity of expressions of fear and sadness may be lessened in high dominance-looking individuals.

5.3.1 Method

5.3.1.1 Participants

Data from one hundred and seventy seven psychology undergraduate students and/or participants using the Psychology 'online portal' system available to all university staff and students, were used (32 men and 145 women; age $M = 23.7$, $SE = .68$).

5.3.1.2 Stimuli

5.3.1.2.1 Perceived dominance composites

One hundred faces from a pre-existing face set (50 male and 50 female), posed with neutral expressions and direct gaze towards the camera in standardized lighting conditions. These face images were presented to 17 (11 men, age $M = 26.4$, $SE = 1.04$) online participants who rated each face on a 7-point Likert scale for dominance, with 1 being least, and 7 being most, dominant. There were no further instructions other than 'dominance', and no definition of dominance was provided. As adopted by (Oosterhof & Todorov, 2008), we allowed participants to use their 'gut feeling', although our participants were not explicitly given these instructions. These faces were delineated using 179 landmark-points using the program Psychomorph (Tiddeman et al., 2001). Using Psychomorph software the highest rated (most dominant) 15 and the lowest rated (least dominant) 15 male (high $M = 4.73$, $SD = .37$, low $M = 3.06$, $SD = .42$) and female faces (high $M = 4.45$, $SD = .27$, low $M = 2.85$, $SD = .27$) were averaged to yield 'high dominance' and 'low dominance' composites (Figure 13; see Benson & Perrett, 1991; Tiddeman et al., 2001 for details on procedure). These faces were aligned so interpupillary distance was constant, and each was made symmetrical. The final averaged faces were used as end points for high and low dominance composite faces, as described in detail below (Figure 13).



Figure 13. Left column: Average of 15 lowest dominance rated female (top) and male (bottom) faces. Right column: Average of 15 highest dominance rated female (top) and male (bottom) faces.

5.3.2.2.2 Emotion stimuli and manipulations

Faces used as stimuli in this study were taken from the validated Radboud face set (Langner et al., 2010), which is different to the face set used for the creation of the high and low dominance composites described above. The faces from the Raboud set included a randomly chosen (using a random number generator) subsample of 4 male and 4 female faces. The pictures were of Caucasian participants' faces exhibiting angry, sad, and fearful expressions with a direct gaze towards the camera. The mean overall accuracy for expressions was reported as 82%, with the median at 88% (Langner et al., 2010). The faces were delineated (as described above), and transformed for shape and texture to look both 50% higher and 50% lower in dominance than the original, by using the dominance composites we created as described above. Briefly, the transformation process works by calculating the difference in the location of each landmark vector point between the high and low dominance composite faces. This difference in

the location of each vector point is then applied to the face being transformed by either addition or subtraction, in effect making the face more or less like the high dominance/low dominance composite faces. Details of this process are described in Tiddeman et al. (2001). The resulting faces (of 50% higher and 50% lower dominance than the original) were then aligned on interpupillary distance. Finally, the faces were cropped to remove hair and ears, and positioned on a black background (Figure 14).



Figure 14. Facial dominance manipulation of an angry male face. Left: face transformed to appear 50% lower in dominance than the unmanipulated face. Middle: unmanipulated faces. Right: face transformed to appear 50% higher in dominance than the unmanipulated face. Note: Participants saw images manipulated to look high and low in dominance, never the original, unmanipulated face.

5.3.1.3 Procedure

Participants were first asked to fill in a standard demographic questionnaire which included age, sex, race, etc. They were then sequentially presented with a total of 48 pictures of expressive faces (four male and four female faces x two levels of dominance (high or low) x three expressions (angry, sad, fearful)), and asked to rate each image on the traits anger, sadness, and fear using a 1 to 7 point Likert scale, with 1 being 'low' and 7 being 'high'. In order to minimise the effects of an expression influencing ratings for another, and to help avoid ceiling effects, we presented the emotions in blocks in the following order: angry faces, sad faces, and fearful faces.

5.3.1.4 Analysis

A 3 (expression of face; anger, sad, or fear) x 2 (sex of face; male or female) x 2 (dominance manipulation; high or low) x 2 (sex of participant; male or female) mixed-factor repeated-measures ANOVA was performed to look at whether ratings of expression intensity differed based on the expression that the face exhibited, the sex of the face, the sex of the participant, and whether that face was manipulated to look high or low in dominance. Sex of participant was included as dominance differs between the two sexes, as mentioned in Chapters 1, 2, and 3. Briefly, men tend to exert their dominance physically, while women exert their dominance through social and verbal interaction (Björkqvist, 1994; Campbell, 1999). As such, male and female judgements of emotional expressions on faces varying in perceptual dominance may differ.

5.3.2 Results

5.3.2.1 Intensity ratings of expressions

The initial mixed-factor repeated-measures ANOVA revealed no significant main effect of sex of participant, $F(1,175) = .30, p = .59, \eta_p^2 = .02$ on intensity ratings with no significant interactions involving this variable (all F 's < 2.1, p 's > .12). The significant effects reported below remained unchanged when sex of participant was included. Sex of participant was therefore removed as a between-subjects variable and the test was repeated. There were significant main effects for expression of face, $F(2,352) = 124.57, p < .001, \eta_p^2 = .41$, sex of face, $F(1, 176) = 7.13, p = .008, \eta_p^2 = .04$, and dominance manipulation, $F(1, 176) = 15.14, p < .001, \eta_p^2 = .08$. However, all of these effects were qualified by a significant 3-way interaction between expression of face, sex of face, and dominance manipulation, $F(2, 352) = 13.70, p < .001, \eta_p^2 = .07$.

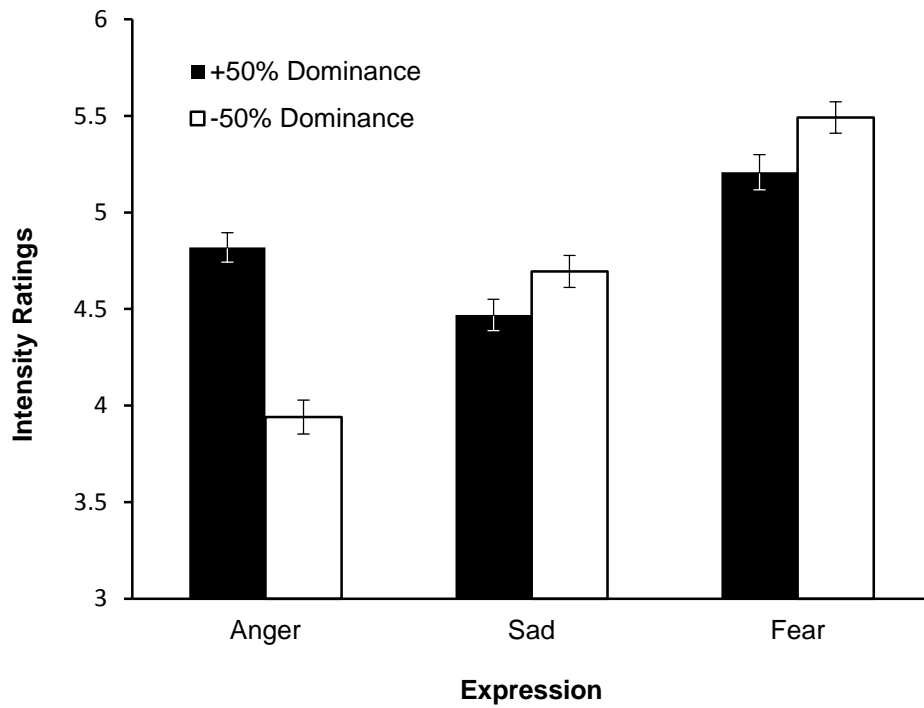
In order to explore the 3-way interaction, the data were split by sex of face and separate ANOVAs were performed with expression of face and dominance as within-subjects factors. In male faces, there were significant main effects for expression of face, $F(2, 352) = 84.98, p < .001, \eta_p^2 = .35$; and dominance manipulation, $F(1, 176) = 12.53, p = .001, \eta_p^2 = .07$. However, there was also a significant interaction between expression of face and dominance manipulation, $F(2, 352) = 130.74, p < .001, \eta_p^2 = .43$. Paired-samples t-tests were performed to examine the differences in rated expression intensity between high and low dominance transforms. Angry faces high in dominance were rated as significantly angrier than those low in dominance, $t(176) = 11.6, p < .001, r = .66$ but significantly less sad, $t(176) = -4.51, p < .001, r = .32$ and fearful, $t(176) = -6.45, p < .001, r = .44$ (Figure 15a).

In female faces, there was also a significant main effect for expression of face, $F(2, 352) = 141.02, p < .001, \eta_p^2 = .45$; but no main effect for dominance manipulation, $F(1, 176) = 2.49, p = .12, \eta_p^2 = .01$. Like the male faces, the interaction between expression of face and dominance manipulation was significant for female faces, $F(2, 352) = 42.66, p < .001, \eta_p^2 = .20$. Paired-samples t-tests revealed that female angry faces manipulated to look more dominant appeared significantly angrier, $t(176) = 7.48, p < .001, r = .49$ than those manipulated to look less dominant. Female faces manipulated to look high in dominance also appeared significantly less sad, $t(176) = -4.00, p < .001, r = .29$ than their low dominance counterparts (Figure 15b). There was a similar trend that did not reach significance for female fearful faces manipulated to look more dominant, $t(176) = -1.86, p = .065, r = .14$ (Figure 15b).

To explore the sex of face differences within the 3-way interaction, paired-samples t-tests were performed between the female and male faces. First, a difference score was calculated for each sex of face, between the high and low dominance faces, for each expression. This gave us an estimate of the amount of change between high and low dominance intensity scores within an expression. Paired-samples t-tests revealed a larger change in score for male than female angry faces between high and low dominance conditions, $t(176) = 3.65, p < .001, r = .27$, and the same was true of fearful faces, $t(176) = 3.09, p < .01, r = .23$. There was no difference in the change in score between male and female sad faces, $t(176) = .25, p = .81, r = .02$.

The three-way interaction then reflects that while dominance manipulation has similar effects on perceptions of sadness for male and female faces, the manipulation had a greater influence on both male anger and fear than it did on female anger and fear (see Figure 15).

a.



b.

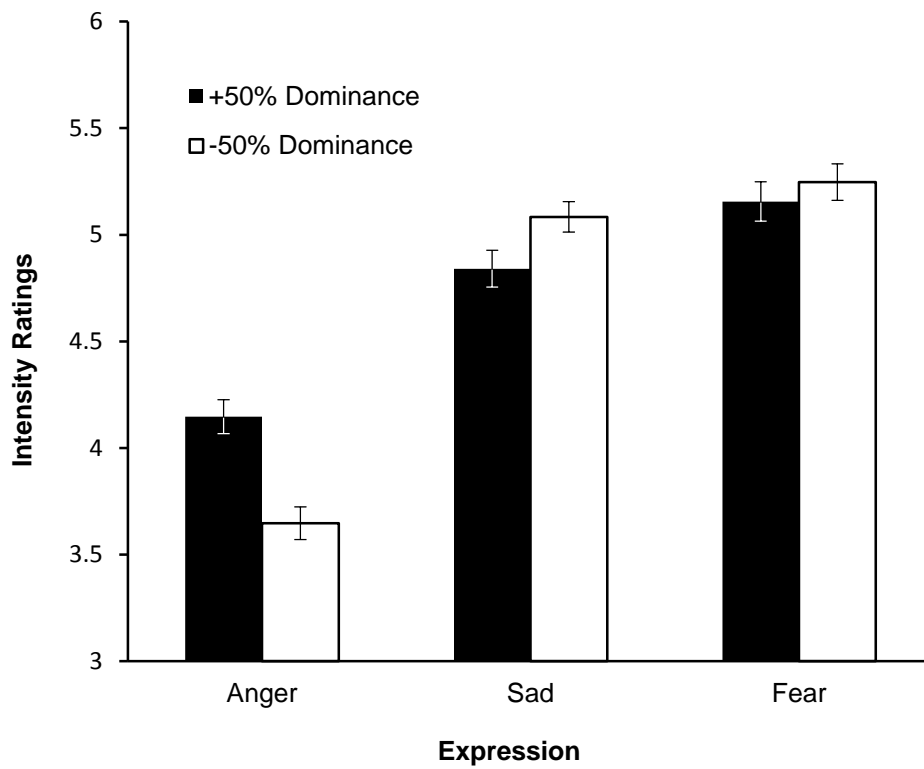


Figure 15. Mean intensity ratings of anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.

5.3.2.2 Checking for expression in our dominance composite images

As noted in section 5.3, dominance may impact on expression perception via resemblance between facial features associated with dominance and those of certain facial expressions rather than through any specifically psychological associations. In order to explore this possibility I performed a manipulation check to determine whether the intensity differences seen in this study were due to our composite images (Figure 13) containing characteristics of certain emotions. For example, when I originally asked participants to rate faces for dominance in order to create our composite images, they may have been rating faces which exhibited subtle traits of ‘anger’ as high in dominance, and those which exhibited subtle ‘sad’ and ‘fearful’ traits as low in dominance. To test this, two naïve, experienced FACS coders were supplied with a randomly selected image (from the set of stimuli used in both Study 1 and 2) of a face of each sex, with each expression, and in both high and low dominance manipulations. They were asked to code which action units (AUs) and their intensities were present in each image. One of the FACS coders found no difference between the high and low dominance transforms, both involving the same AUs of equal intensities, for all expressions and in both sexes. The second FACS coder noticed slight intensity changes between the low and high dominance male face manipulations of anger in AU 7 (C to D) and AU 24 (B to C), as well as the addition of AU 15 for the high dominance female angry face. Anger expressions are generally attributed to AUs 4, 5, 7, and 23, and so the AUs represented above do not provide evidence that the face was changing in a characteristically ‘angry’ fashion. Additionally, I manipulated both male and female neutral faces by 200% towards high dominance, far beyond the 50% manipulations used in this study (Figure 16) in order to see whether greatly exaggerating dominance in a neutral face would lead to some association with ‘anger’ expressions. Again, these manipulations were coded by both FACS coders as having a neutral expression, with no AUs of ‘anger’, or any other expressions, present. Finally, I manipulated male and female neutral faces by 200% towards low dominance, in order to see whether traits of sadness or fear were present. FACS coding again revealed that no AUs were present. These findings suggest that dominance manipulations do not alter face structure in such a way as to produce visible changes in the face that are diagnostic of facial expressions, even when the dominance manipulations are of much greater magnitude than those used in the study.



Figure 16. Top: The average neutral male (20 faces) and female face (19 faces) from the Radboud face set. Bottom: Average of the same individuals posing with anger expressions (left male and female faces) versus transforms of +200% dominant (right male and female faces, based on the transform described in Study 1).

5.3.3 Discussion

Study 1a examined whether the intensity of expressions of anger, fear, and sadness were judged differently depending on whether a face was manipulated to look high or low in dominance. The results showed that male and female faces manipulated to be high in dominance looked significantly angrier than those manipulated to look low in dominance. The opposite was true of fear and sadness for male faces, with the high dominance faces looking less sad and fearful than the low dominance ones. In female faces, those high in dominance were judged as less sad, but not less fearful than low-dominance faces.

Additionally, there was a main effect of expression of face in both male and female faces. The intensity attributed to each expression may simply be related to the extent that models who were posing these expressions interpreted the instructions. Indeed models posing ‘anger’ do not have their lips pressed together perhaps as firmly as would constitute a very high intensity rating of anger, and thus may be lower on the intensity scale. Because my main interest was within-subject differences in intensity rating between the high and low dominance facial transforms, these differences in intensity

between expressions did not impact on my conclusions. I also note that ratings of intensity are neither at floor or ceiling, meaning that dominance could impact on all expressions to the same extent.

Upon inspection, both male and female low dominance neutral facial composites (Figure 13) appear younger, have slightly upturned mouths, larger eyes, and the male composite has a narrower jaw, than the high dominance composites. I investigated whether some of these characteristics may have been structurally similar to facial expressions, and whether this could explain why we found an interaction between dominance and facial expression. For example, FACS coding of anger expressions require that the brows move down, the lips tighten, and the eyes become narrow (Ekman & Friesen, 1978); when this combination of AUs is active, it results in an easily discernible display of anger. Thus, it is possible that our manipulated images may have shared some of these features. However, of our two naïve FACS coders, one believed that there were no differences in the AUs involved and intensity of expression present in the 50% high and low dominance manipulations, while the other found small differences in intensity between AUs which were not systematically related to the expression of anger. Even in greatly exaggerated 200% manipulations of high and low dominance neutral faces there was no evidence of the presence of any emotional expressions. This suggests that the association I found between intensity of expression and dominance is unlikely to be purely structural, but instead points to a psychological interaction.

Earlier, I discussed several such theoretical possibilities. One is that the perceived dominance in a face activates the concept of dominance as well as those related to it, such as threat, force, intimidation, and anger. This kind of implicit, automatic conceptual association may well influence subsequent judgements about the intensity of anger in a face. However, also discussed was the possibility that the influence of dominance on expression judgements might derive from consciously generated inferences concerning the relationship between dominance and anger, which might also influence one's rating of expression intensity. One might explicitly reason that a dominant-looking individual is also one who is often angry, and this kind of inference could impact upon one's judgment of the intensity of that person's angry expression. In order to test this possibility, I introduced a response-time paradigm in an attempt to limit the possibility of participants basing their judgements on consciously derived decisions.

