Testosterone and Romance: The Association of Testosterone with Relationship Commitment and Satisfaction in Heterosexual Men and Women

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Objectives: The current study extends previous research on testosterone (T) and mating effort by examining whether relationship commitment and satisfaction explain variance in T beyond relationship status alone.

Methods: Salivary testosterone and self-reported assessments of relationship commitment and satisfaction were assessed among 90 heterosexual men and women (age M = 23.57) in a cross-sectional community sample.

Results: Relationship commitment was significantly related to T among men (P < 0.01), with increasing levels of commitment predicting lower T, even among paired men (P < 0.05). In contrast, relationship commitment was not related to women’s T (P > 0.05). Controlling for relationship commitment, satisfaction did not predict T levels in men or women (P’s > 0.18).


A growing body of research has documented a link between testosterone (T) levels and monogamous relationship and/or paternal status among men in various populations. On average, fathers and those in monogamous relationships have lower T than single men (reviewed in Archer, 2006). Exceptions to the general pattern have been documented, but they fit a conceptually meaningful pattern with differences related to cultural variation in paternal investment or commitment to monogamous pair-bonds (e.g., Alvergne et al., 2009; Muller et al., 2009).

The leading interpretation of these findings places them within the broader framework of life history theory. Within this framework, testosterone and other hormones can be considered the means by which the organism realizes the allocation of effort and resources toward various evolutionarily relevant ends (Ketterson and Nolan, 1999; Zera and Harshman, 2001). Overall, the effects of higher T on male physiology and behavior can be interpreted as increasing allocations to mating effort, or effort toward attracting or competing for new mating opportunities (Wingfield et al., 1990), at the cost of investment in survival (e.g., immunocompetence) and—among pair-bonding, paternally investing species—in current partners and offspring. Low T, on the other hand, may generally lead to reduced mating effort, increased investment in longevity, and increased willingness and ability to care for partners and offspring (Gray and Campbell, 2009; Ketterson and Nolan, 1999; Wingfield et al., 1990). To the extent that male mating effort interferes with pair-bonding and parenting effort, selection is likely to have shaped the hormonal regulatory system such that T increases when reproductive success can best be improved via increased mating effort, whereas circumstances that call for increased investment in longevity, pair-bond maintenance, or paternal effort lead to lower T. Since men in committed relationships or fathers optimally allocate less to mating effort relative to single men, the testosterone-as-mating-effort hypothesis predicts that pair-bonded men and fathers should evidence lower T than single or childless men (e.g., Bribiescas, 2001; Ellison, 2003).

Theory and empirical research have focused on male rather than female T because males generally accrue greater fitness benefits from increased mating effort than females, rendering the trade-off between mating and other forms of effort particularly salient. Kuzawa et al. (2010) found that T collected in morning saliva samples, but not afternoon, were lower among pair-bonded Filipino women. Another study examining heterosexual and nonheterosexual women separately demonstrated an association between T and relationship status among nonheterosexual women only (van Anders and Watson, 2006). Studies with samples comprised of women with mixed sexual orientation have found inconsistent results (van Anders and Goldey, 2010; van Anders et al., 2007). The association between relationship status and T in women is unclear, and thus warrants further investigation.

In this study, we aimed to further test the testosterone-as-mating-effort hypothesis, by examining whether T levels were associated with graded levels of self-reported monogamous relationship commitment or satisfaction among heterosexual men and women. If T modulates mating effort in human males, men in less strongly committed and satisfying relationships should have relatively high T levels indicative of potential openness to alternative...
TABLE 1. Demographic, relationship and testosterone characteristics of the sample

<table>
<thead>
<tr>
<th></th>
<th>All (n = 90)</th>
<th>Men (n = 48)</th>
<th>Women (n = 42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testosterone (pg/ml)</td>
<td>160.7 (151.7)</td>
<td>277.05 (117.15)</td>
<td>27.81 (16.85)</td>
</tr>
<tr>
<td>Log T</td>
<td>4.43 (1.29)</td>
<td>5.53 (1.46)</td>
<td>3.17 (1.55)</td>
</tr>
<tr>
<td>Age</td>
<td>23.53 (3.95)</td>
<td>23.44 (4.00)</td>
<td>23.6 (3.93)</td>
</tr>
<tr>
<td>Education completed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>42 (22)</td>
<td>22 (9)</td>
<td>20 (7)</td>
</tr>
<tr>
<td>2-year vocational</td>
<td>2 (2)</td>
<td>2 (2)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>College</td>
<td>36 (23)</td>
<td>23 (13)</td>
<td>13 (6)</td>
</tr>
<tr>
<td>Masters</td>
<td>9 (1)</td>
<td>1 (1)</td>
<td>8 (2)</td>
</tr>
<tr>
<td>PhD/Professional</td>
<td>1 (0)</td>
<td>0 (0)</td>
<td>1 (0)</td>
</tr>
<tr>
<td>Ethnicty</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>59 (28)</td>
<td>28 (18)</td>
<td>32 (10)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>23 (14)</td>
<td>14 (14)</td>
<td>11 (5)</td>
</tr>
<tr>
<td>African American</td>
<td>2 (1)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Other</td>
<td>6 (5)</td>
<td>5 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Relationship commitment</td>
<td>1.93 (1.73)</td>
<td>1.77 (1.73)</td>
<td>2.11 (1.73)</td>
</tr>
<tr>
<td>Has children</td>
<td>5 (4)</td>
<td>4 (3)</td>
<td>1 (1)</td>
</tr>
</tbody>
</table>

*aDemographics provided for those included in analyses, removing those who identified as nonheterosexual (n = 8), and an outlier with T valued > 4 SD above the mean.
*bFor continuous variables, means and (standard deviations) are provided.

relationships. It is not clear that females should face a T-modulated tradeoff between parenting and mating effort, but we included females in this study to help resolve conflicting prior research.

