



Original Article

Contest competition and men's facial hair: beards may not provide advantages in combat

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ABSTRACT

In contemporary human societies, where direct male-male competition is reduced compared to ancestral societies, sporting competitions remain an avenue for status acquisition via intra-sexual competition. Beards are the most visually salient and sexually dimorphic of men's secondary sexual traits and play a strong role in communicating masculinity, dominance and aggressiveness intra-sexually. Hypotheses have been advanced that beards provide advantages in intra-sexual combat, as protective organs and honest signals of fighting ability. Here we provide the first test of these hypotheses using data from professional mixed martial arts fighters competing in the Ultimate Fighting Championship. We explored whether secondary sexual traits (height, weight, beardedness), fighting stance (southpaw, orthodox), arm reach and past contest experiences impact on contest outcomes. If beards function as protective organs, bearded fighters should succumb to fewer knock-outs, and hence protection to injuries to the jaw, fewer abrasions and lacerations to the face and brain damage than clean-shaven fighters. Alternatively, if beards signal fighting ability then bearded fighters should win more fights. We found no evidence that beardedness was associated with fewer losses by knock-out or greater fighter ability. While fighters with longer reaches won more fights, neither stance nor past experience influenced fight outcomes. We suggest that beards represent dishonest signals of formidability that may serve to curtail the escalation of intra-sexual conflict through intimidation rather than providing advantages in direct combat.

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1. Introduction

Intra-sexual selection has shaped the evolution of male weaponry and aggressive behavioral displays across many taxa (Andersson, 1994; Emlen, 2008; Zahavi, 1975). Canines, and horns operate in concert with fighting styles to determine the outcome of fights (McCullough, Miller, & Emlen, 2016). Like all other animals, human males also compete intra-sexually via behavioral displays that incorporate facial and bodily secondary sexual traits (Archer, 2009; Puts, 2010, 2016). Masculine facial structure, which includes the jawline, brow ridge and mid-face, are exaggerated in men compared to women and associated with upper body strength (Fink, Neave, & Seydel, 2007; Sell et al., 2009), behavioral aggressiveness (Archer, 2009), and judgements of men's masculinity, dominance, and aggressiveness (Geniole, Denson, Dixon, Carré, & McCormick, 2015). More dominant looking adolescent males reach sexual maturity more rapidly (Doll, Cárdenas, Burriss, & Puts, 2016) and have earlier ages at first copulation (Mazur, Halpern, & Udry, 1994). In adulthood, men's acquisition of status and mating

success within male-male hierarchies is associated with facial masculinity, dominance, and height (Hill et al., 2013; Muller & Mazur, 1997). This pattern is also found in small-scale subsistence societies where upper body strength is associated with male hunting reputation and reproductive success (Apicella, 2014) and social status is linked to reproductive success (von Rueden & Jaeggi, 2016). It is for these reasons that secondary sexual facial traits are argued to be shaped by contest competition in ancestral human environments (Puts, Bailey, & Reno, 2015).

Beards are arguably the most visually conspicuous and sexually dimorphic of all human secondary sexual traits. Facial hair develops under the actions of androgens during early adolescence and are fully developed by adulthood (Randall, 2008). Beards develop faster among adolescent boys who are more behaviourally aggressive (Isen, McGue, & Iacono, 2015) and intra-sexually competitive (Singal, Bhatnagar, & Kaur, 2006). In adults, bearded men report feeling more masculine (Addison, 1989) and have higher levels of serum testosterone (Knussman & Christiansen, 1988) than clean-shaven men. Full beards consistently enhance ratings of men's age, masculinity, social dominance, and aggressiveness compared to clean-shaven faces (Dixon & Brooks, 2013; Dixon & Vasey, 2012; Geniole & McCormick, 2015; Neave & Shields, 2008; Saxton, Mackey, McCarty, & Neave, 2016) by augmenting jaw size (Dixon, Lee, Sherlock, & Talamas, 2017; Dixon,

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Rantala, Melo, & Brooks, 2017), overall facial masculinity (Sherlock, Tegg, Sulikowski, & Dixon, 2017), and aggressive facial expressions (Dixon & Vasey, 2012). Facial hair is also more sexually attractive and is positively associated with mating success under conditions of high male–male competition (Barber, 2001; Dixon, Lee et al., 2017; Dixon, Rantala et al., 2017).

Although contemporary ecological and social conditions in human societies are vastly different from those that occurred ancestrally, sporting contests remain active Darwinian arenas in which direct same-sex competition for status readily occur (Lombardo, 2012). There is also evidence that individual performance within sporting contests relies on many of the same physical and mental faculties as those employed during earlier phases of human ancestry (Lombardo, 2012). Sporting competitions are ritualised interactions typically restricted to competitions within the same-sex which are often performed in front of audiences (Deaner, Balish, & Lombardo, 2016). As would be predicted if sporting competitions were analogous to male–male competitions, analyses of 50 small-scale societies revealed that sports were more likely to occur between men than women or to be of mixed sex (Deaner & Smith, 2013). Success in sporting contests can also result in higher social status, greater mating opportunities, and higher fitness for males involved in sports (Lombardo, 2012; Postma, 2014). For example, among Sereer communities in rural Senegal, men competing in a traditional form of Greco-Roman wrestling known locally as ‘Njom’ had significantly more surviving offspring and higher social status than non-wrestlers (Llaurens, Raymond, & Faurie, 2009). This seems to be true in modern societies as well, as male athletes report higher mating success than non-athletes (Faurie, Pontier, & Raymond, 2004).