5.4 Study 1b

Study 1a examined rated intensity in which participants had unlimited time to rate the faces. I found that intensity of expression was perceived differently when expressed on a high or low dominance face.

In Study 1b, I used the same manipulated faces and explored whether there might also be differences in the speed and accuracy of classification of expressions. The limited time available for judgement and the use of reaction time to classify expression in Study 1b can also help determine if the effects of cross-talk seen in Study 1a rely on processes that require more conscious deliberation. If an interaction was present in this study, between static and dynamic features (indicated by differences in response-time) this could be suggestive of conceptual associations (those for which there is no conscious thought required) between structural dominance and certain expressions, rather than an explicit association (those associations which require conscious thought). Following the findings in Study 1a, I predicted that reaction times would be faster for angry male and female faces manipulated to look high in dominance, but slower for high dominance sad and fearful faces.

5.4.1 Methods

5.4.1.1 Participants

Thirty eight university students were recruited for this study (26 women; age $M = 22.84$, $SE = .96$).

5.4.1.2 Stimuli

Twelve female and 12 male faces exhibiting angry, sad, or fearful expressions were chosen at random (using a random number generator) from the Radboud face set used in Study 1. All eight faces used in Study 1 were also included in this study. These faces were manipulated to look 50% higher and 50% lower in dominance than the original face, using methods described in Study 1. In total this yielded 144 faces.

5.4.1.3 Procedure

Using E-prime software (version 2.0.8.79) the above faces were presented individually to the participants, in a randomized order. The participants were instructed to judge what expression was being shown as quickly as possible, though there was no response deadline and they were able to spend as long as they wanted per question. They were asked to press a button corresponding to the expression they thought was presented on the screen and were instructed to use only their index finger on the numeric keypad portion of the keyboard, and to press '8' for angry, '5' for sad, and '2' for fearful faces.

Participants first saw a set of 24 practice trials, allowing them to familiarise themselves with the keys and to experience each expression 8 times (four with female faces, and four with male). In the test phase which followed, participants were presented with two blocks of 72 faces each, with a break in between should they need to rest. Faces in the practice trial and test phase were different so that

participants did not become acquainted with the individuals and their expressions. Median reaction-times (RTs) were calculated for each participant's responses to high and low dominance faces, for each expression, and sex of face. We used medians as RT data tend to be positively skewed and this is a commonly used technique when trial numbers are equal between conditions (see Whelan, 2010 for review). The means of these medians were computed across participants, and these scores were used in the analyses described below. Following the reaction time study, participants were asked to complete a short standardised demographics questionnaire which included their age, sex and race.

5.4.1.4 Analysis

A 3 (expression of face; anger, sad, or fear) x 2 (sex of face; male or female) x 2 (dominance manipulation; high or low) x 2 (sex of participant; male or female) mixed-factor repeated-measures ANOVA was performed to examine whether reaction times and accuracy differed depending on whether the expression that the face exhibited, the sex of the face, the sex of the participant, and whether that face was manipulated to look more or less dominant. I also analysed mistakes made by individuals between conditions using paired-samples t-tests.

5.4.2 Results

5.4.2.1 Reaction times

Only correct responses were used in the analysis of RT data. The initial mixed-factor ANOVA revealed no significant main effect of sex of participant, $F(1,36) = .66, p = .42, \eta_p^2 = .02$, on reaction time, and no significant interactions involving this variable (all F 's < 1.8, p 's > .17), and the significant effects below remain unchanged if sex of participant is included. Sex of participant was therefore removed as a between-subjects factor. There was a significant main effect of sex of face, $F(1,37) = 13.16, p = .001, \eta_p^2 = .26$, with non-significant trends for expression of face, $F(2,74) = 2.30, p = .10, \eta_p^2 = .06$, and dominance, $F(1,37) = 2.86, p = .10, \eta_p^2 = .07$. There was no significant 3-way interaction between expression of face, sex of face, and dominance manipulation, $F(2, 74) = 1.02, p = .37, \eta_p^2 = .03$. However there were significant two-way interactions between sex of face and dominance manipulation, $F(1,37) = 6.04, p = .02, \eta_p^2 = .14$ and sex of face and expression of face, $F(2, 74) = 7.10, p = .002, \eta_p^2 = .16$.

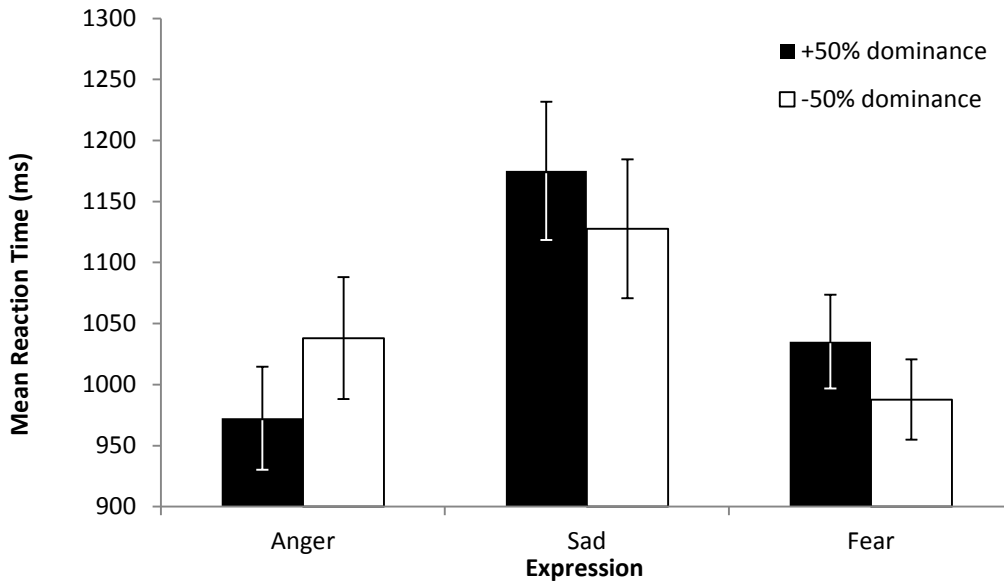
To further explore the above interactions with sex of face I split the data by sex of face and separate ANOVAs were performed with dominance manipulation and expression of face as within-subject factors. In male faces there was a significant main effect of expression of face, $F(2, 74) = 8.35, p = .001, \eta_p^2 = .18$, but no significant main effect of dominance manipulation, $F(1, 37) = .22, p = .64, \eta_p^2 = .01$, however this was qualified by a significant interaction between expression of face and dominance

manipulation, $F(2, 74) = 3.50, p = .035, \eta_p^2 = .09$. Paired-samples t-tests revealed that male high dominance angry faces were recognised faster than male low dominance angry faces, $t(37) = -2.11, p = .04, r = .33$ (Figure 17a). There were no significant differences in reaction times between male high dominance and low dominance sad and fearful faces (all $p > .15$).

In female faces there was a significant main effect of dominance manipulation, $F(1, 37) = 7.58, p = .009, \eta_p^2 = .17$, and no main effect of expression of face, $F(2, 74) = 1.08, p = .35, \eta_p^2 = .03$. There was no significant interaction between dominance manipulation and expression of face, $F(2, 74) = .04, p = .96, \eta_p^2 = .001$ (Figure 17b). Paired-samples t-tests showed no differences between the high dominance and low dominance angry, $t(37) = -1.4, p = .16, r = .22$ and sad, $t(37) = -1.20, p = 0.24, r = .19$ expressions, with a near-significant trend for high dominance fearful faces to be recognised faster than low dominance fearful faces, $t(37) = 1.98, p = .055, r = .31$.

To explore the sex of face differences, paired-samples t-tests were performed between the female and male faces. First, a difference score was calculated for each sex of face, between the high and low dominance faces, for each expression. This gave us an estimate of the amount of change between high and low dominance reaction times within each expression. Paired-samples t-tests revealed no significant differences in the reaction times for male than female angry faces between high and low dominance conditions, $t(37) = .15, p = .89, r = .02$; however there was a significant difference in the change in reaction times between male and female fearful faces, $t(37) = 2.34, p = .03, r = .36$, and a near significant difference in the change in reaction times between male and female sad faces, $t(37) = 2.06, p = .05, r = .32$.

a.



b.

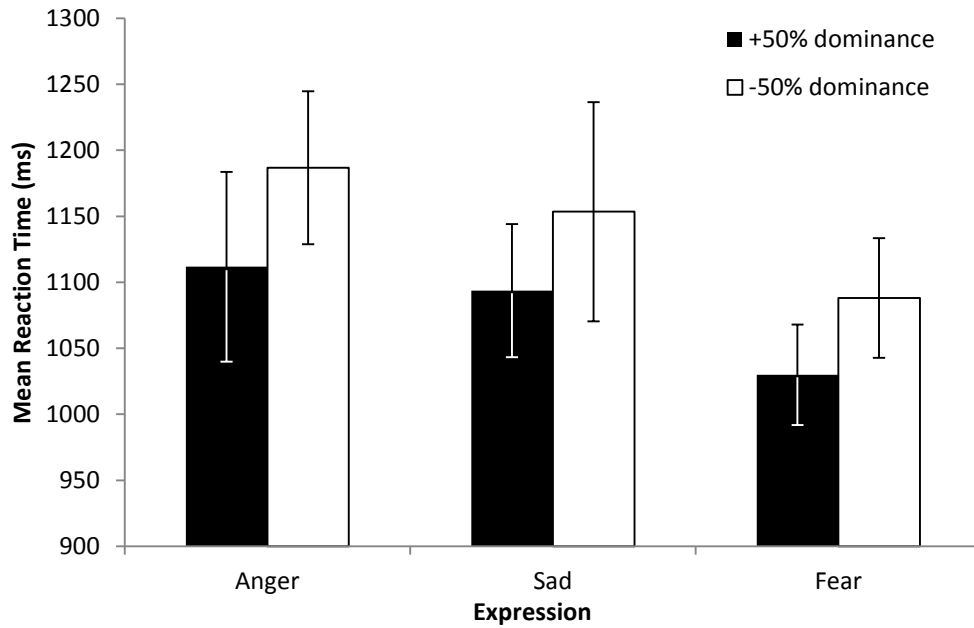


Figure 17. Mean reaction times for anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.

5.4.2.2 Accuracy

Accuracy scores were calculated as the proportion of correct responses made. The initial mixed-factor ANOVA revealed no significant main effect of sex of participant, $F(1,36) = .01, p = .97, \eta_p^2 < .01$, on accuracy and there were no significant interactions involving this variable (all F 's $< 1.84, p$'s $> .17$). When sex of participant was included in the analyses, all effects remained significant except for the 3-way interaction, which became non-significant, $p = .24$, likely due to decreased statistical power. Sex of participant was therefore removed as a between-subjects variable. There was a significant main effect of expression of face, $F(2,74) = 10.0, p < .001, \eta_p^2 = .21$, with near significant trends for the main effect of dominance manipulation, $F(1,37) = 2.89, p = .1, \eta_p^2 = .07$ and sex of face, $F(1,37) = 2.48, p = .12, \eta_p^2 = .063$. However, these were qualified by a significant 3-way interaction between expression of face, sex of face, and dominance manipulation, $F(2, 74) = 3.45, p = .037, \eta_p^2 = .09$.

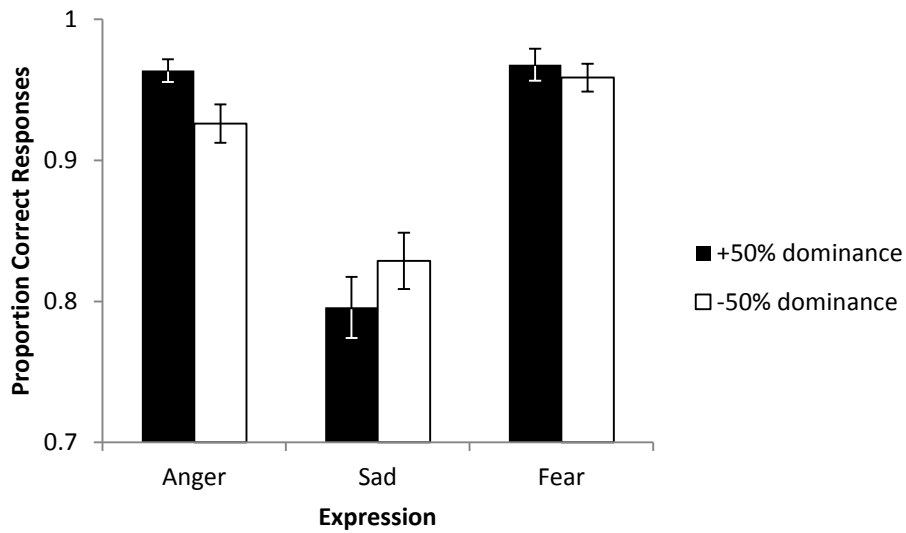
To explore this interaction, I split the data by sex of face and performed separate ANOVAs with dominance manipulation and expression of face as within-subjects factors. In male faces, there was a significant main effect of expression of face, $F(2,74) = 34.97, p < 0.001, \eta_p^2 = .49$ on accuracy, but a non-significant main effect of dominance manipulation, $F(1, 37) = .35, p = .56, \eta_p^2 = .01$. However these main effects were qualified by a significant interaction between expression of face and dominance manipulation, $F(2, 74) = 5.73, p = .005, \eta_p^2 = .13$. Paired-samples t-tests revealed that male high dominance angry faces were discerned significantly more accurately as angry than male low dominance angry faces, $t(37) = 3.32, p = .002, r = .48$ (Figure 18a). Additionally, male sad faces appearing high in dominance were identified significantly less accurately as sad than male sad faces low in dominance, $t(37) = -2.11, p = .042, r = .32$ (Figure 18a). There was no difference in accuracy for male high dominance and low dominance fearful faces, $t(37) = .58, p = .57, r = .09$ (Figure 18a).

In female faces, there was a significant main effect of expression of face, $F(2,74) = 8.87, p < 0.001, \eta_p^2 = .19$ and a non-significant trend for dominance manipulation, $F(1, 37) = 3.19, p = .08, \eta_p^2 = .08$ on accuracy. However these were qualified by a significant interaction between expression of face and dominance manipulation, $F(2,74) = 10.66, p < .001, \eta_p^2 = .22$ (Figure 18b). Paired-samples t-tests revealed that participants were much more accurate when judging that female high dominance faces were angry than low dominance female faces, $t(37) = 3.95, p < .001, r = .54$ (Figure 18b). There was no significant difference in accuracy for sad faces, $t(37) = .57, p = .57, r = .09$ and a slight though non-significant trend for low dominance fearful being more accurately recognised as fearful than their high dominance counterparts, $t(37) = 1.61, p = .12, r = .26$ (Figure 18b).

To explore the sex of face differences within the 3-way interaction in accuracy, paired-samples t-tests were performed between the female and male faces. First, a difference score was calculated for each sex of face, between the high and low dominance faces, for each expression. This gave us an estimate of the amount of change between high and low dominance accuracy scores within each expression. Paired-samples t-tests revealed a marginally significant difference in accuracy for male than female angry faces between high and low dominance conditions, $t(37) = -2.04, p = .05, r = .32$; however there were no significant differences in the change in accuracy between male and female sad faces, $t(37) = -1.18, p = .25, r = .19$, and fearful faces, $t(37) = 1.54, p = .13, r = .25$.

The three-way interaction then most likely reflects that while dominance manipulation has similar effects on accuracy on sadness and fear in male and female faces, the manipulation had a greater influence on anger for male faces than it did on anger in female faces (see Figure 18).

a.



b.

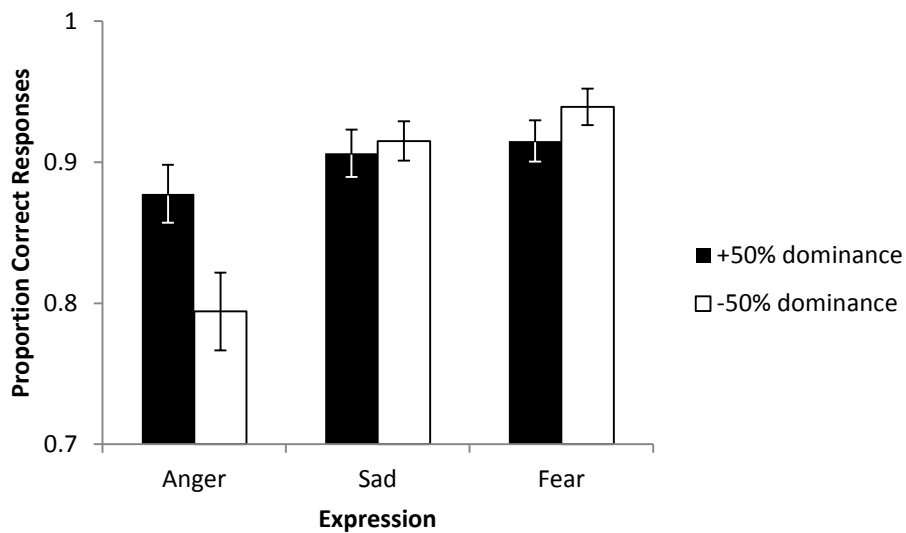


Figure 18. Proportion correct responses for anger, sad, and fear expressions for a) male and b) female faces manipulated to look 50% higher (black bars) and 50% lower (white bars) in dominance than unmanipulated face images. Note: Error bars denote between-subject variability.

