



## Short Communication

# Morningness–eveningness and intrasexual competition in men



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## ABSTRACT

A growing body of research points to a relationship between chronotype and socio-sexuality, especially in men, such that evening-types appear both to be more short-term mating oriented than morning-types and to possess more personality traits and other behavioral characteristics that facilitate sexual promiscuity. This study contributes to and expands this body of research by investigating the relationship between chronotype and intra-sexual competition. We tested the prediction that, in a subject population of young heterosexual men, evening-types would score higher on intra-sexual competition in the context of mating. The results were consistent with our prediction and showed that the association between chronotype and intra-sexual competitiveness is not the by-product of correlations with personality measures. Higher intra-sexual competitiveness in men who are evening-types may contribute to their higher short-term mating success reported by previous studies. Evolutionary hypotheses testing predictions derived from sexual selection or life history theory can make a significant contribution to our understanding of the functional significance of inter-individual variation in chronotype and its associated psychological and behavioral traits.

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## 1. Introduction

There are consistent individual differences in humans' self-reported preferences for sleep and diurnal activity patterns, with some individuals preferring to wake up early, be active during the day, and go to bed early (morning-types) and others preferring to stay up late in the evening, be active at night, and sleep late in the morning (evening-types) (e.g., Horne & Östberg, 1976). Morningness–eveningness, or chronotype, is associated with individual differences in biological circadian rhythms (Burgess & Fogg, 2008; Duffy, Rimmer, & Czeisler, 2001) and psychological dimensions. For example, morning-types score higher than evening-types on the Big-Five personality dimensions of conscientiousness and agreeableness (Tsaousis, 2010), are less prone to risk-taking (Killgore, 2007; Maestriperi, 2014), less impulsive (Caci et al., 2005) and score lower on various measures of cognitive function than evening-types (Preckel, Lipnevich, Schneider, & Roberts, 2011).

Although age and environmental factors (e.g., geographic and seasonal variation, work schedule, etc.) can contribute significantly to variation in chronotype (Natale, Adan, & Fabbri, 2009; Roenneberg et al., 2004), morningness–eveningness is generally stable over time and moderately heritable ( $h^2 = 0.45$ ; Hur, 2007;

Klei et al., 2005). Morningness–eveningness is normally distributed within populations, with unequivocal morning-types and evening-types at the two extremes of the distribution (Roenneberg et al., 2004, 2007). Men are overrepresented among the evening-types, while more women are found among the morning-types (Randler, 2007). This sex difference in chronotype is absent or minimal before puberty and after menopause (Roenneberg et al., 2004) and similar to other sexually dimorphic traits, chronotype may be under the influence of gonadal steroids (Hastings Hagenauer, & Lee, 2012).

In evolutionary biology, morphological, physiological or behavioral traits that become sexually dimorphic at puberty are often interpreted as secondary sexual characters (e.g., enlarged breasts in women and facial hair in men), in other words, they are believed to be related to mating and to have evolved by sexual selection (Darwin, 1871). Sexual selection accounts for sexually dimorphic traits that, during evolutionary history, increased the reproductive success of individuals of one sex either by making them more competitive toward same-sex individuals (intra-sexual selection) or by increasing their qualities as prospective mates for opposite-sex individuals (inter-sexual selection) (Andersson, 1994; Darwin, 1871). Since sex differences in chronotype appear at puberty and are most prominent during the period in which women are fertile (between puberty and menopause), it has been suggested that chronotype may have been under sexual selection (Piffer, 2010; Randler et al., 2012). Specifically, it has been hypothesized that

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eveningness, especially in men, is associated with increased short-term mating success as measured by the number of lifetime sexual partners (Piffer, 2010; Piffer, Gunawardane, & Custance, 2011; Randler et al., 2012) as well as with unrestricted socio-sexuality and psychometric measures of fast life histories (Ponzi et al., 2014). Despite the association between chronotype and sexual behaviors, it is not clear why evening types may have higher short-term mating success. For example, eveningness may be associated with specific characteristics that are found attractive by opposite sex partners or with greater competitiveness in the context of mating.

In this study we investigated the relationship between chronotype and responses to the Intrasexual Competition Scale (ICS; Buunk & Fisher, 2009) among male college students. The ICS is a questionnaire that assesses one's views of a competitive confrontation with an individual of the same sex in the mating context. This scale showed high reliability ( $\alpha > 0.80$ ) and was independently validated in two subject populations in the Netherlands and Canada (Buunk & Fisher, 2009). It is correlated with extraversion and neuroticism in men and has been suggested to be a different construct from sociosexual orientation (Buunk & Fisher, 2009). Given that extraversion and other aspects of personality have also been linked to chronotype (Tsaousis, 2010), in this study we tested if variation in chronotype could explain variation in intra-sexual competition above and beyond the effects of Big Five personality traits.