Research among mixed martial arts (MMA) fighters competing in the The Ultimate Fighting Championship® (UFC) provides evidence that sexually dimorphic traits function directly in intra-sexual competition. The UFC is a US based promotional company for MMA fights (the largest in the world) and includes the best fighters in the world. Fights take place between two individuals in an enclosed octagon-shaped cage. Fighters use a variety of techniques, generally in combination, including wrestling, kickboxing, submission grappling and boxing in no-holds barred contests in which victory is assigned via knockouts, submission, or judge decisions. Strikes to the genitals, eyes, and back of the head are forbidden, however; the lack of stringent regulations coupled with the highly aggressive nature of the fights make the UFC a potential arena for testing evolutionary hypotheses regarding male–male competition. The UFC also maintains an unofficial rule that after three losses in a row a fighter must retire (Zilioli et al., 2015), making this an intriguing arena within which to test the role of non-phenotypic traits like past contest outcomes on fighting performance. The risks involved in competing in such a violent sport are strongly financially incentivised, with winners in the UFC routinely receiving high rewards that in one fight were reported to be \$400,000 (Pollet, Stulp, & Groothuis, 2013). UFC fighters with more pronounced androgen-dependent facial traits, particularly a more robust midface, have the most victories (Třebický et al., 2015; Zilioli et al., 2015) and are judged as looking more aggressive by naïve raters (Třebický et al., 2013). Participants who were unfamiliar with the UFC were also able to accurately assign winners from bouts and assigned winners higher ratings of masculinity, strength, aggressiveness and attractiveness (Little, Třebický, Havlíček, Roberts, & Kleisner, 2015). The UFC also has a female league and analyses revealed that the facial characteristics associated with male fighting success did not predict female fighting success (Palmer-Hague, Zilioli, Jagore, & DeLecce, 2016).

The UFC provides a unique opportunity to test whether beards provide any advantage to fighters or reflect a fighter's performance. While most sports that involve fights, including groups that sanction boxing and wrestling, restrict the growth of facial hair owing to views that it enhances protection against blows (Blanchard, 2009), this restriction does not apply in the UFC. Although beards cannot enhance fighting ability directly, there are two main hypotheses that suggest evolutionary

advantages for facial hair during intra-sexual contests. First, phylogenetic analyses of the facial structures of ancestral members of the genus *Homo* suggest that facial structure and musculature evolved, in part, to protect against blows to the head (Carrier & Morgan, 2015). As facial hair develops around the jaw, lips and midface, framing and enhancing perceptions of the sexually dimorphic facial regions (Guthrie, 1970), Blanchard (2009) hypothesised that beards are analogous to the male lion's mane in covering the vital parts of the face and neck from costly strikes. Since meta-analyses of MMA bouts revealed that 66–78% of serious injuries are to the head and face (Jensen, Maciel, Petrigliano, Rodriguez, & Brooks, 2017; Lystad, Gregory, & Wilson, 2014), if the human beard has evolved as a protective organ to blows to the lower face (Blanchard, 2009), then fighters with beards should suffer fewer knockouts and technical knockouts than clean-shaven fighters.

Alternatively, as beards are incorporated into threatening jaw-thrusting behaviors (Eibl-Eibesfeldt, 2007; Guthrie, 1970), facial hair might reflect a handicap in fights that allow opponents to grasp and pull a fighter towards them, providing leverage when delivering strikes to the face (Zahavi & Zahavi, 1999). Thus, only high quality fighters can adorn full beards and may do so in order to signal confidence in their ability to overcome the handicapping effects to opponents (Zahavi & Zahavi, 1999). Beards, may also act in concert with other androgen-dependent characters like muscularity and aggressiveness to positively influence fights. Further, beards visually frame and highlight androgen-dependent masculine facial features, particularly jaw size, and therefore might influence fight outcomes via intimidating rivals. If beards are a form of handicap signal and bearded fighters have higher fighting ability compared to clean-shaven fighters, we hypothesised that bearded fighters should win more fights than clean-shaven fighters. We tested these two hypotheses using data on individual fighting characteristics (i.e. stance), morphological traits (arm reach, height and beardedness) and outcomes of contests (i.e. knockout, submission) among 395 fighters in 600 fights from UFC events 2007–2015.

2. Methods

2.1. MMA fight outcomes

Fight outcome data is available for all UFC events that have taken place, however; high-definition photographs of fighters during each event in which facial hair is easy to categorise are somewhat limited. As a result, fight outcome data was used from UFC71 (26/05/07) up to the most recent event at the time of data collection (UFC194, 12/12/2015). Fight outcomes were drawn from either the Wikipedia page for each event or the UFC official website. Method of victory was coded as follows: 1 = knock out, 2 = technical knockout (fight stopped based on fighter not intelligently defending themselves from strikes), 3 = doctor or corner stoppage (doctor or corner disallows fight to continue for fear of injury or exacerbation injury i.e. severe cut or broken bone), 4 = submission (fighter ‘taps out’ due to chokehold or joint lock), 5 = unanimous decision (all three judges score fight in favour of the victor), 6 = split decision (two of three judges scored fight in favour of the victor), and 7 = no contest (i.e. accidental use of an illegal technique/draw/disqualification or stoppage due to injury (i.e. immediate stoppage due to severe injury)).

2.2. MMA fighter level of facial hair

Research assistants who were blind to the predictions of the current study scored each fighter's profile as the most appropriate of ten possible facial hair styles: 0 = clean-shaven, 1 = stubble, 2 = moustache, 3 = goatee (without moustache), 4 = Goatee (with moustache), 5 = Sideburns, 6 = Sideburns and moustache, 7 = moustache and soul patch, 8 = Full beard (trimmed), 9 = Full beard (bushy; Fig. S1 in ESM1). To ensure that the level of beardedness scored accurately

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