5.4.2.3 Errors

The proportion of errors per trial type ranged between 0 and .58, with the highest mean errors reported for male high dominance sad faces being mistaken for angry ($M = .16$, $SD = .12$) and female low dominance angry faces being mistaken for sad ($M = .17$; $SD = .15$). To explore whether male high dominance sad faces were equally likely to be mistaken for angry or fearful, I performed a paired-samples t-test and found that high dominance sad faces were much more likely to be mistaken for angry

than fearful, $t(37) = 5.14, p < .001, r = .65$. Additionally, I found the reverse was true, whereby male low dominance angry faces were more likely to be mistaken for sad than fearful, $t(37) = 3.39, p = .002, r = .49$. Likewise, female low dominance angry faces were much more likely to be mistaken for sad than fearful, $t(37) = 5.42, p < .001, r = .67$ and female high dominance sad faces were more likely to be mistaken for angry than fearful, $t(37) = 2.21, p = .033, r = .34$.

5.4.3 Discussion

Study 1b was designed to investigate whether the cross-talk between expressions and the static facial features attributed to dominance, which I found in Study 1a, was also seen for reaction time and accuracy when participants were given a speeded expression classification task. While participants had unlimited time to make their decision, they were verbally instructed to classify which expression was being presented as quickly as they could, thus limiting conscious deliberation. I found differences in response-times, and accuracy, with speeded judgements of expressions from high and low dominant faces. Thus, my results suggest that the associations between static and dynamic facial features are present even when the ability to use conscious thought is curtailed. Participants were faster at responding to angry faces when the faces were manipulated for high dominance rather than low dominance. Because the 3-way interaction in reaction time scores was not significant, male and female faces were considered as behaving the same way. Additionally, accuracy was greater for angry high dominance faces than for low dominance faces, and lower for sad high dominance than low dominance male faces. Finally, more errors were made in the direction of 'sad' for male and female low dominance angry faces, and towards 'angry' for male and female high dominance sad faces. These data point to a perceptual confusion between sad and angry expressions which interacts with perceived facial dominance, whereby low dominance angry males are perceived as sad and high dominance sad males as angry.

In female faces, accuracy and error rates showed significant differences, with female high dominance angry faces being easier to recognise as angry than female low dominance angry faces. Similar to the male faces, errors were made with low dominance angry females being mistaken for sad, rather than fearful. Female high dominance sad faces were likewise mistaken for angry, rather than fearful. These results again highlight a potential perceptual confusion between sad and angry expressions that is changed by facial dominance in females as well as males.

5.5 Study 2

In Study 1a, I found that angry faces manipulated to look higher in dominance were rated as angrier than faces which were manipulated to look low in dominance. I also found that faces exhibiting sadness and fear were perceived as lower in intensity when manipulated to be high in dominance than low in dominance. In Study 1b, I replicated the effect when limiting, though not completely removing the possibility of conscious deliberation, demonstrating faster reaction times when responding to high dominance than low dominance angry faces. Both studies used manipulated faces in order to manipulate perceived dominance. In order to provide stronger evidence that there are conceptual associations between dominance and expressions, in Study 2 I used expressive male faces that were unmanipulated for structural dominance. Instead, with each image I paired a fictitious description from their peers as to whether they found that individual to be high or low in dominance, in order to examine whether it would influence how intense the expressions of each image were perceived to be. I chose to use male faces as Study 1a and 1b both suggest male dominance and anger are linked when judging intensity and judging expression when conscious deliberation is reduced.

From the results in Study 1a and 1b, I reasoned that providing information that a face belonged to a dominant person would make that face appear angrier while less sad and less fearful.

5.5.1 Methods

5.5.1.1 Participants

Two hundred and forty eight psychology undergraduate students and/or participants were recruited using the same methods as Study 1 (146 men; age $M = 26.1$, $SE = .61$).

5.5.1.2 Stimuli

In this study I used 10 expressive (anger, sadness, fear) male faces chosen at random from the Radboud face set. These faces were masked and cropped as described in Study 1; however the facial structure was not manipulated in any way. Instead, on the black background below each picture was written either 'high dominance' or 'low dominance' in 18pt white font.

5.5.1.3 Procedure

Similar to Study 1a, each participant was first instructed to fill in a demographic questionnaire. Prior to rating the faces they were told: 'peers were asked to rate each face for dominance and the overall consensus for that face is displayed underneath it.' Subsequently, they saw a total of 30 expressive face images presented sequentially in random order (10 male faces x 3 facial expressions), and were asked to

rate each for how intense expressions of anger, sadness, and fear were on a 7-point Likert scale, as described in Study 1a. For one set of participants, five of the ten male faces were randomly selected to be 'high dominance' and the other to be 'low dominance'. For another set of participants this was the opposite.

5.5.1.4 Analysis

A 3 (expression of face; anger/sad/fear) x 2 (dominance manipulation; high/low) x 2 (sex of participant; male/female) mixed-factor repeated-measures ANOVA was performed to examine whether changing participants' views of someone's dominance would alter how intense they thought that person's expression was.

5.5.2 Results

The initial mixed-factor repeated-measures ANOVA revealed no significant main effect of sex of participant, $F(1,246) = .78, p = .38, \eta_p^2 = .03$, on intensity of expression ratings and no significant interactions involving this variable (all F 's $< .76, p$'s $> .46$) apart from a theoretically unrelated significant interaction between expression of face and sex of participant, $F(2,492) = 6.47, p = .002, \eta_p^2 = .03$, which is not pursued here. When including sex of participant, the interaction between expression of face and dominance manipulation remains significant below. Sex of participant was thus removed as a between-subjects variable and the test was repeated. There were significant main effects for expression of face, $F(2,494) = 147.22, p < .001, \eta_p^2 = .37$, but no significant main effect of dominance manipulation, $F(1, 247) = 2.42, p = .12, \eta_p^2 = .01$. However, these effects were qualified by a significant 2-way interaction between expression of face and dominance manipulation, $F(2, 494) = 5.70, p = .004, \eta_p^2 = .023$.

In order to explore the 2-way interaction, data were split by expression of face and separate paired-samples t-tests were performed to examine the differences in rated expression intensity between those faces labelled as high dominance and those labelled as low dominance. Angry faces labelled high in dominance were rated significantly angrier than those labelled low in dominance, $t(247) = 3.1, p = .002, r = .19$, but sad faces labelled high in dominance were no less sad than those labelled low in dominance, $t(247) = -0.70, p = .49, r = .04$, and there was also no difference between dominance conditions for fearful faces, $t(247) = -0.43, p = .67, r = .03$ (Figure 19).

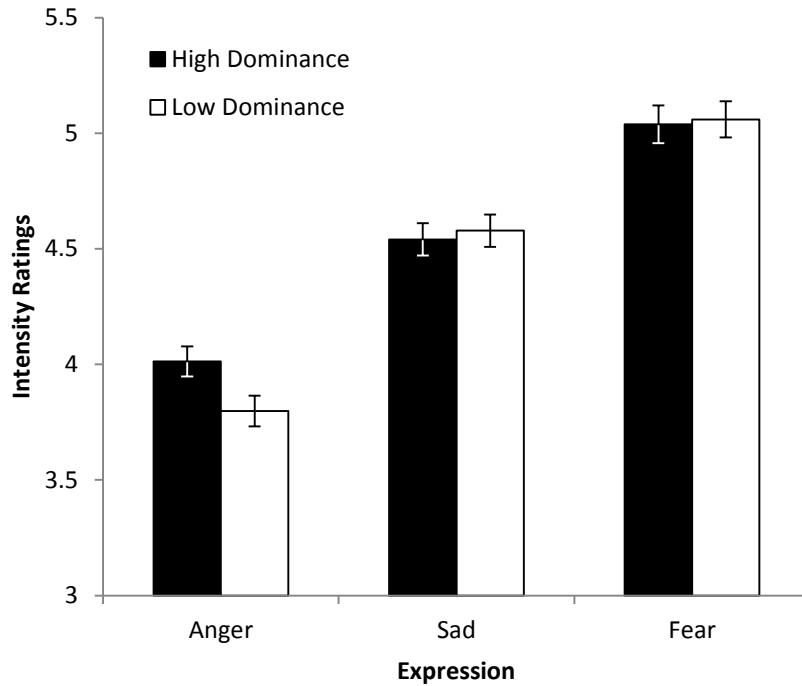


Figure 19. Mean intensity ratings of anger, sad, and fear expressions where face images were labelled as either ‘High Dominance’ (black bars) or ‘Low Dominance’ (white bars).

5.5.3 Discussion

In Study 2, I told participants that a face they were looking at on screen was either high or low in dominance, as rated by their peers, without manipulating facial structure. I found that angry faces which were labelled as ‘high in dominance’ were rated as higher in intensity than those same faces labelled as ‘low in dominance’. This provides evidence for a conceptual association between dominance and anger unrelated to facial structure changes. I did not find any significant associations with dominance and sad or fearful faces, and though there were no trends to report, the direction of the results was as predicted, where faces labelled as ‘high in dominance’ appeared less sad and fearful.

It is worth noting that my manipulation may not have been strong as I only told participants at the beginning of the survey that the labels below were what peers thought of these faces. I also made no mention to participants whether they should be actively paying attention to these labels or not. However, even given only this minimal information I was able to demonstrate an association between anger and labels of dominance. This finding also suggested that there is a stronger conceptual association between anger and dominance than dominance and the other two expressions tested (sadness and fear).

5.6 General Discussion

Dominance is a complex construct, and there are many factors that influence our perceptions of a person's behavioural dominance, including facial features (Keating et al., 1981; Mazur et al., 1994), certain personality characteristics (Ensari, Riggio, Christian, & Carslaw, 2011) and even voice pitch (Puts et al., 2006; Puts, Hodges, Cárdenas, & Gaulin, 2007). Of these, facial features are probably the most important in an initial encounter with a high or low dominance person as they are generally the first source of information we acquire. Consequently, the way in which emotional expressions are displayed (and then perceived) on faces varying in structural dominance is expected to be influential during social interaction.

In two studies (1a and 1b) I showed that manipulating the structural dominance of an expressive face changes the perceived intensity of the expression, and also affects the accuracy, errors, and speed of recognition of expressions. In Study 1a, I found that male and female faces high in dominance, and displaying angry expressions, looked angrier than those low in dominance. The opposite effect was seen for male and female sad faces, and for male fearful faces, with expressions of high dominance faces appearing less intense. In Study 1b, I found that recognition was faster, and accuracy improved for angry faces which were high in dominance compared with those low in dominance. Finally, for both male and female faces, more errors were made in the direction of 'anger' when sad faces were manipulated to look higher in dominance, and 'sad' when angry faces were manipulated to look lower in dominance. A subsequent study (Study 2) showed that there is an association between dominance and anger when dominance is presented as a written label and when facial structure is not manipulated. Study 2 then suggests that these results most likely reflect a conceptual association between anger and dominance.

5.6.1 Structural and perceived dominance interacts with dynamic expressions

There are several potential explanations for why others perceive highly dominant individuals' facial features as more intensely angry, and conversely less sad and fearful. FACS coding of faces in these studies suggests that this association is unlikely to be a purely structural one. That is, faces high in perceptual dominance do not possess characteristics which are diagnostic of anger expressions, and faces low in perceptual dominance do not possess characteristics of sad and fearful expressions. Additionally, the results of Study 1b serve to reduce the possibility that the interaction is purely based on some kind of conscious, deliberate reasoning deploying concepts of dominance. Participants were able to categorise the emotional expression, given a choice of three expressions (angry, sad, fearful), in a little over 1000 ms, which we believe leaves little time for conscious deliberation.

Thus, it is more likely that the concepts of dominance and anger are somehow psychologically associated through learning; if highly dominant individuals tend to act and react with anger and aggression, and less so with submissive traits or behaviours like fear and sadness, this could lead to one learning and applying the schema ‘high dominance = anger’ when faced with highly dominant individuals. In Study 2, I showed a clear association between dominance and anger in male faces when the only manipulation was the information participants received regarding the faces: they were either high or low in dominance as fictitiously ‘rated by peers’. Hence, facial dominance was not able to influence these judgements; however faces labelled as ‘high in dominance’ were still perceived as angrier than those labelled ‘low in dominance’.

Consequently, this automatic activation of the concept of anger, due to its association with dominance, may have biased the speed of categorisation (Study 1b) as well as judgements of anger intensity in both Studies 1a and Study 2. Recent studies suggest that facial dominance (i.e. faces with high fWHR) and aggression are linked (Carré et al., 2009; Carré & McCormick, 2008; R. T. Johnson et al., 2007), and many recent definitions of dominance, as distinct from another form of high status termed ‘prestige’, include the words ‘intimidation’, ‘coercion’, and ‘force’ (Cheng et al., 2010; Henrich & Gil-White, 2001, and Chapter 4 of this thesis). These associations can then be learned by others, becoming a reliable mechanism to discover who is highly dominant in the social surroundings.

5.6.2 Processing invariant and variant facial features

Early models of face processing postulated that the invariant facial features underpinning facial identity (i.e. facial structure) were processed independently from the transient features of a face including emotional expressions, lip movements, and eye-gaze direction (Bruce & Young, 1986; Gobbini & Haxby, 2007; Haxby, Hoffman, & Gobbini, 2000; Schweinberger & Burton, 2003). Some support was found for this hypothesis (Humphreys, Donnelly, & Riddoch, 1993; Le Gal & Bruce, 2002; Young, Newcombe, de Haan, Small, & Hay, 1993); however, recent work has suggested a more integrated approach for face processing, whereby these systems which were previously thought to be separate, instead interact in some way (Calder & Young, 2005). Indeed, using varying methodology from visual adaptation to Garner and Simon interference paradigms, there is increasing support for an interaction between facial identity and emotional expressions (Atkinson, Tipples, Burt, & Young, 2005; Bestelmeyer, Jones, Debruine, Little, & Welling, 2010; Ganel & Goshen-Gottstein, 2004; Schweinberger, Burton, & Kelly, 1999). For example Atkinson et al. (2005), found that the sex of a face influences emotion expression attributions, so men expressing fearful expressions were classified slower as men than those exhibiting happy expressions.

In these studies I showed an interaction between structural and dynamic facial processing systems (dominance and expression) but as discussed above, the associations could be in part conceptual at a high level (as evidenced by Study 2). Thus, they may be processed separately early on but interact at some level, suggesting that the distinction may not be relevant for general face perception. While I did not test which of these models was correct, the implication of the Bruce & Young (1986) model is separability and I show that at some level there is interaction when people see faces in Studies 1a and 1b.

5.6.3 Implications for social interactions with dominant individuals

This research fits with recent work by Oosterhof and Todorov (2009) in which the researchers found that manipulating trustworthiness affected perceived intensity of emotions; trustworthy-looking faces were judged as appearing happier and less angry than non-trustworthy faces even though the strength of manipulation was the same for both levels of trustworthiness. Oosterhof and Todorov (2008) also propose that dominance and trustworthiness are two orthogonal attributes on which people evaluate faces. Here I show that manipulating the second of these proposed structural traits (dominance) also produces changes in perception of expression intensity and speed of recognition. This association may also influence social interactions.

For a dominant individual, there may be direct benefits of having their anger perceived more intensely, quickly, and accurately. Firstly, these characteristics can remove any ambiguity from the expression; in essence there would be little doubt when a high dominance person is angry. Thus, if an individual high in facial dominance exhibits a more easily recognisable, unmistakable, and intense anger expression, this could ultimately lead to more power, authority, and ability to get one's way. The same could apply to female faces high in dominance, where we showed that high dominance increases participants' accuracy in discerning angry faces, and increases the perceived intensity of anger expressions.

Recent studies suggest that individuals negotiating with angry individuals tend to be more likely to concede (especially when they have no other alternatives), and also demand less in subsequent negotiations (Sinaceur & Tiedens, 2006; Van Kleef & De Dreu, 2010). Anger expressions alone have also been associated with avoidance behaviours (likely in response to perceived threat) from perceivers (Marsh, Ambady, & Kleck, 2005). Due at least in part to the conceptual association between dominance (whether structurally manipulated in Study 1a or perceived in Study 2) and the facial expression of anger, perceivers might be expected to react even more strongly towards individuals displaying both dominance characteristics and anger expressions simultaneously.

Error management theory suggests that when faced with uncertainty, individuals will opt to make less costly mistakes (Haselton & Buss, 2000; D. D. P. Johnson et al., 2013), and so perceivers might view a potentially dominant individual as a threat, regardless of whether they are acting as a threat at that moment in time or not. This bias to avoid costly mistakes, coupled with the introduction of a dominant individual acting in a threatening or angry fashion might lead perceivers to exhibit heightened responses than they would to an individual displaying either high dominance or anger alone. Potential responses to negatively valenced stimuli, including anger, and subsequently dominance due to the conceptual link between the two, might cause perceivers to adopt avoidance strategies towards dominant individuals in general (Chen & Bargh, 1999). Although reactions such as avoidance were not explicitly tested in these studies, it is worth speculating on the potential causal mechanisms for these findings.

