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Facial asymmetry and aggression in Spanish adolescents

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A B S T R A C T

Intrasexual competition is often characterized by the struggle for sexual partners. Men’s competitive behavior typically includes physically aggressive acts or anger, whereas women tend to disparage their rivals via derogation. Fluctuating asymmetry (FA), a measure of developmental instability and health, has been reported to negatively correlate with physical aggression in boys and young adults. In this study, we investigated the relationship between facial FA and different forms of aggression in a sample of 296 Spanish adolescents (148 men and 148 women) aged 14–19 years. Geometric morphometrics was used to assess facial FA and the buss and perry aggression questionnaire (BPAQ) was administered to collect self-reports of physical aggression, verbal aggression, anger and hostility. Our results showed a negative association between facial FA and anger in male adolescents and with hostility only in older adolescent women (17–19 years). No significant association was detected between physical aggression and facial FA in either sex. We discuss our results with reference to the recalibrational theory of anger (in men) and in terms of competitor derogation (in women).

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1. Introduction

Intrasexual competition is defined as the competition between members of the same sex in order to gain reproductive access to members of the opposite sex (Ridley, 1996). In animal species, males are typically more competitive than females, possibly due to their lower parental investment (Trivers, 1972), although in many cooperative breeders (e.g., Clutton-Brock et al., 2006; Smith, Ottosson, & Sandell, 1994) and social species (Palombit, Cheney, & Seyfarth, 2001) females also compete for ‘high quality’ mates. There is evidence for intrasexual competition also in humans, as both men and women commonly use sex-typical tactics that should attract potential partners and, once attracted, give them exclusive access to them (Campbell, 2009).

Men’s competitive actions show striking similarities with those observed in animals and this primarily concerns the use of physical aggression (Gallup, O’Brien, & Wilson, 2011). However, fighting rivals in direct physical conflict has the disadvantage that it can eventually be harmful for both parties. Thus, it has been argued that other mechanisms of intrasexual competition could have evolved to resolve conflicts without facing direct costs for both rivals (Archer & Thanzami, 2007; Sell, Tooby, & Cosmides, 2009). These mechanisms range from subtle forms of intrasexual competition (Simpson, Gangestad, Christensen, & Leck, 1999) to direct confrontations including anger. The ‘recalibrational theory of anger’ suggests that men who possess traits that signal high resource holding power (RHP) are prone to use anger as a bargaining intrasexual mechanism (Sell et al., 2009). In this view, RHP traits are thought to be physical features (such as muscularity or strength), which are associated with fighting ability. Contrary to men, women tend to use non-physical intrasexual aggressive tactics (e.g., hostile aggression) when competing with other women in order to derogate the status or desirability of a rival (Benenson, 2009; Simpson et al., 1999). In this sense, hostility toward other women is considered as generalized strategy to devaluate the attractiveness of their competitors (Buss & Dedden, 1990; Cashdan, 1998; Fisher, 2004; Loya, Cowan, & Walters, 2006). This mechanism is more effective in reducing men’s perception of the victimized women’s attractiveness when it is employed by an attractive woman (Fisher & Cox, 2009).

Most of the evidence on intrasexual competition in humans is derived from the evolutionary psychology study of adults (typically students at college age). However, there is high interest in understanding the causes of aggression also in children and adolescents, as this has implications on deriving health policies (Craig & Harel, 2004). While the individual causes of developmental aggression certainly require a multi-factorial concept, it has been reported that like in adults, there is a sex difference in the expression of physical and non-physical aggression also in adolescents, with boys using physical aggression more frequently than girls (Archer, 2004). In
addition, it has been shown that physical aggression becomes less frequent with age in both male and female adolescents (e.g., Brame, Nagin, & Tremblay, 2001; Tremblay & Nagin, 2005) and that the age-related displays of aggression correspond with both physical and psychological developmental changes (Gallup, O’Brien, White, & Wilson, 2010; Kroger, Martinussen, & Marcia, 2010). For example, Muñoz-Reyes, Gil-Burmann, Fink, and Turiegano (in press) found that in Spanish male adolescents there was a positive relationship between self-perceived fighting ability and physical aggression, which decreased with age. Moreover, these authors reported a positive relationship between fighting ability and anger only for older adolescent males (17–18 years), and argued that these findings were in support of the recalibrational theory of anger, as only older adolescents showed the shift toward the use of non-physical aggression.