MATERIALS AND METHODS

A total of 99 (54 male) active, healthy people participated in the study and were tested at 10:00, 13:00, 15:30 h. Following informed consent, participants provided a saliva sample and completed questionnaires concerning demographics, relationship information, and reverse method menstrual cycle estimation. Salivary assay procedures followed the technique of Granger (1999; for more details see Supporting Information). Participants identified with one of six levels of relationship status forming an ordinal commitment variable (single < casually dating < seriously dating < explicitly monogamous but not cohabitating < explicitly monogamous and cohabitating < married). Relationship satisfaction was measured with the Relationship Quality Components Inventory (Fletcher et al., 2000; α = 0.95).

Few participants identified as homosexual (n = 8; 5 men), and were excluded from analyses. One male had a T level more than four SDs above the mean and was removed from data analyses (final sample n = 90). T values were log transformed to normalize the distribution. Among women, approximately half were using hormonal contraceptives (HCs; n = 24). Including these women allowed us to examine between-groups differences in T, and examine the potential moderating effect of HC use. Women using HCs had significantly lower T (M = 2.96, SD = 0.57) than women not using HCs (M = 3.49, SD = 0.41, t(40) = 3.37, P = 0.002). HC use was controlled for in all analyses among women. Demographic, T and relationship data are summarized in Table 1. The Human Research Review Committee of the University of New Mexico approved the study, and participants were reimbursed 25USD. Analyses were conducted using Statistical Package for Social Sciences [SPSS v.15.0].

RESULTS

Relationship commitment and testosterone

We performed ANCOVAs within sex with HC use as a factor (women), and relationship commitment and age treated as covariates (There was no linear or quadratic relationship between cycle day and testosterone (R² = 0.006, P > 0.79) and including cycle day as a covariate did not alter the significance of our results).

Among men, there was a significant difference in T depending on relationship commitment, F(1,45) = 18.37, P < 0.001, η² = 0.29. We further explored the nature of this relationship by testing a preplanned linear polynomial contrast of the six levels of relationship status. There was a significant linear effect (P < 0.05) such that higher relationship commitment was associated with lower mean T (see Fig. 1).

Among women, there was no main effect of relationship commitment on T, F(1, 37) = 0.22, P = 0.65. There was a significant effect of HC use, F(1, 37) = 8.36, P = 0.006, η² = 0.18, but the interaction was not significant F(1,37) = 0.03, P = 0.87; hence, HC use did not moderate the association between relationship commitment and T. Similarly, relationship commitment had no effect on T among women not using HCs, F(1,15) = 0.02, P = 0.90.
**Relationship satisfaction and testosterone**

To examine predictions regarding relationship satisfaction on T above and beyond relationship commitment, we performed an ANCOVA among those who were in a relationship within sex with HC use as a factor (women), and age, relationship satisfaction and commitment treated as covariates.

Among paired men (n = 28), the association between relationship commitment and T remained significant, \( F(1,24) = 6.30, P = 0.019, \eta_p^2 = 0.21 \). There was no significant association between relationship satisfaction and T, \( F(1,24) = 0.64, P = 0.43 \).

Among paired women (n = 28), the association between relationship commitment and T remained nonsignificant, \( F(1,21) = 2.10, P = 0.16 \). As with paired men, the satisfaction-T relationship was nonsignificant, \( F(1,21) = 1.16, P = 0.29 \). HC use remained a significant predictor of T, \( F(1,21) = 5.41, P = 0.03, \eta_p^2 = 0.21 \), but did not moderate the satisfaction association with T (\( P = 0.58 \)). Satisfaction had no effect on T among women not using HCs (\( P's = 0.992 \)).

**DISCUSSION**

Our results suggest that men's T is inversely and linearly associated with relationship commitment, with higher levels of commitment associated with lower levels of T. This result was not driven simply by the difference between single and paired men, considering commitment predicted T in analyses with men in relationships only. This is the first study that has explicitly examined self-reported relationship commitment, a variable which provides greater resolution on potential variation in mating effort among unmarried men. In contrast, we did not find a significant association between heterosexual women's relationship commitment and T levels. Relationship satisfaction was not related to T in men or women. Low relationship satisfaction need not signify an increase in mating effort, and therefore higher T.

Taken together with extant literature (Kuzawa et al., 2010; van Anders and Watson, 2006; van Anders et al., 2007), our findings support the conclusion that, among heterosexual adults, the clear association between monogamous relationship commitment and T may be specific to men, extending to women in specific mating contexts. Previous research demonstrated that women in polyamorous mating markets had higher T than single or paired women in monogamous ones (van Anders et al., 2007). Thus, women's T regulatory system is potentially similar to men's, but among single, heterosexual women in monogamous mating contexts, the benefits of increased T do not outweigh the costs of production and hence, are not elevated to a robust degree. Future research with larger samples examining relationship status and/or commitment and T in women across mating contexts (e.g., differing degrees of competition) will illuminate what role, if any, T plays in mating strategies of women.

**ACKNOWLEDGMENTS**

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**LITERATURE CITED**


