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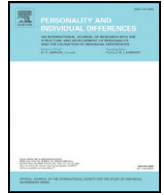
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# High intrasexual competition is related to inflated height reports in male junior soccer players



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## ABSTRACT

Intrasexual competition refers to the rivalry between same-sex individuals over access to potential mates. Because in many animal species larger males are more likely to defeat smaller opponents over access to potential mates and additional resources, it has been suggested that intrasexual competition was a major driver in the emergence of male-biased sexual size dimorphism. In the same vein, human male height has been related to aggressive behavior, status and dominance. Given the value of body size in agonistic interactions, body inflation strategies are likely to have evolved in many animal species. In this study, we explored the relationship of the bias in reporting one's own height—a phenomenon reminiscent of animal self-inflation mechanisms—with intrasexual competition, and sociable and aggressive dominance, in the highly competitive context of Uruguayan pre-professional soccer. We also considered the bias in reporting additional operationalizations of body size, i.e., weight, and body mass index (BMI). We showed that intrasexual competition is positively correlated with height over-report. To the best of our knowledge, this study is the first to relate intrasexual competition and the bias in reporting one's own height, a putative indicator of power and status.

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## 1. Introduction

In addition to obvious differences in primary sex characteristics, i.e., those organs directly involved in reproduction, human males and females exhibit relatively marked differences in a number of attributes referred to as secondary sex characteristics, including males displaying larger statures, more robust cranial and facial features, and greater muscularity (Frayer & Wolpoff, 1985).

In humans, sex differences in height, and height preference, have been extensively studied in relation to intersexual selection—i.e., mate choice. A wealth of evidence points to a significant female preference for taller males; e.g., taller men receive more responses on personal advertisements (Pawlowski & Koziel, 2002), females report dating taller men more frequently (Shepperd & Strathman, 1989), and women in a potentially fertile phase of the menstrual cycle, seem to prefer taller

men (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Pawlowski & Jasienska, 2005). It has also been shown that women, but not men, consider partner stature unacceptable if it results in the female being taller than the male (Stulp, Buunk, & Pollet, 2013). However, despite this female preference for taller men, exceptional height does not seem to confer reproductive success in human males (Barber, 1995; Buss & Barnes, 1986; Stulp, Pollet, Verhulst, & Buunk, 2012). That average height men usually marry at an earlier age, and thus extend their reproductive window, has been suggested as a possible explanation of this apparent contradiction (Stulp, Pollet, et al., 2012). It has also been noted though, that scarce food supply and highly-demanding environments may dampen the female preference for taller men (Sear & Marlowe, 2009; Sorokowski & Sorokowska, 2012; Sorokowski, Sorokowska, Fink, & Mberira, 2011).

Several lines of evidence suggest that height preference in humans is rooted in the signaling value of human stature. Adult height is the result of complex interactions between genetic factors and environmental conditions (Gahtan & Mark, 2013; Gustafsson & Lindfors, 2009; Lango Allen et al., 2010; Lettre, 2011), and thus, it has been proposed as a good indicator of good health, status and cognitive abilities (Case

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& Paxson, 2006; Judge & Cable, 2004; Silventoinen, Lahelma, & Rahkonen, 1999; but see also Samaras, 2012). Human height has also been found to be negatively related to fluctuating asymmetry, which results from perturbations of the ontogenetic development, thus human height has also been considered as a proxy for good genes (Manning, 1995).

A consensus over an exact definition of body size does not exist (Lovich & Gibbons, 1992). Therefore, in addition to measures along a major morphological axis (height, in humans), body weight, and body mass index (BMI) have been frequently used as operational measures of size (e.g., Gustafsson & Lindenfors, 2004; Lindenfors et al., 2007; Plavcan, 2012a). Male BMI seems to play a lesser role than height in female preferences, following also a curvilinear pattern (Maisey, Vale, Cornelissen, & Tovée, 1999). Furthermore, differences in socio-economic context have been found to influence the role played by BMI on females' attractiveness judgment of men, with BMI having a larger influence in rural contexts than in urban settings (Swami & Tovée, 2005).