In addition to sex differences and age-related changes in aggression of adolescents, researchers have reported results suggesting that fluctuating asymmetry (FA) may have an effect on aggression in adolescents (Furlow, Gangestad, & Armijo-Prewitt, 1998; Manning & Wood, 1998). FA has been proposed as a cue of health and fitness and is, therefore, thought to reflect an organism’s ability to maintain a stable morphology by resisting developmental perturbations (Møller, 2006; Møller & Swaddle, 1997). FA denotes the deviation from bilateral symmetry in physical traits that are symmetrical at the population level (van Dongen & Gangestad, 2011; van Valen, 1962). Low FA correlates negatively with attractiveness in a wide range of species, including humans (Brown et al., 2008; Perrett et al., 1999; van Dongen & Gangestad, 2011). The animal literature suggests that FA is associated with male fighting ability (Thornhill, 1992) and with secondary sexual characters size (Møller & Pomiankowski, 1993). Hence, it has been proposed that in human males FA might reflect RHP as well (Furlow et al., 1998; Wilson & Manning, 1996), given that low FA men seem to perform better in obtaining resources, especially in situations involving aggression (Zaatari & Trivers, 2007). Other studies have shown that FA correlates negatively with male facial masculinity (Gangestad & Thornhill, 2003), body mass and height (Gangestad & Thornhill, 1996; Manning, 1995), torso volume and shoulder breadth (Brown et al., 2008), social dominance and with perception of masculinity, robustness and vigor (Gangestad & Thornhill, 1996). All these features are considered as RHP traits (Archer & Thanzami, 2007; Sell et al., 2009). Manning and Wood (1998) reported that body FA in boys is negatively correlated with physical aggression and Furlow et al. (1998) described a similar result in a sample of undergraduate college students. Finally, Holtzman, Augustine, and Senn (2011) reported a negative association of FA with certain personality characteristics, including aggressive-ness, anger and hostility in young men and women.

The present study concerns the possible relationship of aggression and facial FA in a sample of Spanish adolescents aged 14–19 years. In considering the evidence on negative association of FA with aggression (Furlow et al., 1998; Holtzman et al., 2011; Manning & Wood, 1998) and recent evidence on the use of anger instead of physical aggression in late adolescent boys (Muñoz-Reyes et al., in press) our prediction was that also facial FA should correlate negatively with aggression, this being particularly the case for the link between facial FA and anger in adolescents. Given the sex-differences in types of aggression, we predicted that in adolescent females facial FA should be particularly related to measures of hostility.

2. Materials and methods

2.1. Participants

Our initial sample comprised 321 male and female students of regular classes from one public school in Madrid (Spain). Twenty-five students had to be excluded from the statistical analysis because we did not obtain permission for using their facial photographs (n = 15) and/or because of difficulties with the understanding of the survey (n = 10). Thus, the final sample included 296 students, 148 men (aged 14–19 years, Mean ± SD = 16.18 ± 1.00: 79.7% Spanish, 16.2% South-American, 3.4% Eastern-European, 1% other), and 148 women (aged 14–19 years, 16.23 ± 1.29: 70.9% Spanish, 22.3% South-American, 5.4% Eastern-European, 1.4% other). The study was approved by the ethics committee of the Universidad Autónoma de Madrid (code: CEI 27-677) and by the Head of the School. Each legal guardian (usually the father or mother) gave written consent to the student’s participation. In order to protect the participant’s privacy and to improve the accuracy of answers, all questionnaires were encoded questionnaires and completed anonymously.

2.2. Procedure

2.2.1. Buss and Perry aggression questionnaire (BPAQ)

The BPAQ (Buss & Perry, 1992) was administered to the participants in a form adapted to Spanish pre-adolescents and adolescents (Santisteban & Alvarado, 2009). This questionnaire comprises 29 items that are answered in Likert-type format (i.e., 1 = “uncharacteristic of me” to 5 = “very characteristic of me”). This questionnaire has a four-factor structure, composed of physical aggression (PA), verbal aggression (VA), anger (A), and hostility (H). It has been broadly and successfully employed in several countries (see references summarized in Santisteban & Alvarado, 2009). The BPAQ showed high internal consistency in our study, with Cronbach’s alpha (a) values similar to those reported by Santisteban and Alvarado (2009) (a PA: 0.83; a VA: 0.70; a: 0.74; a: H: 0.71).

2.2.2. Facial asymmetry measurement

We measured facial FA following the protocol employed by Sanchez-Pages and Turiegano (2010) and Holtzman et al. (2011). Facial photographs of all participants in frontal view were taken with a Nikon D-90 digital camera under standardized conditions in terms of light and head orientation. Participants wore a shower cap (to avoid that their hair covered ears and eyebrows), took off any facial adornment, and were then prompted to look straight into the camera with neutral expression. Five images of each participant were taken and the best was taken for further processing (i.e., we discarded images in which the participant was smiling, had his/her head tilted to the left or right side, or those where the face was out of focus). FA was calculated from 39 facial landmarks (LM) that were identified on each face (see for details Sanchez-Pages & Turiegano, 2010) using the TPS software toolkit (see http://www.life.bio.sunysb.edu/morph). Each LM was placed twice, i.e., by two different researchers. The LMs placement error did not deviate significantly from zero (average difference ± SEM = 0.0025 ± 0.0239; ±SEM = 0.10: p = 0.92). Using MorphoJ software (Klingenberg, 2011; see also http://www.flywings.org.uk/MorphoJ_page.htm) facial symmetry was calculated from the Procrustes distances between each LM and the corresponding LM of its mirror image. These distances were then decomposed into directional asymmetry and FA by means of the Procrustes ANOVA (Klingenberg, Barluenga, & Meyer, 2002; Klingenberg & McIntyre, 1998). Facial FA measures correlated positively and significantly with those of total (object) asymmetry (r = 0.94, p < 0.001), indicating that our facial asymmetry measure was not considerably affected by directional asymmetry.