## 2. Methods

Participants were 107 heterosexual young men recruited on the University of Chicago campus through fliers, mailing lists, or a human subject recruitment website (Sona System). The majority of the participants were students. All study participants completed a written informed consent form before participating in the study and were paid \$20 after completion of the procedures. This study and the use of human subjects were approved by the Social Sciences Institutional Review Board of the University of Chicago.

### 2.1. Questionnaires

#### 2.1.1. Reduced version of the morningness–eveningness questionnaire

We assessed chronotype with the reduced version of the morningness–eveningness questionnaire (rMEQ; Adan & Almirall, 1991). The rMEQ is a validated five-item Likert-type scale obtained from the original 19-item version of the MEQ (Horne & Östberg, 1976). Scores for the rMEQ range from four to 25; scores below 12 identify participants as evening-types and scores above 17 as morning-types. The Cronbach's  $\alpha$  coefficient for the present study was .68.

#### 2.1.2. Intra-sexual Competition Scale

The Intra-sexual Competition Scale (ICS; Buunk & Fisher, 2009) is composed of 12 items with a Likert-type response ranging from 1 (not at all applicable) to 7 (very much applicable); it measures someone's attitude toward a confrontation with same-sex individuals in situations where opposite-sex individuals are potential mates. Examples of the items are: "I can't stand it when I meet another man who is more attractive than I am" and "I always want to beat other men". In the present study the ICS's Cronbach's  $\alpha$  was .78.

#### 2.1.3. Big-Five Personality Inventory

Personality was assessed using the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991), a 44-item questionnaire measuring personality traits along five dimensions: extraversion (Cronbach's

$\alpha = .87$ ), agreeableness ( $\alpha = .76$ ), conscientiousness ( $\alpha = .82$ ), neuroticism ( $\alpha = .82$ ), and openness to experience ( $\alpha = .75$ ).

### 2.1.4. Statistical analysis

In agreement with previous studies, we analyzed the rMEQ scores as a continuous variable (e.g., Jonason, Jones, & Lyons, 2013; Mecacci & Rocchetti, 1998). We assessed the association between morningness–eveningness and intra-sexual competition, while controlling for the possible effects of personality, using multiple regression analysis. Since previous studies found significant relationships between the Big Five and the ICS and the MEQ scores, personality traits of the Big Five Inventory were entered as potential covariates in the regressions. Given the relatively small sample size for linear regression standards we used both OLS and robust regression analysis. In order to test for the accuracy of the regression coefficients we performed bootstrapping of residuals (residuals resampling) and present the bias accelerated confidence interval (BCa). These analyses were carried out in SPSS 22 and R packages MASS and CAR (CRAN.R-project.org)

## 3. Results

### 3.1. Descriptive statistics and correlations

Table 1 presents the descriptive statistics for the sample and the bivariate correlations. Mean age of the participants was 22.44 years ( $SD = 3.90$ ). The rMEQ was normally distributed and its average score was 13.52 ( $SD = 3.30$ ). Likewise, all the variables used in the present study were normally distributed. There was a significant positive correlation between the rMEQ scores and age, indicating that morningness was more common in older than in younger individuals. There were small size positive correlations between the rMEQ score and Agreeableness and Conscientiousness (Table 1), indicating that morning-types scored slightly higher on these personality dimensions than evening-types. The same two personality dimensions were significantly and negatively correlated with the ICS scores ( $M_{ICS} = 3.30$ ,  $SD_{ICS} = .85$ ), indicating that individuals who were less agreeable and less conscientious scored higher on the ICS. The ICS scores were not significantly correlated with age, or with extraversion, neuroticism, or openness to experience (Table 1).

### 3.2. Multiple regression analyses

Regression diagnostic showed that there were no outliers and that the residuals were normally distributed and homoscedastic. However, 6 subjects had a score above the threshold for the Cook's distance and therefore were considered as multivariate influential points. We then ran two multiple regression analyses, one in which we did not include these 6 subjects and another one in which they are included but we used a robust regression with M estimators using the Huber weights. In the first analysis, the model was significant ( $R^2_{adj} = .14$ ,  $F(6,91) = 3.75$ ,  $p < .001$ ) and extraversion ( $\beta = .20$ ,  $t(91) = 2.03$ ,  $p < .05$ ) and agreeableness ( $\beta = -.22$ ,  $t(91) = -2.18$ ,  $p < .05$ ) were associated with the ICS (Table 2). In this model morningness was negatively associated with the ICS ( $\beta = -.25$ ,  $t(91) = -2.51$ ,  $p = .01$ ). In the second analysis, the robust regression showed that only agreeableness ( $\beta = -.17$ ,  $t(97) = -1.66$ ,  $p = .05$ ) and morningness ( $\beta = -.23$ ,  $t(91) = -2.29$ ,  $p = .01$ ) were associated with the ICS scores. However, an inspection of the confidence intervals obtained from both regressions suggests that in this sample, among the variable tested, morningness is likely the strongest independent predictor of intrasexual competition (Table 2).

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