In addition to intersexual selection, further non-mutually-exclusive mechanisms, including intergroup violence, and mate and resource competition, have also been implied in the emergence of SSD in many animal species (Frayer & Wolpoff, 1985; Isaac, 2005; Kanazawa & Novak, 2005; Plavcan, 2012). Among mammals, larger males are more likely to defeat smaller male opponents leading to higher social rank and increased dominance (Ellis, 1994). It has recently been argued that intrasexual competition may play a greater role than previously thought in human male-biased SSD (Hill, Bailey, & Puts, 2016). Accordingly, a positive association between human male stature and different attributes relevant to intrasexual competition has been observed. Male height has been found to be positively associated with greater actual and perceived physical strength (Sell et al., 2009), aggressive behavior and entitlement (Archer & Thanzami, 2007; but see also Archer & Thanzami, 2009), perceived fighting ability (von Rueden, Gurven, & Kaplan, 2008; but see Třebický et al., 2015), increased perceived authority (Stulp, Buunk, Verhulst, & Pollet, 2012), and dominance in dyadic agonistic interactions (Stulp, Buunk, Verhulst, & Pollet, 2015).

However, in humans the relationship between BMI—an alternative measure of body size—and intrasexual competition remains unclear. A positive correlation between fighting ability and BMI has been reported for females (Palmer-Hague, Zilioli, Jagore, & Delecce, 2015), but these variables do not seem to be significantly associated in males (Třebický et al., 2015). Similarly, BMI was found to be positively correlated with physical aggression in women, and—surprisingly—negatively associated in adolescent males (Pinhey, 2002).

The value of a large body size in relation to intrasexual competition—particularly in contest competition—was recognized early (Darwin, 1872, 1981). Moreover, in *The Expression of the Emotions in Man and Animals*, Darwin proposed that body-inflation mechanisms may serve as a means of exciting fear in the enemy, and eventually deter potential rivals (Darwin, 1872/2009). Subsequent research has provided evidence of the association between dominance and an expanded posture both in primates and humans (Weisfeld & Linkey, 1985). Weisfeld and Beresford (1982) reported a positive association, in high school students, of erect posture while receiving midterm grades with the numerical examination score received. In the same direction, it has been observed that the experience of power can influence an individual's perceptions of their own height, that is individuals in a simulated high-power situation report significantly higher height values than those in a low-power condition (Duguid & Goncalo, 2012).

A number of studies based on height self-reports, have shown that both males and females tend to over-report their height (Rowland, 1990; Sharples, Crutchley, García, Gray, & Horwarth, 2012; Shields, Connor Gorber, & Tremblay, 2008; Wang, Patterson, & Hills, 2002; but see Bowring et al., 2012). Whether such inaccuracies in height

report—reminiscent of animal self-inflation mechanisms—are related to intrasexual competition is an interesting question.

In this regard, Fisher and Cox (2011) have proposed that human intrasexual competition is composed of four major themes: self-promotion, competitor derogation, mate manipulation, and competitor manipulation. In intrasexual contexts, males more frequently engage in deceptive acts and tactics related to exaggeration of superiority and sexual promiscuity, intensity, and popularity. (Tooke & Camire, 1991). Thus, in this study, we investigated whether intrasexual competition and two different forms of dominance—sociable and aggressive dominance—were associated with the bias in height report. We also examined the potential association of intrasexual competition and both forms of dominance in relation to weight and body mass index (BMI), as alternative measures of body size. We hypothesized that intrasexual competition and dominance levels would be positively associated with the extent of size over-report, mimicking animal self-inflation mechanisms.

As an operational measurement of intrasexual competition, in this research we used the scale developed by Buunk and Fisher (2009) which focuses on intrasexual competition as an attitude, that is, the extent to which one views confrontation with same-sex individuals in competitive terms. Sociable and aggressive dominance—two forms of dominance characterized by Kalma, Visser, and Peeters (1993)—were also considered in this study. According to the authors of these scales, sociable dominance is characterized by a strong need to dominate in a reasonable way, a positive attitude towards others, a central position in groups, and a solid self-esteem; whereas aggressive dominance is characterized by a prevailing negative attitude towards others, and a strong motivation to realize one's own aims, even at the expense of personal relationships (Kalma et al., 1993).