Unlike anger expressions, fear and sadness expressions scored lower in intensity when on a highly dominant face in Study 1a. Additionally, in speeded classification of expressions (Study 1b), I found that angry female and male faces manipulated to look lower in dominance were more likely to be mistaken for sad than their high dominance counterparts. Conversely, I found that high dominance sad male and female faces were more likely to be mistaken for angry. This suggests that when onlookers have to make speeded judgements (perhaps catching only a glimpse of someone's face) they may find it more difficult to differentiate certain expressions depending on whether a face is high or low in dominance. This may render onlookers less able to pick up on cues of vulnerability from high dominance faces and/or perhaps misconstrue them as other expressions. Moreover, individuals high in facial dominance may be perceived as less timid (less likely to express sadness or fear, and to express these at a lower intensity) and more formidable (more likely to express anger, and to express these at a higher intensity) simultaneously. Indeed, previous studies have shown that faces expressing sadness and fear also score lower in perceived behavioural dominance, while faces expressing anger score higher (Hareli et al., 2009; Knutson, 1996). Together, these results suggest that individuals high in facial dominance are capable of, perhaps without being cognisant of it, concealing (sad and fear) and amplifying (anger) their expressions.

5.6.4 Limitations and future directions

In these studies I used the same individual's picture for each emotional expression and manipulated it for high and low dominance without changing other variables. In doing so, I was able to use more realistic appearing faces than previous studies which used computer generated models of expressions (as in Oosterhof and Todorov, 2009), while still keeping expression intensity constant across images.

Using non-manipulated faces would mean other variables including baseline expression intensity varied. I used the expressions of anger, sadness, and fear as these were thought most likely to be linked to dominance interactions than other expressions, however future studies could investigate other emotions. In Study 1b each expression was bound to a specific key which did not change, thus differences in response-time between expressions could be confounded by the response mechanics. Because this study focused on the differences between high and low dominance within each expression this did not hinder our interpretation of the data. Additionally, I used static images of expressions, to control expression intensity. Future studies could implement videos and look at more life-like scenarios. In order to test the hypothesis that anger and dominance are conceptually linked in a slightly different way to study 2, I could perform a reaction-time task in which high or low dominance angry faces are presented on screen for a very brief interval (in the order of a few hundred milliseconds) as a prime followed by a non-face object (i.e. a word) which is either sad or angry. I would expect a certain level of congruency whereby viewing a high dominance angry face (even without realising it was high in dominance) would lead to faster recognition of angry words as angry and similarly a low dominance angry face prime would facilitate faster recognition of sad words as sad.

Finally, I used a small number of source faces for these studies. Because all of the manipulations were identical, I focussed on the effects of the transform rather than variation in dominance in the source faces. Future studies could address the impact of starting dominance on the influence of changing dominance and expression perception.

5.7 Conclusion

In conclusion, these results suggest that varying the static, structural components of a face (i.e. stable traits associated with dominance) can change the way we perceive more dynamic aspects of a face, i.e. expressions. I found that real face images manipulated for high dominance were perceived as angrier, less sad, and less fearful than those manipulated for low dominance. I suggest that the mechanism behind the association of structural dominance and facial expressions is more likely psychological (i.e. how we view and/or relate to dominant individuals) which may not require much conscious deliberation, rather than structural (i.e. structural facial characteristics mimicking emotional expressions), and this was corroborated in Study 2, in which I did not manipulate structural dominance. Accuracy was also higher for angry male and female faces manipulated for high dominance, with errors highest when judging high dominance sad faces (mistaken for angry) and low dominance angry faces (mistaken for sad). These findings suggest an interesting interplay between the evolution of stable facial

characteristics associated with highly dominant people, and expression, and the ability of those who look more or less dominant to change the way a perceiver interprets their facial expressions, be it through speed of recognition, accuracy, or intensity.

Chapter 6 Sex differences in the perceived dominance and prestige of women with and without cosmetics

6.1 Abstract

Women wearing cosmetics have been associated with a higher earning potential and higher status jobs. However, recent literature suggests that status can be accrued through two distinct routes: dominance and prestige (Henrich & Gil-White, 2001). In two studies, I applied a standardized amount of cosmetics to female faces using computer software. I then asked participants to rate faces with and without cosmetics for various traits including attractiveness, dominance, and prestige. Men and women both rated the faces with cosmetics added as higher in attractiveness. However, only women rated faces with cosmetics as higher in dominance, while only men rated them as higher in prestige. In a follow up study, I investigated whether these enhanced perceptions of dominance from women were caused by jealousy. I found that women experience more jealousy toward women with cosmetics, and view these women as more attractive to men and more promiscuous. These findings suggest that cosmetics may function as an extended phenotype and can alter other's perceptions differently depending on the perceiver's sex.

6.2 Introduction

The use of cosmetics to manipulate facial appearance has a long history, with one such example being the use of kohl around the eyes in Ancient Egypt (Lucas, 1930). In this study, I examined the impact of cosmetics use on perceptions of women's social status and attractiveness. Skin and lip coloration have been associated with attractiveness and health (Fink, Grammer, & Matts, 2006; Matts, Fink, Grammer, & Burquest, 2007; Stephen, Coetzee, et al., 2009; Stephen & McKeegan, 2010), and a high contrast between the eyes or lips with the rest of the face is associated with youth, femininity, and attractiveness (Porcheron, Mauger, & Russell, 2013; Russell, 2003, 2009). Cosmetics, including concealers, eye-liner, and lipstick, can all act to make the skin appear homogenous and increase contrast between features (for an example of this effect see stimuli used in Etcoff, Stock, Haley, Vickery, & House, 2011). Indeed, numerous studies have found that using cosmetics makes women appear healthier, more attractive, and more feminine (Cash, Dawson, Davis, Bowen, & Galumbeck, 1989; Cox & Glick, 1986; Etcoff et al., 2011; Mulhern, Fieldman, Hussey, Lévêque, & Pineau, 2003; Nash, Fieldman, Hussey, Lévêque, & Pineau, 2006; Richetin, Croizet, & Huguet, 2004; Russell, 2003, 2009). Cosmetics use may also be linked to success in the work place. Beautiful people of both sexes tend to have a higher earning potential than those who are below-average or average looking (Hamermesh & Biddle, 1993) and female waitresses

wearing cosmetics have been shown to earn more tips than those without (Jacob, Guéguen, Boulbry, & Ardiccioni, 2009). Cosmetics have also been associated with perceived higher status, with women wearing cosmetics being judged to have higher status jobs including 'company director' and 'architect' versus perceived low status jobs such as 'child-minder' and 'cleaner' (Nash et al., 2006). Using an implicit association task, another study found that pictures of women's faces with cosmetics were also associated with higher status jobs more than lower status jobs (Richetin et al., 2004).

As discussed in Chapter 1, high social status can confer benefits including greater authority, wealth, and physical and mental wellbeing (Adler, Epel, Castellazzo, & Ickovics, 2000; Ball et al., 2001; Ridgeway, 1987). Additionally, as discussed in Chapter 1, there are two largely different routes to gaining high status, dominance and prestige. As Henrich and Gil-White (2001) point out, prestigious individuals are looked up to by members of their group, while dominant individuals are generally feared.

Until now, much research has focused on characteristics of high status in men; both behavioural and physical. For example, men with higher facial width to height ratios (fWHR; which is thought to be a marker of physical dominance), as discussed in Chapter 3, have been associated with increased aggression (Carré, McCormick, & Mondloch, 2009; Carré & McCormick, 2008) and deception (Stirrat & Perrett, 2010), while also possessing a higher achievement drive (Lewis et al., 2012). Cheng et al. (2010) also studied other-perceived dominance versus prestige in male athletes and found prestigious men to be associated with prosocial and intelligent attributes, while dominant men were thought to be more aggressive and less cooperative.

While some studies mentioned above do concern women's prestige and dominance (see Cheng et al., 2013, 2010; R.T. Johnson et al., 2007), these studies are based on self-report data which may differ from other's opinions of an individual's dominance and prestige. How cosmetics use fits into the bigger picture of women's social status, with specific focus on prestige and dominance has, to my knowledge, never been tested. In Western society, the almost exclusively female activity of cosmetics use has been shown to make women appear of higher status; however whether the mechanism is through appearing higher in prestige or dominance has yet to be determined.

6.3 Study 1

In order to address relationships between dominance, prestige, and status generally, I artificially applied a standardized amount of cosmetics to female faces and, using a within-subjects design, asked male and female participants to rate the faces for attractiveness, dominance, and prestige. Studies report that women wearing cosmetics appear both more attractive and more competent (Etcoff et al., 2011). If

competence is a measure of ability, then I would predict that women with cosmetics ought to be rated as prestigious rather than dominant. However, as femininity (a strong correlate of attractiveness) has previously been associated with social dominance, a probable facet of 'dominance' (Watkins et al., 2012), it might be that women with cosmetics are considered dominant by others.

Moreover, women's and men's strategies for gaining high status differ, as women are generally not as physically strong as men (Lassek & Gaulin, 2009), and are less likely to aggress physically in order to solve a conflict (Björkqvist, Lagerspetz, & Kaukiainen, 1992; Björkqvist, 1994; Campbell, 1999). This suggests that as dominance and social status acquisition behaviours between the sexes differ, it is plausible that perceptions of cosmetics use in women will also differ. That is, men and women may view women's cosmetics practices differently as a function of their own status acquisition mechanisms. Hence, while women with cosmetics are associated with higher status professions (Nash et al., 2006; Richetin et al., 2004), whether they are perceived as being high status through the perception of higher dominance or prestige is unknown, and whether this differs based on the perceivers' sex has yet to be explored.

6.3.1 Materials and Methods

6.3.1.1 Stimuli creation

Forty five female undergraduate students (age $M = 21.18$, $SE = .29$) from Bangor University were recruited for this part of the study. Models were asked to remove all traces of facial cosmetics and jewellery, and to tie their hair back from their face as much as possible. Models were then photographed against a white background, at a distance of approximately one meter. After the initial photograph, models were provided with a range of cosmetics items including eye-liner, mascara, blush, foundation, etc., and instructed to apply cosmetics as she would on a typical 'night out'. Subsequently, a second photograph was taken. All camera settings were identical between the first and second photographs. All models provided informed consent to have their pictures used for future studies.

Using Psychomorph software (Tiddeman, Burt, & Perrett, 2001) each of the 90 facial images (those with and without cosmetics) was delineated using a custom template consisting of 160 landmark points. The 45 faces with no cosmetics were then averaged to create a 'no cosmetics' composite, while the 45 faces with cosmetics were averaged to create a 'with cosmetics' composite. These were aligned on interpupillary distance and symmetrized (Figure 20).



Figure 20. Composite images of 45 women's faces with no cosmetics (left) and with cosmetics (right).

I used the composite images to apply cosmetics to the original 45 female faces without cosmetics. With Psychomorph, a 100% manipulation was used to evenly simulate the appearance of cosmetics on each face, by changing the coloration of the face in the same way that the no cosmetics composite can be changed to become the with cosmetics composite. In this way I was able to manipulate each face in precisely the same way, simulating the visual effects of cosmetics. Only texture and colour were manipulated, with no changes applied to face shape. The composite images both have even, homogeneously pigmented skin tone due to the morphing procedure which averages out the small-scale pigmentation irregularities that are present in normal skin. Thus the two composites differed only in terms of the coloration of different parts of the face (e.g. redder lips), but not in terms of the evenness of the skin tone. Because of this, the effect of this manipulation included all the major aspects of cosmetics as applied by the 45 women, with one exception—it did not increase the evenness of the skin tone, which is the effect of applying foundation and concealer.

The resulting 90 faces were then aligned on interpupillary distance and cropped such that the left and right zygion were visible, and the hairline and chin provided the upper and lower constraints. I excluded five faces from our stimuli set, as four of the original faces with no cosmetics had remnants of cosmetics around the eyes, while one woman had no discernible eyebrows. Thus, 80 stimuli (40 with cosmetics and 40 without) were included in this study (Figure 21).

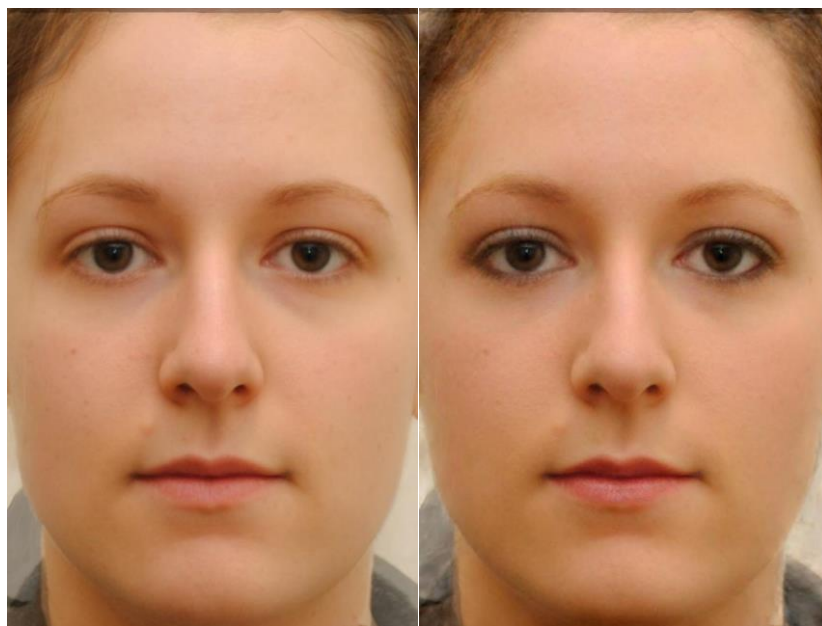


Figure 21. Example stimulus with no make-up (left) and with manipulation of added (100%) make-up (right). This figure was made by combining facial images of 3 women in the dataset so as to protect each woman's anonymity. However for the actual study, single pictures of each of the women's faces were presented to participants.

6.3.1.2 Participants

A total of 86 university students (59 female; age $M = 19.2$, $SE = .24$) were recruited to take part in the online portion of this study, for course credit.

6.3.1.3 Design

We used a 2x2 repeated measures design by using the stimuli as the unit of analysis. This allowed both manipulation type and sex of rater to be within-stimuli factors. Each stimulus was rated with and without cosmetics and mean scores were calculated separately for each sex of rater. This meant for each stimulus we had four ratings: female ratings of stimuli with and without cosmetics and male ratings of stimuli with and without cosmetics. For each stimulus, we also had three types of ratings as dependent variables: Attractiveness, dominance, and prestige.

6.3.1.4 Procedure

Students were provided with a link to the survey, which was created using Qualtrics (www.qualtrics.com; Qualtrics Labs Inc., Provo, UT). Participants were first asked their age, sex, nationality, and other standard demographic information. Following this, each student was instructed that they would be seeing faces of women and was asked to rate them on certain attributes in

comparison to the average woman. They were not told that cosmetics use was being manipulated. Each participant was then randomly assigned to one of two blocks: all faces with no cosmetics, or all faces with cosmetics. Subsequently they were randomly assigned to a specific attribute which they were to rate the faces for first. They then had to rate all 40 faces (which were fully randomized) for that attribute before continuing on to the next attribute within that block. There was an opportunity to rate faces for 3 different attributes (attractiveness, dominance, or prestige) and each participant was directed to use a 100 point scale (0 being 'much less than average' and 100 being 'much more than average') to make their judgment. Once they had completed rating the 40 faces for all three attributes they moved on to the other block. For example, if they had seen all faces with cosmetics first then they would subsequently see all faces without cosmetics, or vice versa. The attributes and faces to be rated within this second block were randomized as described above. Consequently, every participant provided a total of 240 ratings (3 attributes x 2 cosmetics conditions x 40 faces). I allowed participants to use their gut feeling when rating for each attribute; this procedure has been used in previous studies (e.g. Oosterhof & Todorov, 2008).

6.3.2 Results

6.3.2.1 Attractiveness

To investigate the difference in perceptions of attractiveness for stimuli with or without cosmetics I conducted a 2 (cosmetics manipulation: no cosmetics or with cosmetics) x 2 (sex of rater: male or female) repeated-measures ANOVA. There was a significant main effect of cosmetics manipulation, $F(1, 39) = 25.47, p < .001, \eta_p^2 = .40$, and a significant main effect of sex of rater, $F(1,39) = 91.93, p < .001, \eta_p^2 = .70$. However these were qualified by a significant interaction between cosmetics manipulation and sex of rater, $F(1,39) = 5.66, p = .02, \eta_p^2 = .13$ (Figure 22). To explore this interaction I calculated the difference scores between attractive faces with and without cosmetics (i.e. with cosmetics minus no cosmetics) for both female and male raters. I then performed a paired-samples t-test between the two difference scores to look at whether the change in attractiveness ratings differed in men and women. We found that the change in men's ratings between the no cosmetics and with cosmetics conditions were greater than those of female raters, $t(39) = 2.3, p = .02, r = .35$. That is, men thought women with cosmetics increased in attractiveness more than women thought they did, however both sexes perceived made-up faces to be more attractive (Figure. 3).