2.3. Analysis

Since FA did not meet the assumption of normality (skew = .97; kurtosis = 1.40), we multiplied FA values by 100 and log-trans-
formed them (skew = .09; kurtosis = .07) (see Sanchez-Pages & Turiegano, 2010). In addition, all variables were transformed into z-scores, following the commonly employed technique when comparing psychological measures with anthropometric features, as they were measured on different scales (e.g., Furlow et al., 1998; Sell et al., 2009). In considering the literature on marked developmental differences within the stages of adolescence (e.g., Bahadur, 2000; Roenneberg et al., 2004), we split our sample into two age groups, i.e., young adolescents, aged 14–16 years (men: N = 83, Mean age ± SD = 15.19 ± .78; women: N = 85, Mean age ± SD = 15.31 ± .77), and older adolescents, aged 17–19 years (men: N = 63, 17.43 ± 4.5; women: N = 65, 17.51 ± .59) (see also Lempers & Clark-Lempers, 1992; Muñoz-Reyes et al., in press). In order to test for possible differences between the sexes and age groups in BPAQ measures, we analyzed our data by employing a 2 (sex) × 2 (age group) ANOVA. Finally, in each age group, and separately by sex, we performed simple linear regression, between each BPAQ subscale and facial FA. All statistical analyses were performed using SPSS 18.

3. Results

Descriptive statistics of BPAQ scores, separately for sex and age groups, are reported in Table 1. We found a significant effect of sex on facial FA (F(1, 293) = 4.7, p < 0.05). Male adolescents had significantly higher scores on physical aggression than female adolescents (F(1, 293) = 34.9, p < .001), whereas anger and hostility scores were found to be significantly higher in female than in male adolescents (anger: F(1, 293) = 14.72, p < .001; hostility: F(1, 293) = 14.53, p < .001). No significant sex difference was found for verbal aggression (F(1, 293) = .004, p = .97). Age (group) of the participant did not have a significant effect on facial FA (F(1, 293) = .08, p = .77) and also no significant effect on any of the BPAQ measures (all F < 2.34, all p > .13).

Concerning the association between facial FA and aggression, we found that in male adolescents facial FA was negatively and significantly associated with anger only in older adolescents (beta = –.25, p < .05) (Fig. 1A). In female adolescents, facial FA was associated negatively and significantly with hostility, but also only in the older adolescents’ group (beta = –.32, p < .05) (Fig. 1B). In the young adolescents’ group we did not detect any significant relationship between facial FA and the BPAQ measures (Table 2).

4. Discussion

Traditional social learning theorists conceptualize aggression as a loss of control from a pathological or antisocial perspective (Hoffman, Ireland, & Widom, 1994). In this sense, aggression is mainly viewed as a learned behavior (Reiss & Roth, 1993). In contrast, and following an evolutionary perspective, we suggest that human aggression could be placed in an intrasexual competition context. We hypothesized that different components of aggression would correlate negatively with FA (associated with attractiveness and RHP) in adolescents in response to different intrasexual selection pressures. Our results confirmed this hypothesis, in that we found negative relationships between facial FA and different BPAQ subscales during late adolescence in both sexes (anger in male and hostility in female adolescents). Since there was no association between FA and any aggression measure in young adolescents, we suggest that intrasexual competition pressures at this age (14–16 years) differ in the strengths of their effects from those in older adolescents.

Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>Young adolescents</th>
<th>Older adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N = 83)</td>
<td>(N = 85)</td>
</tr>
<tr>
<td>Age</td>
<td>15.19 ± .78</td>
<td>15.31 ± .77</td>
</tr>
<tr>
<td>PA</td>
<td>25.3 ± 6.4</td>
<td>20.8 ± 6.9</td>
</tr>
<tr>
<td>VA</td>
<td>12.9 ± 3.3</td>
<td>13.3 ± 3.8</td>
</tr>
<tr>
<td>H</td>
<td>21.3 ± 4.8</td>
<td>24.2 ± 5.4</td>
</tr>
<tr>
<td>A</td>
<td>18.1 ± 5.2</td>
<td>20.9 ± 5.7</td>
</tr>
<tr>
<td>FA</td>
<td>65 ± 23</td>
<td>55 ± 30</td>
</tr>
</tbody>
</table>

Note: For men N = 148, for women N = 148. Physical aggression (PA), verbal aggression (VA), anger (A), hostility (H), fluctuating asymmetry (FA).