While in many mammals dominance is achieved aggressively, in humans alternative mechanisms—such as sport competitions, competitions for promotion, elections and criticism—are used (Mazur & Booth, 1998). It has been suggested that athletic competition constitutes a culturally regulated expression of intrasexual competition, which provides a venting channel such that the competition does not escalate into uncontrolled violence (Geary & Bjorklund, 2000). The present research was conducted in the highly competitive context of Uruguayan pre-professional association football (soccer). Soccer has been characterized as one of the most competitive sports (Ben-Naim, Vazquez, & Redner, 2007), making it an ideal environment to study intrasexual competition mechanisms and dominance relationships.

Despite its small size population of 3.43 million inhabitants, Uruguay has a reputed soccer history having won two Olympic titles, two World Cups and 15 America Cups—the oldest continental soccer championship in the world. Becoming a successful soccer player in Uruguay is one of the few available avenues for upwards social mobility for the least advantaged, with 700 Uruguayan adolescent males joining different clubs affiliated with the Uruguayan Soccer Association (AUF) every year. The selection process involved in becoming a professional soccer player is extremely competitive—only 5% will become First Division players, while less than 1% will become successful international players (Secretaría Nacional del Deporte (Uruguay), 2009).

To summarize, in this study we examined the association of intrasexual competition and two forms of dominance—sociable and aggressive dominance—with the bias in self-reporting different operationalizations of body size—height, weight and BMI—in the context of pre-professional soccer in Uruguay. The highly competitive nature of this sport, makes it an ideal context for studying competition and dominance attitudes. This study is based on self-reported measures of psychological attributes; and a combination of self-reported and measured anthropometric data, which combined provide a measure of a self-enhancement strategy reminiscent of animal self-inflation mechanisms. As this research was carried out in a non-US, non-European country, we believe the results reported here would add to the cultural diversity of social psychology studies.

## 2. Methods

### 2.1. Participants

A total of 112 male junior soccer players, ages 13 to 19 ( $M = 15.79$ ,  $SD = 1.56$ ), from a Uruguayan First Division soccer team participated freely in this study. According to the Team's authorities, none of the players suffered from any significant medical or psychological condition, or was using drugs at the time the study was conducted.

### 2.2. Reported and measured height, weight, and BMI

In addition to their personal information, participants were asked to provide their own height and weight. Once participants had completed this questionnaire, and the additional scales for assessing sociable and aggressive dominance, and intrasexual competition (see below), they were invited to a different room where height and weight measures were obtained using typical methods by a trained collaborator. Participants did not know that actual measurements were to be taken when they reported their own height and weight. BMI was calculated as body mass (kg) divided height (m) squared. BMI was calculated both for reported and measured data.

Following Hoaglin and Iglewicz (1987), three participants were identified as outliers and were excluded from the height bias analyses due to differences between reported vs measured height being larger (larger negative values) than 2.2 interquartile ranges from percentile 25. That is, these participants reported heights 8.0 to 16 cm smaller than their measured statures, which suggests that they did not complete the task seriously. Similarly, two additional participants were also identified as outliers, as the difference between reported and measured height was larger than 2.2 interquartile ranges from percentile 75. That is, these participants reported heights 6.5 cm larger than the measured values. Following the same criterion, three participants were excluded from the weight bias analysis (differences between reported and measured weight:  $-11.40$  kg,  $-10.60$  kg, and  $12.30$  kg) and two participants were excluded from the BMI bias analyses (differences between reported and measured BMI:  $3.93$  kg/m<sup>2</sup>, and  $4.19$  kg/m<sup>2</sup>).

When the outliers are included in the Pearson correlation analyses, the relationship between intrasexual competition and the bias in height report (see Results) become non-significant. However, by using the more robust—i.e., less sensitive to extreme values—Spearman correlation, a significant positive association was still observed.