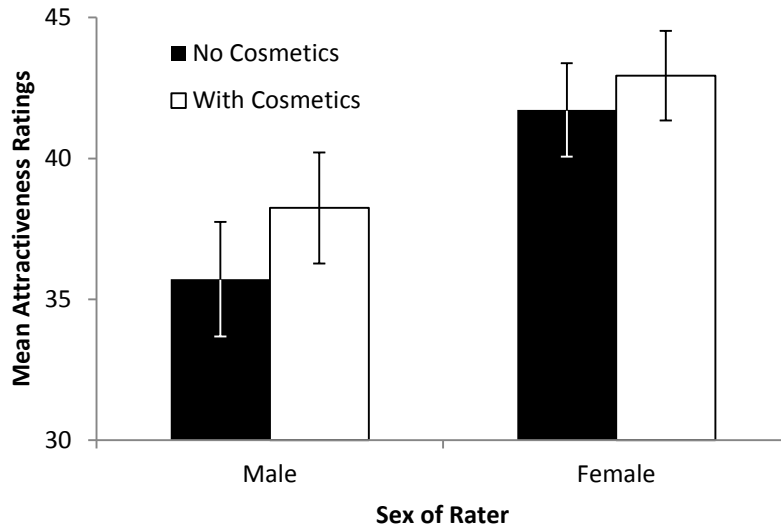


Figure 22. Attractiveness ratings for faces with and without cosmetics, as judged by male and female raters.

6.3.2.2 Dominance

A second repeated-measures ANOVA was performed to investigate perceptions of dominance for stimuli with or without cosmetics, again a 2 (cosmetics manipulation: no cosmetics or with cosmetics) x 2 (sex of rater male or female) design. There was a significant main effect of cosmetics manipulation, $F(1,39) = 4.74, p = .04, \eta_p^2 = .11$, and a significant main effect of sex of rater, $F(1,39) = 30.0, p < .001, \eta_p^2 = .44$. However these were qualified by a significant interaction between cosmetics manipulation and sex of rater, $F(1,39) = 5.65, p = .02, \eta_p^2 = .13$ (Figure 23). Follow-up paired-samples t-tests revealed that male rater's judgments of dominance were not significantly affected by cosmetics use, $t(39) = .36, p = .72, r = .06$, while female raters judged women with cosmetics as significantly more dominant than those wearing no cosmetics, $t(39) = 4.14, p < .001, r = .55$.

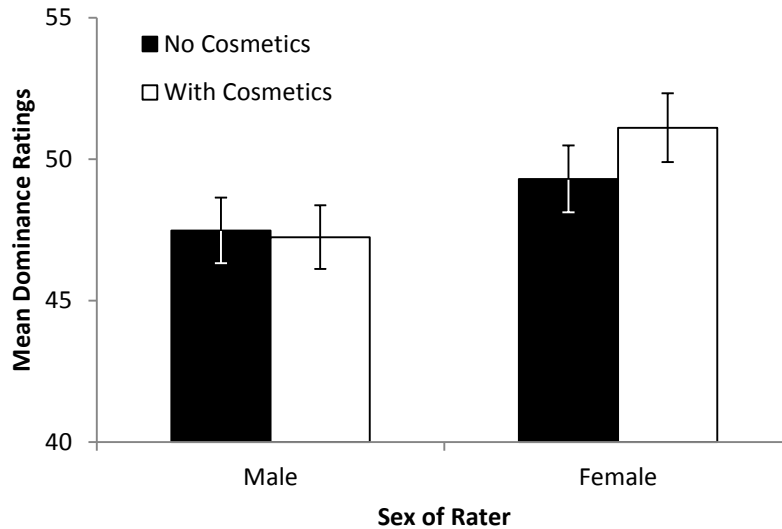


Figure 23. Dominance ratings for faces with and without cosmetics, as judged by male and female raters.

6.3.2.3 Prestige

To test whether cosmetics use had any effect on ratings of prestige, a third 2 (cosmetics manipulation: no cosmetics or with cosmetics) x 2 (sex of rater: male or female) repeated-measures ANOVA was performed. There was a main effect of cosmetics manipulation, $F(1,39) = 6.41, p = .02, \eta_p^2 = .14$, as well as a main effect of sex of rater, $F(1,39) = 70.37, p < .001, \eta_p^2 = .64$. There was also an interaction between cosmetics manipulation and sex of rater, $F(1,39) = 9.23, p = .004, \eta_p^2 = .19$ (Figure 24). Follow-up paired-samples t-tests showed that males judged faces with cosmetics as significantly more prestigious than those without cosmetics, $t(39) = 3.54, p = .001, r = .49$, while female rater's judgments of prestige were not significantly affected by cosmetics use, $t(39) = .23, p = .82, r = .04$.

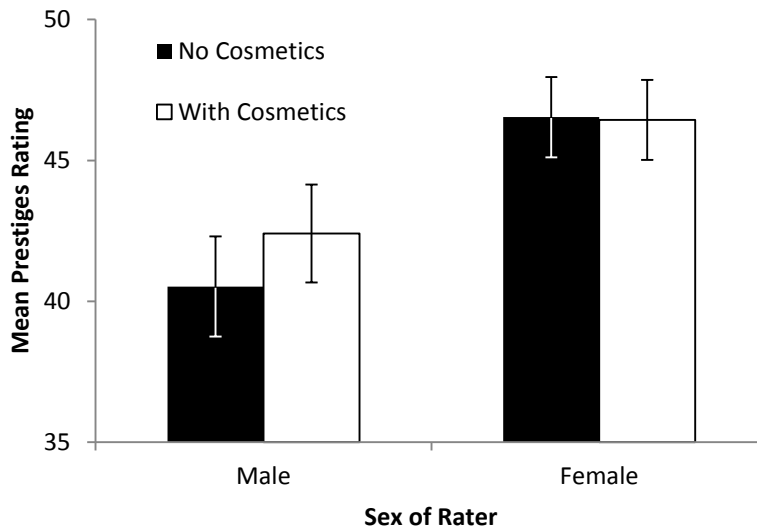


Figure 24. Prestige ratings for faces with and without cosmetics, as judged by male and female raters.

6.3.3 Discussion

Both sexes agreed that women were more attractive with cosmetics than without, and that women with cosmetics were of higher status. However in male raters, I found that women wearing cosmetics were perceived as being higher in prestige but no different in dominance than those without cosmetics. There may be several explanations for this finding. Firstly, men do not tend to compete directly with women, and competition with other males takes a different form than that in women, namely direct vs indirect methods of gaining status, as discussed in Chapter 1 (Section 1.5.2) and Chapter 4 (Section 4.2). It is unlikely then, that men would need to physically aggress against a woman in competition for something, and men are also stronger on average and therefore more likely to win in this type of context (Lassek & Gaulin, 2009). Thus, for men, a woman’s dominance would not be expected to differ depending on her cosmetics use. Secondly, attractive individuals tend to be associated with other positive qualities. For example, highly attractive individuals are perceived to have a better sense of humour, be higher in extraversion, and even be more likely to have a happier marriage than unattractive individuals (Albright, Kenny, & Malloy, 1988; Cowan & Little, 2013; Dion et al., 1972). This attractiveness “halo” effect may be the reason why men think women with cosmetics are also more prestigious, as prestigiousness itself is associated with the positive characteristics of agreeableness, prosociality, genuine self-esteem, etc. (Cheng et al., 2010, and Chapter 4 of this thesis). Finally, cosmetics have been shown to make women appear more competent (Etcoff et al., 2011), and prestige has been associated with possessing skills and knowledge (Henrich & Gil-White, 2001). Thus, the competence attributed to cosmetics use might

directly impact men's perceptions of women's prestige. However, competence may also be attributable to the aforementioned "halo" effect, whereby attractive women have the added positive quality of competence. Whatever the reasons, men appear to view women with cosmetics as both more attractive and higher in prestige.

In contrast to men, women rated women with cosmetics to be more dominant than those without, while there was no difference in their ratings of prestige between women with and without cosmetics. This might be due to raters finding other attractive women more threatening. Men have been shown to prefer women who are younger and more attractive, as these can be indicators of fertility and potential reproductive success (Buss, 1989; Kenrick & Keefe, 1992). As cosmetics can help a woman look both younger and more attractive, this could make other women feel threatened, and in turn jealous. Indeed, in several studies women report that they would feel more jealousy towards physically attractive rivals than less physically attractive rivals (Buss, Shackelford, Choe, Buunk, & Dijkstra, 2000; Dijkstra & Buunk, 1998). Highly attractive women are also perceived as having a greater number of sexual partners and as less restricted in their sexual encounters (Boothroyd, Jones, & Burt, 2008; Stillman & Maner, 2009). Thus it may be that women feel more threatened by attractive women and conversely may judge them as more likely to attract, or even to poach, mates.

Since dominance has been defined in the literature as attaining social status through manipulation or coercion (eg. Cheng, Tracy, & Henrich, 2010; Henrich & Gil-White, 2001) and has been associated with words including 'aggressive', 'intimidating', and 'arrogant' (Chapter 4), female raters may associate these negative characteristics with attractive women in part due to the jealousy they experience. This may explain why there were no differences for prestigious ratings, as characteristics of prestigious individuals are generally positive. A recent study found that feminine women were rated as more *socially dominant* (Watkins et al., 2012), and femininity correlates very strongly and positively with attractiveness in female faces (see review by Rhodes, 2006). As women are thought to use direct and indirect psychological aggression as opposed to physical aggression (Björkqvist et al., 1992; Björkqvist, 1994; Conway, Irannejad, & Giannopoulos, 2005) and form hierarchies through social behaviours including creation of, and exclusion from, cliques (Campbell, 1999; Eder, 1985) it may be that 'manipulative' and 'coercive' fit within *social dominance*. Indeed in Chapter 4 we find that the world 'manipulative' was placed within the social dominance category as well as the broader, overarching category of dominance for both sexes (see Figure 12). Thus women's perceptions of women with cosmetics may align with the dominant aspect of social status rather than that of prestige.

6.4 Study 2

As women wearing cosmetics have been associated with higher status careers, in Study 1 I investigated perceptions of women with cosmetics regarding two main routes to high status: dominance and prestige. I observed that women wearing cosmetics were perceived as higher in dominance by other women (but not men). To further understand why women might see women using cosmetics as dominant, in Study 2 I investigated whether jealousy may have played a role. Women have been shown to feel a greater sense of jealousy towards attractive than unattractive women (Buss et al., 2000; Dijkstra & Buunk, 1998), and as the findings from Study 1 suggest that women with cosmetics appear more attractive, it may be jealousy driving the findings for dominance. First, I asked women how jealous they would feel if a woman with or without cosmetics were to interact with their partner. Additionally, I also conducted 2 short forced-choice tests to investigate other perceptions of women with and without cosmetics including their promiscuity and their attractiveness to men. I did this in order to examine the further nuances of whether attractiveness differences in women with and without cosmetics may affect jealousy, which may in turn be the reason why women with cosmetics are perceived as more dominant. If women find women with cosmetics more attractive, they may feel that men would make similar observations, and this could lead to their being more jealous of them (i.e. intrasexual competition for mates).

6.4.1 Methods

6.4.1.1 Participants

A total of 48 undergraduate women studying Psychology at university (age $M = 21.2$, $SE = .70$) were recruited to take part in this study for course credit.

6.4.1.2 Stimuli

Stimuli used in this study were identical to those used in Study 1 described above; all 40 female faces with and without standardized cosmetics were used.

6.4.1.3 Design

As in study 1, I used a repeated-measures design with each stimulus as our unit of analysis. Each stimulus was rated with and without cosmetics by female participants. This time the dependent variables of interest were jealousy, attractiveness to other women, and promiscuity.

6.4.1.4 Procedure

Participants were first asked to fill out a standard demographic questionnaire as described above. Subsequently, each participant was instructed that they would be seeing faces of women and was asked to rate them on a 1 to 7 point Likert scale (1: “low”; 7: “high”) on the question: “how jealous would you feel if this woman were to interact with your partner?”. As in Study 1, faces were presented sequentially one after the other in blocks, where women saw all faces with or without cosmetics separately and this was randomized between participants.

Two additional short forced-choice studies were conducted. In these, participants saw each woman’s face both with and without cosmetics on the screen (side-by-side). They were then asked to choose which of the two faces presented “men would find more attractive” and which of the two faces “appears more promiscuous”. Participants saw all face-pairs in blocks, first rating for one of the questions (attractiveness to men or promiscuity) and then the other. The side of the screen which faces with cosmetics and those without were presented was randomized. There were eight gradated response options, with participants able to choose “definitely this one”, “mostly this one”, “probably this one” and “guess this one” for each of the two faces. These were scored as -4 to +4 with negative numbers indicating a decision towards the face with no cosmetics while positive numbers indicated a decision towards the face with cosmetics. At no time during any of the studies were participants told that cosmetics were being manipulated.

6.4.2 Results

6.4.2.1 Jealousy

To examine how jealous the faces presented made female raters feel, all ratings were averaged to produce a single score for each stimulus face with and without cosmetics. A paired-samples t-test revealed that participants felt they would be more jealous of women with cosmetics than those without, $t(39) = 5.2, p < 0.001, r = .64$ (Figure 25).

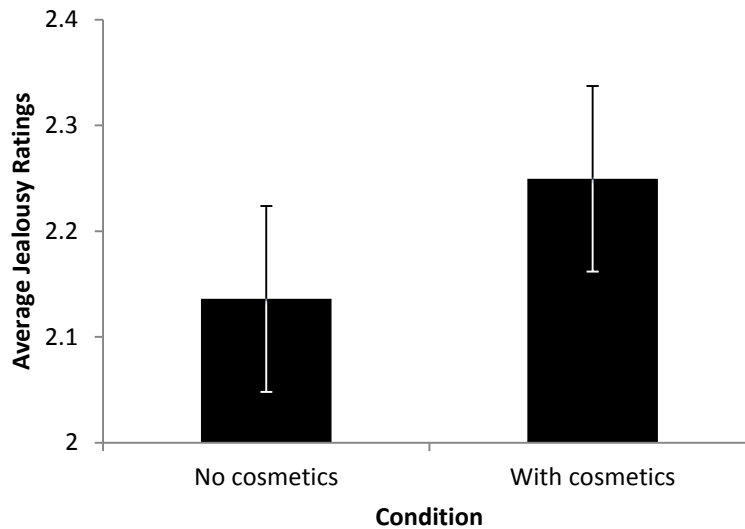


Figure 25. Jealousy ratings for faces with and without cosmetics, as judged by female raters. Note that jealousy ratings were recorded on a 1-7 point Likert scale.

6.4.2.2 Promiscuity and attractiveness to men

For each participant, their forced-choice ratings (from -4 to +4) were averaged for all 40 stimulus face-pairs. I then performed a one-sample t-test using the participant's average scores against a mean of 0. This allowed me to test whether there was a propensity for either faces without cosmetics or faces with cosmetics to be associated with either promiscuity or higher attractiveness to men. For promiscuity, faces with cosmetics were judged to be significantly more promiscuous than those without, $M = 1.90$, $SE = .16$, $t(36) = 11.58$, $p < 0.001$, $r = .89$. The same was true for attractiveness, whereby women judged faces with cosmetics to be more attractive to men than faces without cosmetics, $M = 1.8$, $SE = .12$, $t(36) = 14.90$, $p < .001$, $r = .93$.

6.4.3 Discussion

In Study 2, I examined whether women rate faces of other women with cosmetics as more dominant than those not wearing cosmetics, as shown in Study 1, due in part to jealousy. I found support for this hypothesis in that women reported that they would be more jealous of women with cosmetics than those without. Additionally, when presented with a forced-choice paradigm, women perceived faces of women with cosmetics as both more attractive to men and more promiscuous than their counterparts not wearing cosmetics. These findings indicate that women may be particularly jealous of other women which men find attractive, as attractive women may signal the highest threat to a relationship. Also,

women with cosmetics may be considered a threat due to their being perceived as more promiscuous; however it is important to note that women may also be aware that they appear more promiscuous to others when wearing cosmetics.

6.5 General Discussion

In two studies, I examined the effect of facial cosmetics use on perceived social status in women and the potential mechanisms underlying these perceptions. Using a within-subjects design for cosmetic use and a novel technique of applying standardized cosmetics, I found that women with cosmetics applied to their faces were perceived as more attractive by both men and women. An interaction between sex of rater and cosmetics use suggested the link between cosmetics and higher attractiveness was stronger in men. Both sexes thought that women with cosmetics looked higher in social status; however male raters thought they looked more prestigious, while female raters thought they looked more dominant. Men, however, did not find women with cosmetics more dominant, and women did not find them more prestigious. These findings provide support for the notion that dominance and prestige are two separate aspects of social status because here I found them to vary independently with cosmetics use. These data also suggest that there are certain attributes that both male and female raters agree on (i.e. attractiveness) as well as disagree on (i.e. dominance and prestige) when viewing women wearing cosmetics.