Table 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Young adolescents</th>
<th>Older adolescents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>PA</td>
<td>–.002</td>
<td>.159</td>
</tr>
<tr>
<td>VA</td>
<td>.017</td>
<td>.157</td>
</tr>
<tr>
<td>A</td>
<td>.026</td>
<td>.040</td>
</tr>
<tr>
<td>H</td>
<td>–.121</td>
<td>.125</td>
</tr>
</tbody>
</table>

Note: Physical aggression (PA), verbal aggression (VA), anger (A), hostility (H). * p < .05.

Fig. 1. Scatterplots of the relationship between facial FA and anger in late adolescent men (A) and facial FA and hostility in late adolescent women (B).
The recalibrational theory of anger (Sell et al., 2009) proposes that males with higher fighting ability will have more power to bargain for better treatment through their greater capacity to inflict costs. This increase in bargaining power will make anger more effective for better fighters and lead better fighters to deploy anger more readily (Sell, Hone, & Pound, 2012). We found that FA is linked to anger in older male adolescents. More symmetrical adolescent men, who are thought to be stronger competitors (Gangestad & Thornhill, 1996; Zaatari & Trivers, 2007), tend to use anger more frequently as an alternative way (to physical conflict) in competing with men of their own group. Anger avoids unnecessary fights (and, consequently, the risk of being injured) while maintaining the capacity to dominate potential intragroup allies (Benenson, 2009).

We did not find the hypothesized negative association between physical aggression and FA. We expected this association based on previous findings with boys (Manning & Wood, 1998) and with undergraduate college students (Furlow et al., 1998). However, Furlow et al. (1998) failed to find a correlation between physical aggression subscales of the BPAQ and FA, and supported the link between FA and physical aggression based on reports of previous fights. This may be explained by the differences in participants’ age and methodology between the present and previous studies. To our knowledge, this is the first study exclusively with adolescents on this topic.

Finally, we also found the predicted link between facial FA and hostility in older adolescent women. Women compete for men who display so called ‘honest’ signals of genetic quality, which are thought to reflect their capacity to provide resources and interest in protecting offspring (Buss, 1989; Gil-Burmann, Peléz, & Sánchez, 2002; Wilson, Daly, & Weghorst, 1980). This competition is stronger in older adolescent women, possibly because reproductive opportunities are more common in this developmental period. Thus, female adolescents aged 17–19 years are likely competing more strongly with others for high quality mates. This intrasexual competition also depends on their physical attractiveness (Cashdan, 1998; Fisher, 2004). One strategy that might be adopted in this context is the use of hostile tactics that derogate the reputation and appeal of other females (Gallup & Wilson, 2009; Gallup et al., 2011; Owens et al., 2000a, 2000b). This mechanism is more effective in influencing men’s evaluations of other women when employed by attractive women (Fisher & Cox, 2009). So, attractive women are thought to use this tactic more often than unattractive women. Our data support this prediction, given the hostility negatively associated with FA, and FA correlates negatively with attractiveness in humans (e.g., Perrett et al., 1999; van Dongen & Gangestad, 2011).

However, another explanation, which is not based on differences in the efficacy of the competitor derogation mechanism is feasible. It can be expected that more attractive older adolescent women (i.e., those with low FA) compete harder than less attractive women for high-resource men and are, therefore, more prone to use hostility as a mechanism of intrasexual competition. This different intensity in intrasexual competition between low and high attractive women may arise because low FA women usually try to mate with low FA (attractive) men (assortative mating, see Burris, Roberts, Welleng, Puts, & Little, 2011; Buston & Enlem, 2003; Little, Burt, & Perrett, 2006), and low FA men in turn attract many suitors and report more sexual partners (Gangestad, Bennett, & Thornhill, 2001; van Dongen & Gangestad, 2011). Consequently, women seeking out for low FA men will likely be involved in intense intrasexual competition to attract and retain them, and are, therefore, more prone to use competitor derogation through the use of hostility. Our data show that FA is not related to physical aggression in female adolescents. This confirms the low tendency to employ this costly type of aggression in women. In summary, we conclude that there are links between aggression and FA in older adolescents of both sexes, although the particular form of aggression is different in men and women. That is, FA is negatively related to anger in male adolescents and to hostility in female adolescents. We suggest that both correlations may arise from sex-specific mechanisms, i.e. the recalibrational theory of anger (the use of FA as a RHP signal linked to anger) in men and derogation mechanism through hostility (FA as an attractive trait linked to hostility) in women.

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