### 2.3. Intrasexual competition

Intrasexual competition was measured with a 10-item Spanish version derived from the original 12-item scale (Buunk & Fisher, 2009; Buunk, Zurriaga, González, & Castro-Solano, 2012). This 10-item version has been designed to be used with adolescents samples by removing two items not relevant for this age group—“*I wouldn't hire a very attractive man/woman as a colleague*” and “*I wouldn't hire a highly competent man/woman as a colleague*” (Buunk, Stulp, & Ormel, 2014). Example items of the Intrasexual Competition Scale used in this study include “*When I go out, I can't stand it when women/men pay more attention to a same-sex friend of mine than to me,*” and “*I tend to look for negative characteristics in attractive men/women.*” The reliability of the original scale was high, both in a Dutch and a Canadian sample, with Cronbach's alphas of 0.85 and 0.87, respectively (Buunk & Fisher, 2009). In the present study, the 10-item version also exhibited high reliability, with a Cronbach alpha of 0.83. Participants indicated their agreement with the different statements by means of a 7-points Likert scale (1 = completely disagree; 7 = completely agree).

### 2.4. Sociable and aggressive dominance

Participants also completed two scales which assessed sociable and aggressive dominance, consisting of 8 items for the sociable dominance scale, and 7 items for the aggressive dominance scale. Both original scales are reliable—with Cronbach's alphas of 0.79 and 0.68, respectively—and have been validated using observational data in social interactions (Kalma et al., 1993). Spanish versions of the scales (Mailhos, Buunk, & del Arca, 2013) were used in the current study. In this study, the scales exhibited adequate reliabilities, with Cronbach's alphas of 0.76 and 0.77, respectively. Example items include “*I have no problems talking in front of a group*” (sociable dominance), and “*I can look everybody in the eye and lie with a straight face*” (aggressive dominance). Participants indicated their agreement with the different items by means of a 5-points Likert scale (1 = completely disagree; 5 = completely agree).

### 2.5. Statistical analyses

Statistical analyses were performed IBM SPSS Statistics Version 20 (IBM Corporation, 2012). All tests were two-tailed, and the significance level was set to  $\alpha = 0.05$ .

## 3. Results

Mean reported and measured height, weight and BMI values calculated from reported and measured data are shown in Table 1. We conducted paired-samples *t*-tests in order to compare reported vs measured height, reported weight vs measured weight, and BMI based on reported vs measured values. These analyses showed no significant differences between self-reported height and measured height ( $t_{(97)} = -0.14$ ,  $p = 0.888$ ), between self-reported weight and measured weight ( $t_{(97)} = -1.48$ ,  $p = 0.141$ ), or between BMI based on reported and measured data ( $t_{(94)} = -1.13$ ,  $p = 0.261$ ).

In order to examine the relationship of intrasexual competition with the differences between reported and measured height, weight and BMI, we calculated Pearson's correlation coefficients. The analyses showed a significant positive association of intrasexual competition with the bias in height report ( $r_{(86)} = 0.305$ ,  $p = 0.004$ ), and a negative association with the bias in BMI report ( $r_{(86)} = -0.222$ ,  $p = 0.040$ ) (see also Fig. 1). No significant association was observed with the bias in weight report ( $r_{(88)} = -0.107$ ,  $p = 0.321$ ). That is, greater intrasexual competition was significantly associated with a larger positive bias in reporting height values, and the report of lesser BMI values, but was not significantly associated with a bias in reporting one's own weight. Similarly, we performed Pearson correlation analyses in order to examine potential associations of sociable dominance, and aggressive dominance with height, weight and BMI bias. These analyses showed no significant correlations between these variables ( $r$  values ranged from  $-0.061$  to  $0.121$ ,  $p$ -values ranged from  $0.261$  to  $0.936$ ).