One similarity between the sexes was that both men and women thought women wearing cosmetics were more attractive. Skin quality and appearance have previously been shown to alter perceptions of attractiveness (Fink et al., 2006; Matts et al., 2007), and if cosmetics, including concealer and foundation, act to make the skin appear more homogeneous, it follows that these faces are also rated higher in attractiveness. Higher contrast between facial features and the surrounding skin have also been linked to attractiveness, femininity, and youthfulness (Porcheron et al., 2013; Russell, 2003, 2009). As cosmetics are commonly applied to accentuate facial contrast (e.g. through use of eye-liner, lipstick), it is likely that this is also responsible for the attractiveness findings I observed. Thus, both smoother-looking skin and heightened facial contrast can make women appear more attractive, and previous studies have shown that cosmetics do indeed make women look more attractive (Cash et al., 1989; Etcoff et al., 2011; Mulhern et al., 2003; Nash et al., 2006; Richetin et al., 2004). Here I manipulated facial contrast but not skin homogeneity, and found that faces were rated as more

attractive. Future research could manipulate skin homogeneity alone to compare with the current findings.

Additionally, I found that women rated faces with cosmetics as more dominant, and in a follow-up study deduced that this may in part be explained by jealousy. Women's faces with cosmetics were judged to appear more promiscuous, to be more attractive to men, and instilled a greater sense of jealousy than those faces without cosmetics. As more attractive women have previously been shown to be perceived as more promiscuous (Boothroyd et al., 2008) and to induce a greater sense of jealousy (Buss et al., 2000; Dijkstra & Buunk, 1998) it seems plausible that the attractiveness benefits garnered from cosmetics may be responsible for this finding.

Conversely, men thought women with cosmetics were no more dominant than those without cosmetics, but were instead more prestigious. The association of positive qualities (such as prestige) with attractiveness (Dion et al., 1972) may be one reason for these findings, as I showed that men find women with cosmetics more attractive, which has also been shown in previous literature (e.g. Etcoff et al., 2011; Mulhern et al., 2003). In relation to the lack of perceived dominance, as men do not compete and aggress in the same manner as women (Björkqvist, 1994) men may have less likelihood of associating women with dominance generally.

These data have important implications for sex differences in the perception of women wearing cosmetics. For example, in the mating market, it may be important to note that cosmetics use accentuates ones' attractiveness. Evolutionary psychology literature suggests that men are interested in women who outwardly exhibit youth and beauty as reproductive partners, as these qualities can be indicators of fertility (Buss, 1989). Thus, women wearing cosmetics may gain certain advantages including access to high value men; if these women are considered attractive then they can perhaps be choosier when selecting a male partner. Additionally, interactions with men may be more rewarding due to the benefits of being perceived as both more attractive and prestigious. That is, women may be conferred certain benefits from men including greater attention, respect, and influence.

In contrast to a positive effect of cosmetic use on interactions with men, cosmetic use may have a different effect on interactions with other women. The benefits in attractiveness (and social status) gained by application of cosmetics may lead to less desirable reactions and even higher levels of competitive behaviour from other women. While there are benefits to being perceived as higher in dominance, namely the ability to get ones' way, interactions with other women may be more unpleasant. For example, in one study of adolescents, higher status girls (those who were perceived as more popular) were rarely the most well-liked, and in fact many of their female peers actively disliked

them (Eder, 1985). However, the fact that these girls were still highly popular even without being liked supports a case for women of perceived high status being formidable, and influential, even without the support of other women. Thus, there is the potential to experience certain costs (mostly from women) and benefits (mostly from men) when using cosmetics, which may influence the outcomes of interpersonal interactions.

These results suggest that cosmetics may function as an extended phenotype (Etcoff et al., 2011) whereby certain features and characteristics can be exaggerated to appear more attractive. In a recent non-human animal example, greater flamingos were found to secrete carotenoid-rich oils into their oil glands, which they spread over their wings to enhance their red coloration, much like cosmetics (Amat et al., 2011). This in turn affects their attractiveness to females, with redder birds being perceived as more attractive. In this research I demonstrated that the increasing attractiveness that cosmetics confer to women serves to simultaneously signal dominance to potential rivals, while increasing their perceived mate value to potential partners. Furthermore, cosmetics may function as a supernormal stimulus by exaggerating sexually dimorphic traits like facial contrast (Russell, 2009) that serves as a powerful cue to perceived sex. These sorts of exaggerations confer greater mating success in non-human animals (Winqvist & Lemon, 1994). This exaggeration of sexual dimorphism may be an indicator of mate value, which is perceived as both threatening and desirable by women and men respectively. If this is the case, then it would go some way to explain why cosmetics have been used throughout much of human history (Etcoff, 1999) and across the majority of human cultures (Jablonski, 2006), and why the cosmetics industry is worth millions of dollars today (Etcoff, 1999).

6.5.1 Limitations and future studies

In Study 1, I allowed female and male participants to use their inherent ideas of dominance and prestige in the ratings, rather than providing them with concrete definitions. This methodology has been used in many previous studies (e.g. Jones, DeBruine, Little, Watkins, & Feinberg, 2011; Oosterhof & Todorov, 2008; Sutherland et al., 2013; Watkins et al., 2010); however, it is unclear whether both sexes were rating the faces using the same working definitions. Thus it is possible that the differences I observed are attributable in part to the way in which the faces were rated, and that ratings may have differed if participants were provided with definitions. Revealing exactly what men and women think dominance and prestige mean would help in the interpretation of these data (See Chapter 4 for differences in dominance and prestige between the sexes); however it does not detract from the differences I observed in these studies, and instead is a useful direction for future research. Through this research I also aimed at standardizing the amount and quality of cosmetics applied to each of the faces;

however cosmetics are applied in different ways by different women. Future studies could explore how applying cosmetics in a particular fashion (e.g. very dark eye-shadow or eye-liner, or even varying colours) might affect perception by others.

6.6 Conclusion

Using a novel approach to apply a standardized amount of cosmetics to faces, in Study 1 I found that men and women both viewed the faces of women wearing cosmetics as more attractive and as higher in status, in line with previous findings in the literature. However, women with cosmetics were viewed as more dominant by other women and as more prestigious by men. Furthermore, Study 2 highlighted that women experience more jealousy toward women with cosmetics, and find these women to be more attractive to men and also more promiscuous. This difference in perception can have repercussions on these women's interactions with others. As many women wear cosmetics, either sporadically or on a regular basis, knowing the effect of cosmetics use on other's perceptions may be important in judging how to present oneself to others. Broadening our understanding of the ways in which cosmetics use may affect other's perceptions would be a valuable next step.

Chapter 7 General Discussion

7.1 Synopsis

This final chapter aims to synthesise and summarise the main findings of my thesis. In addition, I aim to place my findings in the context of wider research while highlighting potential applications, future studies, and limitations.

7.2 Summaries

In Chapter 1, I summarised how group living necessitated hierarchy formation for the purpose of aggression reduction within the group. I also explored what is currently known about human social status, specifically focusing on dominance and prestige.

In the first experimental chapter, Chapter 2, I used novel software (EvoFIT) to allow participants to create faces displaying different social traits using evolutionary algorithms, a method not currently used in evolutionary psychology research, in order to create dominant, prestigious, and attractive individuals. Participants created the faces of these individuals based on short descriptions, which were later rated for status and personality characteristics by naïve observers. I found that not only were these artificially created faces differentiable on status, but that they also differed in personality characteristics. Thus, reliable judgements of status and personality were attainable from physical characteristics contained within artificially created faces. It appeared that the dominant faces were most strongly differentiable, with dominant male and female faces appearing highest in dominance in comparison to the prestigious and attractive faces, and also very low in these two other traits. In Study 3, I also showed that the dominant faces created had the most variable personality characteristics, with both male and female faces being rated lower in agreeableness than prestigious and attractive faces, as well as low in extraversion and openness to experience. The results from all three studies in Chapter 2 suggest that 1) using EvoFIT, participants can accurately create distinct faces given only written descriptions of people's behaviour, and 2) The resulting faces appear different to naïve raters both in terms of status and personality characteristics. Moreover, the clear differences between the dominant and prestigious faces alluded to there being certain facial cues to status which had previously not been studied with respect to prestige.

The findings in Chapter 2 were further investigated in the four studies reported in Chapter 3, as once I had ascertained that facial shape does cue social status, even in participant-generated faces, I

aimed to investigate what specific facial features or characteristics viewers might be using in their judgements. In studies 1-3 I examined whether natural variation in facial width to height ratio (fWHR) affected how others perceived faces of participants, and how the owners of the faces perceived themselves. I found that fWHR and self-perceived dominance were positively correlated in men, but not women, and the same was true of fWHR and other-perceived dominance. In a fourth study, I also uncovered that the dominant faces created by participants using EvoFIT had higher fWHR than those created to look prestigious and attractive. As in Chapter 2, this suggests that dominant male faces, at least in part, have features that are recognisable as dominant by onlookers. In addition, the fact that fWHR was not related to self-perceived prestige (Study 3) and was not associated with the prestigious EvoFIT faces (study 4) suggests that fWHR is specifically an indicator of dominance. This means that there may be other cues to prestige in faces that are not related to facial width.

In Chapter 2, and for Study 4 of Chapter 3, I used descriptions of dominance, prestige, and attractiveness in order to allow participants to create faces. These descriptions were compiled using current literature, however, descriptions differ depending on the academic field, with some descriptions of social status being quite broad while others are very narrow. Hence, in Chapter 4, I aimed to explore what specific words were associated with the broad concepts of dominance, prestige, social dominance, and physical dominance. I was most interested to see whether the already adopted language was applicable and accurate. Many of the words used were applicable to their specific concept. For example, dominant individuals of both sexes were considered to be aggressive, manipulative, and intimidating, while prestigious individuals of both sexes were patient, agreeable, and cooperative, among others (Cheng et al., 2013; Henrich & Gil-White, 2001). Similarly, I found sex differences related to concepts like dominance, whereby dominant women were considered to be 'masculine' and 'physically strong', but those two physical traits were used to describe high status men generally. High status women were also described as 'moral', while this only applied to high prestige men. These differences in the words used to describe men and women's social status again allude to there being different ways of achieving social status for men and women (Björkqvist et al., 1992; Björkqvist, Osterman, & Lagerspetz, 1994; Björkqvist, 1994).

Other words including 'influential' and 'skilful', which have typically been used to label competence, were considered to be the mark of a high status person rather than related to prestige as previous research has suggested (Cheng et al., 2010). Uncovering which words fit into which concept will help others exploring these topics to adopt a more exact approach, be it in designing questionnaires or

when instructing participants. Thus, the results of Chapter 4 can help to create very precise definitions of both male and female social status (see Figure 12).

In Chapter 5, I moved away from word descriptions of social status, and focussed instead on facial structure, facial expressions, and perceptions of dominance specifically. In this Chapter, I explored whether changing the perceptual dominance of angry, sad, and fearful faces would change how intense those expressions were perceived to be. This was done by both physically manipulating the faces on a sliding scale of dominance using Psychomorph software, and also through leading some participants to believe that their peers had rated the faces as high or low in dominance while not physically manipulating any facial features; this part was done for the angry male faces only. In Study 1a, I found that male and female faces angry faces looked even angrier when I experimentally increased the dominance within the faces using Psychomorph. Sad and fearful faces, however, looked less sad and fearful, respectively, when the dominance within the faces was increased. These results suggest that manipulating an expressive face based on perceived dominance changes how intense the expression appears.

I was also interested in exploring what the potential mechanism behind these findings was. In Study 1b, I introduced a reaction time task in which participants were given a classification task where they were instructed to press one of three keys depending on whether the face that had appeared on the screen was angry, sad, or fearful. This was done in order to limit explicit thinking and facilitate instinctual responses. Angry male faces manipulated to appear more dominant were classified significantly quicker than those manipulated to appear less dominant. Male faces manipulated to appear more dominant were also classified as sad and fearful more slowly, though not significantly so, than their lower dominance counterparts. For female faces, I found that across all expressions higher dominance led to faster classification, however within each expression the speed of classification between the high and low dominance faces was not significant. Additionally, when errors occurred, high dominance sad faces were mistaken for angry, and low dominance angry faces were mistaken for sad. This suggests that there may be some conceptual association between high dominance and anger, and low dominance and sadness, which was clouding participants' abilities to make accurate classification judgements. Even though I attempted to limit the time in which participants could respond by explicitly instructing them to answer as fast as possible, I was still unable to say definitively whether the findings were due to a non-conscious association between status and facial expressions or whether there was conscious thought involved when making the judgement. In addition, it is important to note that these findings were most likely due to a psychological association between dominance and expressions and

not due to our manipulations making the faces appear to have expressions; all facial expressions were rated as having the same intensity by naïve FACS coders regardless of manipulation.

As changes in ratings of expression intensity were most robust in male faces, I decided to pursue a different line of evidence for a conceptual, or non-conscious, association between dominance and expression in male faces. In Study 2 of Chapter 5, I investigated whether simply manipulating what raters thought about the faces would be enough to see changes in expression intensity, while not physically manipulating any facial features. In this study I told participants that their peers had previously rated the faces on dominance and underneath each face they saw either a 'low dominance' or 'high dominance' label, denoting how that particular face had been rated. Some participants saw one face as 'high dominance' while another set of participants saw that same face labelled as 'low dominance'. The results suggest that there is a conceptual association between dominance and anger in male faces, as the male faces labelled 'high dominance' looked significantly angrier to the raters than the same faces labelled as 'low dominance'. No other expressions were related to dominance, but as I found in Chapter 4, the word anger is associated with dominance and simply knowing someone is high in dominance might lead an onlooker to assume that their angry expression is more acute/intense than someone who is low in dominance. Moreover, the errors made with respect to dominance and sad/anger faces in Chapter 5, Study 1b indicate that high dominance men's expressions of sadness may be misconstrued as angry. Together these findings point to dominance being subconsciously associated with anger, at least in male faces.

In my penultimate chapter, Chapter 6, I decided to focus exclusively on women's social status, as it is much less prominent in scientific literature on the topic (see Chapter 1), and I found that words and in effect the concepts used to describe female and male status differed (Chapter 4). More specifically I concentrated on a very female-specific activity of make-up use to examine whether it could change how dominant, prestigious, and attractive a woman was perceived to be. I manipulated make-up using Psychomorph, whereby I applied the same style and amount of cosmetics to each face and then asked raters to rate the faces for attractiveness, dominance, and prestige.

In Study 1, I found that both men and women thought women with cosmetics looked more attractive but there were differences in perceptions of social status. More specifically, men thought that women with cosmetics looked more prestigious while women thought they looked more dominant. However, men did not find women with cosmetics to look more dominant, while women did not find them to look more prestigious. These results suggest that a small amount of make-up applied evenly to the face, in a way enhancing the contrast of facial features, results in faces looking more attractive to

both sexes but markedly different with respect to status for male vs. female onlookers. As dominance is more closely related to intimidation than prestige, I theorised that perhaps women feel threatened by, or jealous of, women with cosmetics.

In Study 2, I asked women to perform a similar task to that above, and rate the faces for how jealous they would feel if the woman on the screen was to interact with their partner. In addition I also asked them to perform two short forced-choice tasks simply choosing whether the face with or without cosmetics would be more attractive to men, and which appeared more promiscuous to them.

I found that women with cosmetics were more likely to be chosen as more promiscuous and more attractive. Additionally, women said that they would be more jealous of the women whose faces had cosmetics than those that did not have cosmetics. These results provide support that women do feel threatened by others using cosmetics and this may be why they also rate them as more dominant than women without cosmetics. Conversely, as men and women do not directly compete, and attractive qualities are thought to go hand in hand with other positive traits (Dion et al., 1972), this may explain why men view women with cosmetics as high in prestige (a generally positive trait) and not dominance (a somewhat negative trait).

7.3 A case for Dominance and Prestige being visible in ones' face, and being separate strategies to high social status.

Several studies published in the past ten years have outlined differences between dominance and prestige, and that both of these strategies are viable methods of attaining high status; all have been conducted by authors at the same institution (Cheng et al., 2013, 2010; Cheng & Tracy, n.d.; Foulsham et al., 2010; Henrich & Gil-White, 2001), and most have looked at how these two strategies differ with respect to personality characteristics and/or how their behaviour is expected to differ. Throughout my thesis, with the exception of Chapter 5 - in which I concentrated solely on dominance - I was interested in conducting research related to whether/how dominance and prestige are perceived in faces. In addition, in Chapter 4, I was interested in exploring which words were useful in describing these two strategies for attaining high status. Most evidently I provide several levels of support for the existence of these two strategies as distinct from one another.

In Chapter 2, I found that faces created based on written descriptions to look high in dominance had distinct features, which were easily perceived by onlookers. Not only did raters rate high dominance faces as higher in dominance than prestigious or attractive ones, but high dominance and high prestige faces also had very different personality profiles. Had high dominance and high prestige faces of either

sex looked similar, then we would have expected to find no differences in ratings of personality or status between the two strategies. These corroborate and extend the findings of Cheng et al., 2010 who found that self- and other-rated personality characteristics, not explicitly based on facial characteristics, differed between the two strategies. Furthermore, these researchers did not look at each sex independently, which I have done in this thesis.