In this study, 9 different potential associations of three personality traits (intrasexual competition, and sociable, and aggressive dominance) with a bias in the report of three anthropometric measures (height, weight, and BMI) were considered. In order to control for multiple comparisons in the correlation analyses, we applied the conservative Bonferroni correction. The correlation between intrasexual

**Table 1**  
Mean reported and measured height, weight and BMI, and difference between reported and measured height, weight, and BMI.

	Reported	Measured	Difference (Reported – Measured)
Height (cm)	175,05 (8,64)	175,08 (7,56)	–0.03 (3,04)
Weight (kg)	67,48 (8,09)	68,03 (7,79)	–0.55 (3,41)
BMI (kg/m <sup>2</sup> )	21,99 (1,78)	22,14 (1,55)	–0.15 (1,33)

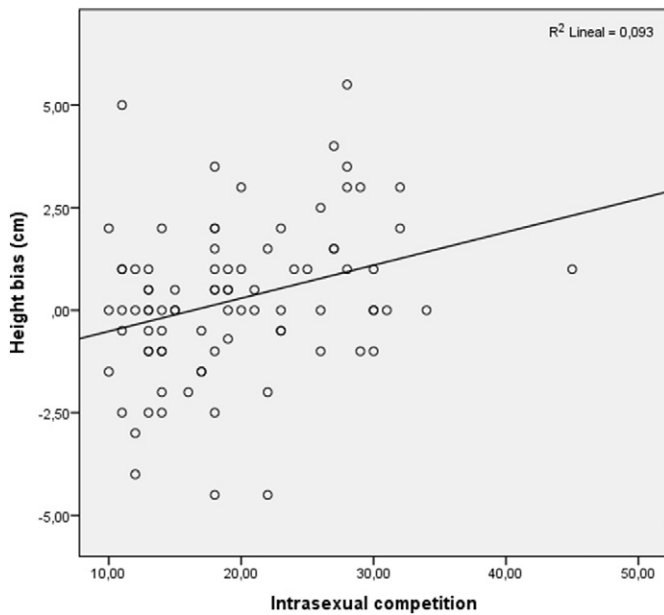


Fig. 1. Relationship between intrasexual competition levels and the bias in height report (reported height minus measured height).

competition and a bias in over-reporting one's own height remains significant after applying the Bonferroni correction (adjusted  $p = 0.036$ ), while the association between intrasexual competition and BMI bias fails to reach significance (adjusted  $p = 0.358$ ).

Since it could be argued that the bias in height report might be explained by actual participant height rather than intrasexual competition—e.g., shorter participants might report larger height values than taller participants—or participant age—e.g., older males may be more likely to report greater intrasexual competition scores—Pearson correlation coefficients for height bias, measured height, age, and intrasexual competition were calculated. The analysis showed that the bias in height report is not significantly correlated with measured participant height ( $r_{(93)} = 0.091$ ,  $p = 0.387$ ), nor with participant age ( $r_{(92)} = -0.015$ ,  $p = 0.886$ ). Additionally, intrasexual competition is not significantly correlated with age ( $r_{(94)} = 0.138$ ,  $p = 0.186$ ), nor with measured height ( $r_{(94)} = 0.089$ ,  $p = 0.392$ ). As expected, measured height is significantly correlated with age ( $r_{(100)} = 0.227$ ,  $p = 0.023$ ).

#### 4. Discussion

Our results show virtually no difference between reported vs measured height in the sample analyzed. Whereas previous research shows that males significantly over-report their own height (e.g., Rowland, 1990; Sharples et al., 2012; Shields et al., 2008; Wang et al., 2002), at least in one study no significant differences between reported vs measured height were observed in a group of males of age similar to that of our sample (Bowring et al., 2012). One possible explanation is that the participants in our sample are very much aware of their own height because their stature is routinely measured as part of frequent physical examinations. Alternatively, soccer players might be more aware of their own height because of its potential impact on their own market value.

In addition, our analyses show a non-significant trend in under-reporting one's own weight. While this difference fails to reach significance, several studies have previously reported a tendency in under-reporting one's own weight. Since weight is closely related to height, from an evolutionary perspective, it could be expected that the bias in height and weight report would go in the same direction. One interesting possibility is that weight has become associated, in Western

societies, with poor health habits and low socioeconomic status—wealthier individuals would have access to higher-quality foods and free time to exercise—and that this association is driving the observed bias in weight report.

Our main result was that, as hypothesized, high intrasexual competition showed a significant positive correlation with height over-report. It could be argued that the bias in height report might result from the players lack of knowledge of their own height. However, if this was the case, we would expect no directionality in such a bias, or even an under-report might be expected—adolescent players are still growing and might be reporting earlier heights. In fact, no correlation between measured height and the bias in height report could be observed. It could also be claimed that the observed association is driven by older players—who could report larger height values—reporting higher intrasexual competition, however, intrasexual competition is not significantly correlated with age.

The observed association between intrasexual competition and the bias in height report is consistent with the idea that height over-report could be considered as a self-enhancement mechanism reminiscent of those animal self-inflation mechanisms observed in agonistic encounters.

It is tempting to suggest that the observed report biases reflect internalized physical ideals which, in turn, drive deceptive strategies aimed at devaluing potential rivals. To the best of our knowledge, this study is the first to relate intrasexual competition levels to a bias in reporting one's own height, a putative indicator of status and power. In intrasexually competitive environments, human males frequently engage in deceptive acts and tactics related to exaggeration of superiority (Fisher & Cox, 2011; Tooke & Camire, 1991). Whether the observed bias in height report is the result of a cognitive distortion provoked by high intrasexual competition levels, a conscious bluff aimed at deterring potential rivals and avoiding overt confrontation, or some alternative mechanism, remains an open question. Since no correlations were found between the bias in height report and aggressive dominance, one could think that inflated height reports might be related to non-aggressive competition strategies.

Soccer is believed to be one of the most competitive sports based on the unpredictability of the results (Ben-Naim et al., 2007). In many developing countries, soccer provides one of the few available channels for upward social mobility, which adds to the competitive pressure in pre-professional and professional leagues. We therefore believe the pre-professional categories of a First Division soccer team provide an ideal environment to study intrasexual competition processes, and might have helped to reveal the association between intrasexual competition and the bias in height report.

We also explored the relationship between weight—another operationalization of body size—and intrasexual competition, and sociable and aggressive dominance, but no significant correlations were found. In this regard, it has been observed that adolescent males are divided between those who want to lose and those who want to increase weight (McCabe & Ricciardelli, 2004; Ricciardelli, McCabe, & Banfield, 2000). It has been suggested that the bias direction and magnitude in weight self-reports seems to be influenced by the overweight status of the respondents—overweight men tend to under-report their weight, while underweight men over-report it (Rowland, 1990; Shields et al., 2008; Wang et al., 2002). This heterogeneity in weight ideals might be obscuring any potential correlations. This might be also true for the correlations between BMI and the psychological variables considered in this study.

While the selection of a highly specific population—such as the one considered in the present study—might reveal interesting phenomena, it also poses some limitations. Our sample consisted exclusively of adolescent male soccer players, thus the findings reported in this study cannot be extended to the general population. The highly competitive nature of soccer, the male-specific intrasexual competitive strategies, and even the age range of the participants in this study, might have

contributed to uncover the correlation between intrasexual competition and the bias in height report. Additionally, while our sample is reasonably large, there a considerable dispersion in the age of the participants. A larger sample may enable the analysis of age specific differences in the observed phenomena. Adolescence is a life stage characterized by dramatic physical and psychological changes, thus it may be worth extending the present studies to other age groups.

Since women engage in intrasexual competition in primarily non-physical ways—e.g., verbal aggression and indirect relational aggression—it will be interesting to examine whether intrasexual competition is related to exaggerating their *damage potential*. Given the current prevalence of online platforms in social interactions, and the relationship of social network size with relational and verbal aggression (Lee et al., 2016; Vanbrabant et al., 2012), in future studies, it would be worth analyzing whether social network size or use frequency are related to intrasexual competition as an attitude.

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