While it is hard to single out specific features in the faces that could be responsible for the observed differences in perceived personality and status, one potential face metric related to these issues is fWHR. In Chapter 3, I found that fWHR was higher in EvoFIT faces created to look high in dominance than those created to look prestigious. In addition, real facial photos of participants taken in a laboratory who rated themselves as high in dominance also had higher fWHR, while the same was not true of those who rated themselves high in prestige. Not only were self-perceived ratings of dominance correlated positively with fWHR but the same was true of other-perceived ratings. The fact that prestige did not correlate with fWHR both in EvoFIT and real faces suggests that this facial metric is only applicable to dominance. Additionally, fWHR in real women's faces was not associated with dominance, and so it appears that fWHR may be an accurate indicator of dominance, but only when judging men's faces.

In Chapter 2, I observed that prestigious faces were rated as similar in attractiveness to those faces created to look more attractive, while dominant faces were rated as less attractive than all others. Facial attractiveness may also be a mark of prestige rather than dominance, or this result may be due to the way in which our descriptive paragraphs were worded; making prestigious people seem 'nicer' could be construed as more attractive, much like the halo effect of 'what is beautiful is good' but in the opposite direction (Dion et al., 1972). Though there are many studies which have specifically looked at, and found, a positive correlation between dominance and attractiveness, in many of these studies the dominance measures are akin to confidence or simply high status (Kenrick, Neuberg, Zierk, & Krones, 1994; Maner, DeWall, & Gailliot, 2008; Sadalla, Kenrick, & Vershure, 1987), and there is no mention of the 'forcefulness' or 'coercive' aspects of dominance as defined in more recent literature (Henrich & Gil-White, 2001). However, in Chapter 4, I found that for women and men the word 'attractive' was placed under 'both' and did not belong solely under the prestige or dominance categories. The words 'manipulative', 'aggressive', 'impatient', and 'angry' were all included in the definition of dominance leading me to believe that while people are aware of the potentially negative behavioural characteristics of high dominance people, they still believe high dominance individuals to be attractive. Thus, attractiveness appears not to be a trait which differs between high dominance and high prestige people,

or at the very least is context dependent, and more work needs to be conducted on when dominance is considered an attractive trait and when it is not. Indeed, a recent study showed that men with high fWHR were more likely to be perceived as attractive for short-term but not long-term relationships (Valentine et al., 2014), providing evidence that visual cues of dominance are considered attractive in certain contexts but not others.

Additional support for dominance and prestige being distinguishable strategies to high status comes from Chapter 6. I found that women's cosmetics choices led to their status being perceived differently, with cosmetics use looking more prestigious to men, while appearing more dominant to women. If there were no differences in the two strategies, then cosmetics use would not have affected the way in which the women were perceived; for example, men should not have rated women with cosmetics as high in prestige and low in dominance but rather as similar in both, and the same is true for women's ratings. These findings are indicative of differences between perceived dominance and prestige in women as well as men, which have not been specifically studied thus far.

Finally, in Chapter 4, different words were used to describe dominant and prestigious women and men. It is important to note that for all chapters except Chapter 2, in which descriptions of dominance and prestige were provided to participants, all raters and participants were not explicitly given the definition of dominance and prestige, and were instead allowed to use their 'gut instinct' in the tasks. That participants chose different words to describe each social status instead of simply placing all the given words in the 'both' (i.e. high status) category supports the notion that these are two robust concepts.

Armed with the information that these are two separate strategies that can be used to gain social status, it is important to look at who is likely to use which strategy.

7.4 Do men and women climb the social ladder in different ways?

7.4.1 Perceptions of women and men's social status

Throughout my thesis I have concentrated on uncovering whether there are two routes to high status, but also how these strategies pertain to both sexes. As I have shown in Chapter 2, EvoFIT faces of both men and women look very different depending on whether they were created to look dominant, prestigious, or attractive. I found that EvoFIT faces of women created to look prestigious looked high in prestige but were rated as equally high in attractiveness, while men who were created to look prestigious were not rated high in attractiveness. There were also more pronounced personality differences between dominant and prestigious men than dominant and prestigious women, with

women showing no difference in extraversion and conscientiousness while men showed differences in all five personality characteristics, between the two strategies. These results suggest that there may be fundamentally different perceptions of women and men who are considered dominant and prestigious.

In Chapter 4, I found more differences between dominant and prestigious women, whereby dominant women were considered to be 'physically strong', and 'masculine' whereas these two traits were considered as belonging to high status men in general and not to a particular strategy. Interestingly, the quality 'feminine' used to describe low status men was at the same time used to describe prestigious and socially dominant women. These differences in word usage show how attributes more likely to be related to women, such as 'feminine' are seen as describing low status in men, while words related to men, such as 'masculine' are thought of as dominant for women, again highlighting differences in perceptions of social status between the sexes. Additionally, prestigious men were considered to be 'moral' while prestigious women were thought of as 'conscientious', 'smiled often', were 'emotionally stable' and 'conservatively dressed'. This again shows us that there are differences in perceptions of dominant women to dominant men, and prestigious women to prestigious men. In addition, the word 'tall' was used for both women and men to denote high status in general, while it could have been expected to pertain only to dominant women and not necessarily prestigious women. However, recent research suggests that height is associated with intelligence in both sexes (Blaker et al., 2013) as well as interpersonal dominance (Stulp, Buunk, Verhulst, & Pollet, 2015), and workplace success (Judge & Cable, 2004) and is thus able to encompass both routes to high status for both sexes. Hence, there appears to be a more nuanced and complex view of female social status, with many more words placed in the female social dominance and female prestige categories than men, whereas those words were simply lumped into 'both' (high status regardless of which route was used) for men.

My thesis exposes many differences in the physical and behavioural attributes associated with prestigious and dominant women and men. Next I outline how having different attributes may be used by each sex in order to gain status.

7.4.2 Climbing the social ladder

Previous studies suggest that women use indirect aggression, such as gossiping about, spreading rumours, and defaming others instead of direct aggression, as used by men, to achieve their goals (Björkqvist et al., 1992, 1994; Björkqvist, 1994). These findings point to women being more likely to be socially dominant as opposed to physically dominant, as was found in Chapter 4, when using a dominance strategy. That is, there were double the number of words that fit into the 'socially dominant'

category for women than men, suggesting that social dominance is a more concrete, discernible, and perhaps more likely route to high status for women than men. As women are on average less physically strong than men (Lassek & Gaulin, 2009) and a man's physical strength can even be gleaned from their facial appearance or facial dominance (Fink, Neave, & Seydel, 2007; Toscano, Schubert, & Sell, 2014; Windhager, Schaefer, & Fink, 2011), this points to physical dominance being more commonly used by men than women. Thus, in terms of dominance, women are likely to use social dominance, as evidenced by their use of indirect aggression, as opposed to outright aggression as seen with physical dominance. This may also explain why the word 'masculine' was placed in the women's physical dominance category, suggesting that it is a particularly male-like way of attaining high status that would be accessible only if a woman were exhibiting masculine qualities. In the same vein, physically strong men may be more likely to opt for the physically dominant route, perhaps asserting their size, physical prowess, and acting outwardly aggressive, as this route may exclude most women, while trying to use a socially dominant route would pit the sexes against each other and may favour women.

With respect to prestige, it is difficult to predict whether there would be differences in how often or likely women are to use prestige versus men. As prestige generally relies on intelligence, competence, and skill, I would predict that both sexes are equally likely to use this route to get ahead if they had the necessary prerequisites. In Chapters 2 and 4, I found differences in personality, behavioural, and physical characteristics between women's and men's prestige, and in Chapter 6 I found that even women's cosmetics use can affect perceptions of their status. These findings suggest that using either method of acquiring social status is, to some extent context-dependent. For example, if a woman were to go to an interview where all panel members are male she might opt to wear a small amount of cosmetics in order to appear more prestigious to them, however she might opt to avoid wearing any cosmetics if the panel was comprised of women as they might be more likely to consider her as dominant, and look at her unfavourably.

7.5 Future directions, possible future research, and limitations

7.5.1 Mapping dominance and prestige on the face

In my thesis, I explored how the faces of high prestige and high dominance people affected ratings of their status and personality characteristics, holistically (Chapter 2). In Chapter 3, I looked at one specific characteristic of faces, fWHR, and its relationship to dominance and prestige. However, it is possible, using currently available software such as Psychomorph, to scrutinise faces and examine many or all facial traits that may contribute to the differences seen between dominant and prestigious individuals.

For example, looking at the distance between one's eyes, distance from cheekbone to chin, from eyes to mouth, or any other combination, could all yield important information and would be a valuable tool to examine specific differences between dominance and prestige as well as facial correlates of each of these two routes.

7.5.2 Perceivers' behavioural changes towards high status individuals

7.5.2.1 Gaze allocation and gaze duration

As my thesis has shown, dominant and prestigious faces look different from one another. In the future, it would be interesting to explore whether there are benefits for people who have either high dominance or high prestige facial features by observing behavioural responses to these faces beyond ratings of expression intensity (Chapter 5), words (Chapter 4), and dominance/prestige (Chapters 2, 3, and 4). As I showed in Chapter 3 using fWHR, it may be that there are very pronounced facial features associated with dominance (high fWHR) that are not present with prestige, and in Chapter 5 I showed that high dominance angry faces looked more intense. Regardless of how these two strategies manifest themselves in a person's face, it would be interesting to explore whether one type of face (i.e. dominance or prestigious) is more eye-catching than the other, or influences the length of time an onlooker spends looking at that face, as these actions are necessarily precursors to behavioural responses. Foulsham et al. (2010) have shown that both dominant and prestigious individuals within a group are looked at more often and for longer than the rest of the group, but what if there appeared a mix of both prestigious and dominant individuals within a group at the same time?

Eye-tracking software could be used to investigate this, whereby images of faces could be manipulated using Psychomorph (see Chapters 5 and 6) to look either high in dominance or prestige and placed side-by-side on a screen. Gaze allocation and duration would be recorded for each participant and I could look at whether the high prestige or high dominance individuals were looked at first, more often, or for longer. This would be a very basic manipulation, and if any differences were found I could go on to using pre-recorded videos or images of faces who had previously been rated high in either prestige or dominance, to increase ecological validity.

Using any of these techniques, several predictions can be made as to whether dominant or prestigious faces would be more eye-catching, i.e. whether they would be looked at first. Firstly, it has been shown that when two individuals are making eye-contact, the one who is most comfortable with that eye-contact also feels higher in dominance (Mazur et al., 1980). If high dominance individuals are able to keep eye-contact comfortably for longer, and less dominant or lower status people cannot, then

when confronted with a high dominance face, onlookers might be more likely to look away or take furtive glances at that face. Thus, if they are presented with a high dominance face with a neutral expression on a screen, it might lead to them looking away rather quickly or avoid it all together if they can tell it is high in dominance simply using peripheral attention. However, if the onlooker feels like they themselves are highly dominant individuals, then perhaps they would stare at that face more intently.

Similarly, if prestigious faces are rated as higher in attractiveness (as shown in Chapter 2), then it is possible that they would be more 'eye-catching' and receive the larger proportion of first gazes. Additionally, a prediction of Henrich and Gil-White's (2001) pivotal paper on prestige and dominance suggests that prestigious individuals will be gazed at more often as this would facilitate social learning. Alternatively, as dominant faces are more likely to be threatening, and conceptual associations between dominance and anger exist (as shown in Chapter 5), perhaps attending to the dominant face first to deduce its threat potential would be a useful strategy. Thus, if a highly prestigious face was paired with a low dominance or low prestige face perhaps the high prestige face would be awarded the larger proportion of gaze. If on the other hand a high dominance face was paired with a low prestige or low dominance face, one might predict that the high dominance face would be gazed at first (perhaps to assess threat) but that the larger proportion of gaze time would be on the low dominance or neither face (in order to avoid the high dominants' gaze), especially if the individual felt that they were low in dominance. If a high dominance face was paired with a high prestige face it is possible that an individual might look at the high prestige face as it is less intimidating, perhaps more attractive, and may express interest, thereby facilitating social learning.

Finally, as the images proposed would be stationary and presented on a screen, this manipulation might not be enough to simulate a proper interaction with a dominant or prestigious individual and live interactions may be more appropriate. However, employing these types of studies would allow researchers to capture the real-life, instinctual decisions people might make, and behaviours they might exhibit, when approached by individuals who are highly dominant or prestigious and would help to further explore differences and similarities between the two methods of status acquisition.

7.5.2.2 Verbal and other non-verbal behavioural changes

As alluded to in the section above, knowing whether someone is dominant or prestigious may influence the attention that that individual is allocated, but it may also influence other non-verbal and even verbal behaviours. Certainly studies suggest that men with dominant faces are more likely to be considered for a second date (Valentine et al., 2014), and the conceptual association between anger and dominance I

uncovered in Chapter 5 suggests that actions towards these individuals would be very different than those towards a prestigious person. However, very little research has been performed which specifically investigates how people would behave in the presence of prestigious vs. dominant people. I myself did not fully explore this possibility, though my research has led me to make several predictions regarding behavioural changes when interacting with individuals who are dominant and prestigious.

In Chapter 5, I briefly discussed the potential implications of the conceptual association between high dominance and anger. That is, people who interact with high dominance individuals might be more likely to back down from an argument as has been shown when interacting with angry individuals (Sinaceur & Tiedens, 2006). In addition, those interacting with angry individuals have been shown to be less demanding in subsequent interactions (Van Kleef & De Dreu, 2010), more afraid of angry individuals (Van Kleef, De Dreu, & Manstead, 2004), and less likely to go above and beyond the standards expected, or try harder, in work environments (Koning & Van Kleef, 2015). These studies suggest that individuals who exhibit anger are able to elicit behavioural changes in those around them. As dominant individuals are conceptually linked with anger (as I showed in Chapter 5 and also through word allocation in Chapter 4), their anger expressions are more easily detectable, and look more intense, it may be that dominant individuals would elicit similar responses in low dominance individuals as angry individuals would. High dominance individuals are considered as intimidating, coercive, and forceful, which are all negatively valenced descriptors. This suggests that interacting with a dominant individual would be an unpleasant experience and the resulting behaviours towards these individuals might be akin to behaviours exhibited towards people who one would not necessarily want to interact with.

At the other end of the spectrum lie the high prestige individuals, and while little work has been performed with respect to behavioural changes when in the presence of a prestigious person, it is likely to be different from dominant individuals. As prestige is freely conferred, it follows that interactions with prestigious individuals would feel more pleasant and potentially more rewarding. Behaviourally, it is predicted that individuals would seek to associate themselves with prestigious individuals in order to maximise the possibility of learning from those individuals (Henrich & Gil-White, 2001). It is also likely that other conceptual associations exist between expressions and prestige than those for dominance. That is, while dominance and anger were conceptually linked, prestige may be conceptually associated with other expressions like, for example, happiness. Repeating the studies I performed in Chapter 5 with prestigious faces would make an interesting future study and would be important in finding about people's implicit attitudes towards individuals using both strategies.

Other future studies examining behavioural changes in participants interacting with high dominance or high prestige people could involve groups of individuals interacting towards a shared goal. For example, I could ask participants to rate those within the group and themselves for dominance and prestige and then analyse recordings for different behaviours such as gazes, smiles, nods, touching, loudness, talking-time, positively vs. negatively valenced words used, etc. With this information I could extrapolate who was thought of as prestigious and/or dominant, and ultimately the perceptions of every individual in the group, as well as whether the goal was completed and to what degree of success. Alternatively, I could use confederates as the designated group leaders who would be required to act in either dominant- or prestigious-specific ways and lead the group towards the final goal. Knowing how people describe both high dominance and high prestige individuals (Chapter 4), I would instruct the confederates to act in a certain manner and see how behaviours changed with respect to the leaders, and how this affected task completion.

7.5.3 Limitations

Throughout my thesis I have consistently tried to create studies that are sound, developed with the aid of previous literature and a great deal of discussion with peers and my supervisors. Inevitably, while I am happy with how it has progressed and the studies I performed, there are certain changes I would make, knowing what I know now. This section aims to discuss certain overarching limitations and changes that can be addressed with regards to my thesis.

Specifically pertaining to experimental Chapter 2 but also important for future studies, is the provision of a definition to participants. That is, in Chapter 2 I gave students descriptions of dominant, prestigious, and attractive individuals. In retrospect, I believe that supplying these descriptions may have been detrimental; in giving participants already written descriptions I was potentially leading participants to specific inferences of how a dominant or prestigious person would act. At the time I believed that using these descriptions, as they had been used in previous literature, would help facilitate a greater understanding of the concepts, and it was only later that I thought to question the concepts and their perceptions as a whole, as I did in Chapter 4. If I were to perform these sets of studies again I would allow participants to use their own 'gut instinct' and opinions of dominance and prestige in order to create the EvoFIT faces, just as I did in Chapters 4, 5, and 6. In this way I could be sure that the faces created were a product of a participant's own understanding and interpretations of the concepts of dominance and prestige, and that I was not adding any associations that they would not otherwise have held, by giving them specific definitions.

As with many studies of faces and the majority of my studies, the faces I used were either static and/or manipulated for dominance, prestige, cosmetics, etc. While allowing me to change specific details and attributes, viewing and rating static images differs from daily interactions with individuals. As such, future studies could use video data or even train confederates in a laboratory setting, in order to boost ecological validity.

7.7 Final Conclusions

Broadly, my thesis has been important in helping to define two strategies for gaining social status – dominance and prestige. Using several distinct methods, some of which have not been used before, I showed differences in facial structure and perception towards individuals using these two strategies. As humans are exceedingly social animals, understanding how individuals come to power and gain social status is important. Understanding how individuals judge others' social status using nothing but facial features, as well as what traits are helpful in this assessment can allow future researchers to hone in on reasons for people's decision making. For example, face shape can be used in voting decisions such as who is more likely to be chosen as a leader in times of war and peace (Little, Burriss, Jones, & Roberts, 2007). The more we know, the more these findings can help researchers and individuals to realise the subconscious biases we hold with regard to others' social standing.

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Appendices

Appendix 1

Table 1. Categorization of words into the constructs dominance versus prestigious. Scores shown reflect percentages for individuals rating both sexes, females only and males only. Scores correspond to classifications of words in Figures 1 and 2.

Word	Dominant			Prestigious			Both			Neither		
	both	female	male	both	female	male	both	female	male	both	female	male
Tall	27.05	24.53	29.70	8.70	10.38	6.93	43.96	41.51	46.53	20.29	23.58	16.83
Short	6.28	5.66	6.93	17.39	16.04	18.81	25.12	29.25	20.79	51.21	49.06	53.47
Attractive	10.14	8.49	11.88	22.71	28.30	16.83	51.69	49.06	54.46	15.46	14.15	16.83
Unattractive	14.01	16.04	11.88	8.21	8.49	7.92	18.36	16.98	19.80	59.42	58.49	60.40
Fat	14.49	19.81	8.91	7.73	6.60	8.91	19.81	16.04	23.76	57.97	57.55	58.42
Thin	9.18	13.21	4.95	19.81	24.53	14.85	33.33	30.19	36.63	37.68	32.08	43.56
Physically strong	36.71	41.51	31.68	5.31	3.77	6.93	35.75	23.58	48.51	22.22	31.13	12.87
Physically weak	3.38	0.94	5.94	18.84	20.75	16.83	12.08	12.26	11.88	65.70	66.04	65.35
Masculine	34.78	40.57	28.71	5.31	3.77	6.93	36.23	17.92	55.45	23.67	37.74	8.91
Feminine	4.83	6.60	2.97	31.88	43.40	19.80	23.19	33.96	11.88	40.10	16.04	65.35
Intelligent	7.32	8.57	6.00	28.29	27.62	29.00	58.05	59.05	57.00	6.34	4.76	8.00
Funny	11.22	14.29	8.00	26.34	28.57	24.00	40.49	34.29	47.00	21.95	22.86	21.00
Angry	54.63	60.95	48.00	2.93	1.90	4.00	17.56	11.43	24.00	24.88	25.71	24.00
Rich	13.17	8.57	18.00	21.46	26.67	16.00	45.37	45.71	45.00	20.00	19.05	21.00
Poor	7.80	8.57	7.00	4.88	3.81	6.00	11.22	12.38	10.00	76.10	75.24	77.00
Prom dressed	23.30	32.38	13.86	9.22	13.33	4.95	10.19	12.38	7.92	57.28	41.90	73.27
Cons dressed	7.28	9.52	4.95	31.07	35.24	26.73	36.89	28.57	45.54	24.76	26.67	22.77
Loud spoken	66.67	76.19	56.86	0.97	0.95	0.98	24.64	15.24	34.31	7.73	7.62	7.84
Soft spoken	1.93	0.95	2.94	48.31	52.38	44.12	10.14	8.57	11.76	39.61	38.10	41.18
Patient	2.90	1.90	3.92	55.07	56.19	53.92	16.91	16.19	17.65	25.12	25.71	24.51
Impatient	62.14	60.00	64.36	3.88	4.76	2.97	21.36	22.86	19.80	12.62	12.38	12.87
Leader	38.65	40.95	36.27	5.31	3.81	6.86	52.66	52.38	52.94	3.38	2.86	3.92
Follower	1.93	0.00	3.92	19.32	20.00	18.63	7.25	6.67	7.84	71.50	73.33	69.61
Commanding	52.17	54.29	50.00	7.25	4.76	9.80	36.71	38.10	35.29	3.86	2.86	4.90
Influential	13.53	13.33	13.73	23.67	24.76	22.55	57.00	56.19	57.84	5.80	5.71	5.88
Powerful	26.57	23.81	29.41	11.59	11.43	11.76	56.52	60.00	52.94	5.31	4.76	5.88
Arrogant	57.00	55.24	58.82	4.35	4.76	3.92	25.60	24.76	26.47	13.04	15.24	10.78
Aggressive	67.15	68.57	65.69	1.93	0.95	2.94	16.43	12.38	20.59	14.49	18.10	10.78
Destructive	51.94	45.71	58.42	2.91	2.86	2.97	13.11	13.33	12.87	32.04	38.10	25.74
Manipulative	53.62	50.48	56.86	7.73	9.52	5.88	20.77	20.00	21.57	17.87	20.00	15.69
Highly expressive	27.54	28.57	26.47	17.39	20.00	14.71	39.13	35.24	43.14	15.94	16.19	15.69
Pretentious	22.71	16.19	29.41	17.87	23.81	11.76	29.47	27.62	31.37	29.95	32.38	27.45
Smiles often	4.35	2.86	5.88	39.61	43.81	35.29	35.27	31.43	39.22	20.77	21.90	19.61
Direct eye gaze	28.02	32.38	23.53	6.28	7.62	4.90	57.00	51.43	62.75	8.70	8.57	8.82
Averted eye gaze	1.45	0.95	1.96	15.46	18.10	12.75	7.73	5.71	9.80	75.36	75.24	75.49
Controlled	17.87	21.90	13.73	22.22	22.86	21.57	40.58	34.29	47.06	19.32	20.95	17.65
Mean	48.78	47.12	50.50	2.93	2.88	2.97	15.12	13.46	16.83	33.17	36.54	29.70
Happy	2.44	2.88	1.98	27.32	28.85	25.74	46.34	44.23	48.51	23.90	24.04	23.76
Unhappy	14.22	15.38	13.00	4.41	5.77	3.00	19.12	18.27	20.00	62.25	60.58	64.00
Caring	4.41	5.77	3.00	40.20	43.27	37.00	31.86	28.85	35.00	23.53	22.12	25.00
Trustworthy	4.90	3.85	6.00	44.12	42.31	46.00	31.86	32.69	31.00	19.12	21.15	17.00
Committed	10.73	13.46	7.92	31.71	32.69	30.69	44.88	44.23	45.54	12.68	9.62	15.84
Intimidating	62.93	61.54	64.36	2.93	4.81	0.99	23.90	22.12	25.74	10.24	11.54	8.91
Respected	6.34	5.77	6.93	35.12	35.58	34.65	51.71	50.00	53.47	6.83	8.65	4.95
Skillful	7.80	9.62	5.94	21.46	22.12	20.79	60.00	56.73	63.37	10.73	11.54	9.90
Unskillful	4.39	3.85	4.95	4.39	3.85	4.95	13.17	11.54	14.85	78.05	80.77	75.25
Cooperative	3.90	4.81	2.97	44.88	46.15	43.56	29.76	25.96	33.66	21.46	23.08	19.80
Knowledgeable	6.34	8.65	3.96	27.32	28.85	25.74	55.61	50.00	61.39	10.73	12.50	8.91
Moral	5.85	6.73	4.95	38.05	36.54	39.60	36.10	39.42	32.67	20.00	17.31	22.77
High self-esteem	16.59	14.42	18.81	13.66	12.50	14.85	60.00	62.50	57.43	9.76	10.58	8.91
Rarely smiles	20.00	22.12	17.82	6.34	7.69	4.95	14.15	11.54	16.83	59.51	58.65	60.40
Introverted	5.80	4.72	6.93	30.92	31.13	30.69	6.76	5.66	7.92	56.52	58.49	54.46
Extroverted	40.10	38.68	41.58	3.86	2.83	4.95	48.31	50.94	45.54	7.73	7.55	7.92
Emotionally stable	9.18	7.55	10.89	36.23	37.74	34.65	37.20	33.96	40.59	17.39	20.75	13.86
Emotionally unstable	28.50	30.19	26.73	8.70	7.55	9.90	17.87	20.75	14.85	44.93	41.51	48.51
Agreeable	2.90	4.72	0.99	51.69	53.77	49.50	24.15	19.81	28.71	21.26	21.70	20.79
Not agreeable	48.54	49.06	48.00	3.88	4.72	3.00	18.93	20.75	17.00	28.64	25.47	32.00
Open	10.68	8.49	13.00	28.64	30.19	27.00	44.66	44.34	45.00	16.02	16.98	15.00
Not open	27.05	28.30	25.74	7.25	4.72	9.90	12.56	12.26	12.87	53.14	54.72	51.49
Conscientious	7.32	8.57	6.00	41.95	47.62	36.00	36.10	29.52	43.00	14.63	14.29	15.00
Not conscientious	30.43	33.02	27.72	5.80	5.66	5.94	13.04	12.26	13.86	50.72	49.06	52.48

Table 2. Categorization of words into the constructs physical dominance versus social dominance. Scores shown reflect percentages for individuals rating both sexes, females only and males only. Scores correspond to classifications of words in Figures 1 and 2.

Word	Physical dominance			Social dominance			Both			Neither		
	both	female	male	both	female	male	both	female	male	both	female	male
Tall	57.55	62.60	52.46	4.08	5.69	2.46	33.88	24.39	43.44	4.49	7.32	1.64
Short	4.49	4.07	4.92	31.43	34.96	27.87	10.61	15.45	5.74	53.47	45.53	61.48
Attractive	13.06	6.50	19.67	26.12	36.59	15.57	51.43	44.72	58.20	9.39	12.20	6.56
Unattractive	15.10	21.95	8.20	8.98	4.88	13.11	6.53	9.76	3.28	69.39	63.41	75.41
Fat	21.22	26.83	15.57	13.06	13.82	12.30	6.94	8.94	4.92	58.78	50.41	67.21
Thin	9.39	8.94	9.84	24.90	28.46	21.31	26.53	29.27	23.77	39.18	33.33	45.08
Physically strong	66.53	74.80	58.20	2.04	1.63	2.46	25.31	15.45	35.25	6.12	8.13	4.10
Physically weak	2.45	2.44	2.46	22.45	23.58	21.31	3.27	4.07	2.46	71.84	69.92	73.77
Masculine	45.71	52.03	39.34	3.67	5.69	1.64	35.92	16.26	55.74	14.69	26.02	3.28
Feminine	3.67	6.50	0.82	31.02	43.09	18.85	16.33	28.46	4.10	48.98	21.95	76.23
Intelligent	3.27	2.44	4.10	48.16	50.41	45.90	41.22	39.02	43.44	7.35	8.13	6.56
Funny	3.67	2.44	4.92	50.20	52.03	48.36	39.18	37.40	40.98	6.94	8.13	5.74
Angry	41.63	43.90	39.34	7.35	8.13	6.56	12.24	13.01	11.48	38.78	34.96	42.62
Rich	7.35	7.32	7.38	34.29	38.21	30.33	25.31	21.95	28.69	33.06	32.52	33.61
Poor	10.20	12.20	8.20	3.27	3.25	3.28	9.39	9.76	9.02	77.14	74.80	79.51
Prom dressed	20.00	15.45	24.59	22.45	34.96	9.84	19.59	25.20	13.93	37.96	24.39	51.64
Cons dressed	13.52	18.70	8.26	26.64	26.02	27.27	17.62	17.07	18.18	42.21	38.21	46.28
Loud spoken	18.37	13.82	22.95	34.29	40.65	27.87	42.86	41.46	44.26	4.49	4.07	4.92
Soft spoken	10.66	14.75	6.56	13.93	11.48	16.39	8.20	9.84	6.56	67.21	63.93	70.49
Patient	12.24	15.45	9.02	23.67	19.51	27.87	14.69	13.01	16.39	49.39	52.03	46.72
Impatient	29.92	26.02	33.88	20.90	28.46	13.22	29.92	30.89	28.93	19.26	14.63	23.97
Leader	14.29	10.57	18.03	28.16	30.89	25.41	55.92	56.10	55.74	1.63	2.44	0.82
Follower	11.84	11.38	12.30	7.76	1.63	13.93	5.71	5.69	5.74	74.69	81.30	68.03
Commanding	18.78	17.07	20.49	24.90	26.83	22.95	52.24	52.85	51.64	4.08	3.25	4.92
Influential	9.80	6.50	13.11	34.29	37.40	31.15	53.06	52.03	54.10	2.86	4.07	1.64
Powerful	23.67	23.58	23.77	15.10	17.07	13.11	56.33	54.47	58.20	4.90	4.88	4.92
Arrogant	25.71	23.58	27.87	22.86	26.83	18.85	33.47	30.08	36.89	17.96	19.51	16.39
Aggressive	48.98	49.59	48.36	8.16	9.76	6.56	25.71	23.58	27.87	17.14	17.07	17.21
Destructive	39.34	40.65	38.02	6.15	5.69	6.61	15.16	13.01	17.36	39.34	40.65	38.02
Manipulative	13.06	9.76	16.39	40.00	47.15	32.79	27.35	31.71	22.95	19.59	11.38	27.87
Highly expressive	8.57	6.50	10.66	48.16	53.66	42.62	30.61	32.52	28.69	12.65	7.32	18.03
Pretentious	7.76	5.69	9.84	27.76	34.15	21.31	23.27	20.33	26.23	41.22	39.84	42.62
Smiles often	9.80	9.76	9.84	44.49	51.22	37.70	31.43	27.64	35.25	14.29	11.38	17.21
Direct eye gaze	10.20	8.94	11.48	36.33	42.28	30.33	46.94	40.65	53.28	6.53	8.13	4.92
Averted eye gaze	12.24	13.82	10.66	6.12	4.88	7.38	4.08	2.44	5.74	77.55	78.86	76.23
Controlled	15.92	19.51	12.30	27.76	26.83	28.69	29.39	28.46	30.33	26.94	25.20	28.69
Mean	24.49	24.39	24.59	7.35	9.76	4.92	19.18	18.70	19.67	48.98	47.15	50.82
Happy	7.35	8.13	6.56	31.02	34.96	27.05	44.08	39.02	49.18	17.55	17.89	17.21
Unhappy	8.98	9.76	8.20	6.12	5.69	6.56	11.43	9.76	13.11	73.47	74.80	72.13
Caring	6.53	5.69	7.38	29.39	30.89	27.87	28.98	27.64	30.33	35.10	35.77	34.43
Trustworthy	7.76	8.13	7.38	26.12	23.58	28.69	33.06	30.89	35.25	33.06	37.40	28.69
Committed	13.06	13.82	12.30	24.90	24.39	25.41	40.00	37.40	42.62	22.04	24.39	19.67
Intimidating	40.41	37.40	43.44	6.53	8.94	4.10	41.22	43.09	39.34	11.84	10.57	13.11
Respected	10.20	11.38	9.02	22.04	24.39	19.67	54.29	51.22	57.38	13.47	13.01	13.93
Skillful	12.24	15.45	9.02	24.90	26.02	23.77	53.06	47.15	59.02	9.80	11.38	8.20
Unskillful	6.94	5.69	8.20	5.71	8.13	3.28	4.90	5.69	4.10	82.45	80.49	84.43
Cooperative	9.39	12.20	6.56	27.35	26.83	27.87	32.24	26.02	38.52	31.02	34.96	27.05
Knowledgeable	3.27	1.63	4.92	36.33	36.59	36.07	46.53	43.90	49.18	13.88	17.89	9.84
Moral	6.94	8.94	4.92	23.67	19.51	27.87	30.61	30.89	30.33	38.78	40.65	36.89
High self-esteem	11.43	6.50	16.39	27.76	35.77	19.67	51.84	45.53	58.20	8.98	12.20	5.74
Rarely smiles	18.37	22.76	13.93	4.90	2.44	7.38	4.08	3.25	4.92	72.65	71.54	73.77
Introverted	17.55	17.07	18.03	5.31	4.07	6.56	3.67	2.44	4.92	73.47	76.42	70.49
Extroverted	5.71	4.07	7.38	37.14	43.09	31.15	52.24	51.22	53.28	4.90	1.63	8.20
Emotionally stable	8.57	10.57	6.56	33.06	35.77	30.33	38.78	32.52	45.08	19.59	21.14	18.03
Emotionally unstable	16.39	17.07	15.70	10.66	15.45	5.79	15.16	15.45	14.88	57.79	52.03	63.64
Agreeable	8.16	11.38	4.92	34.29	34.96	33.61	31.84	24.39	39.34	25.71	29.27	22.13
Not agreeable	22.04	22.76	21.31	11.84	14.63	9.02	21.22	23.58	18.85	44.90	39.02	50.82
Open	8.98	8.94	9.02	33.88	39.84	27.87	41.63	34.96	48.36	15.51	16.26	14.75
Not open	17.14	17.89	16.39	8.98	8.13	9.84	6.94	7.32	6.56	66.94	66.67	67.21
Conscientious	7.76	6.50	9.02	26.12	26.83	25.41	36.33	33.33	39.34	29.80	33.33	26.23
Not conscientious	14.69	13.82	15.57	6.94	8.13	5.74	18.37	21.95	14.75	60.00	56.10	63.93