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Testosterone levels and their associations with lifetime number of opposite sex partners and remarriage in a large sample of American elderly men and women

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ABSTRACT

Testosterone (T) has been argued to modulate mating and parenting behavior in many species, including humans. The role of T for these behaviors has been framed as the challenge hypothesis. Following this hypothesis, T should be positively associated with the number of opposite sex partners a male has. Indeed research in humans has shown that T is positively related to the number of opposite sex partners a young man has had. Here we test, in both men and women, whether this relationship extends to the lifetime number of sex partners. We also explored whether or not T was associated with current marital status, partnership status and whether or not the participant remarried. Using a large sample of elderly men and women (each sample $n>700$), we show that T is positively and sizably associated with the number of opposite sex partners in men. When controlling for potential confounding variables such as educational attainment, age, BMI, ethnicity, specific use of a medication and time of sampling this effect remained. For women, the relationship between T and number of opposite sex partners was positive but did not prove to be robust. In both men and women there was no evidence for an association between T and current marital status and partnership status (being in a relationship or not). However, remarriage was positively associated with T, but only in males. Results are discussed with reference to the literature on T and sex partners, remarriage and more broadly the challenge hypothesis.

Introduction

Testosterone (T) has important physiological, psychological and behavioral effects across the human life span. For example, within men T differentiates the gonads of the human embryo into male genitals, it initiates the development of secondary sex characteristics during puberty, and it is crucial for the support and maintenance of sexual function in adulthood (Nelson, 2005). Work on both animals and humans suggests that T also has implications for mating and parenting behavior (for a review see Archer, 2006). The role of T with respect to these behaviors has often been studied from the perspective of the "challenge hypothesis" (Wingfield et al., 1990; for a review see Archer, 2006). According to this hypothesis, T facilitates a trade-off between mating effort and parental effort. The theory suggests that high T levels promote activities such as mate guarding, intrasexual competition, and sexual activity, whereas low T levels facilitate parental investment. While the theory was originally applied to birds (e.g. Wingfield et al., 1990), there is increasing evidence that this hypothesis also extends to humans. For example, the administration of T to hypogonadal men causes increased libido and improved sexual functioning (e.g. Shah and Montoya, 2007), and broadly, T levels are positively associated with male sexual functioning (e.g. Halpern et al., 1998; see Isidori et al., 2005 for review). Furthermore, several studies show that men in uncommitted relationships have higher T levels than those in committed relationships (e.g. Burnham et al., 2003; Gray et al., 2004; Sakaguchi et al., 2006), and that being married is associated with lower T levels than being single (e.g. Booth and Dabbs, 1993; Mazur and Michalek, 1998; Gray et al., 2002). There is also evidence that among men lower levels of T are associated with increased parental effort. For example, when men become fathers their T levels decrease (Berg and Wynne-Edwards, 2001, 2002; Kuzawa et al., 2009; Storey et al., 2000). Additional evidence for a link between T and parental effort comes from a study by Fleming et al. (2002), who showed that men with lower T levels feel more sympathy in response to infant cries than men with higher T levels. Similarly, men who express more need to comfort a crying baby experience a larger decrease in their T levels (e.g. Storey et al., 2000).

The challenge hypothesis suggests that men with higher T levels will be more motivated to seek out mating opportunities. By extension, one may predict that individuals with high T levels could be

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motivated to change sexual partners more frequently and would therefore have more sexual partners across their life span than men with low T levels. There is indeed evidence that supports the prediction of a direct association between T levels and promiscuity from birds: male dark-eyed juncos (*Junco hyemalis*) increase the frequency of extra-pair copulations after the administration of T (Raouf et al., 1997). Apart from the challenge hypothesis, one could also argue for a social modulation hypothesis (reviewed in Archer, 2006), that is, the association between T levels could be influenced by sexual behavior rather than vice versa (e.g. Dabbs and Mohammed, 1992). Indeed, male T levels increase while viewing explicit sexual videos (Hellhammer et al., 1985), after sexual intercourse (Dabbs and Mohammed, 1992) and even after brief non-physical social interactions with an unfamiliar woman (Roney et al., 2007; van der Meij et al., 2008). Nevertheless, like the challenge hypothesis, the social modulation hypothesis would also predict a positive association between T levels and the number of sex partners.

In males, preliminary evidence exists for a positive association between T levels and the number of sex partners a male has across his life span. For example, a study covering 215 young adult males (mean age: 19.9 years) found higher T levels to be associated with higher numbers of sexual partners reported (Bogaert and Fisher, 1995). Similarly, Peters et al. (2008) also found a positive association between T levels and sexual partners in a sample of 119 male students. Both studies were however restricted to samples of young adults enrolled at universities. To our knowledge no more than three studies have documented an association between high levels of T and number of sex partners in non-student samples. All these studies concerned men in polygynous relationships. Gray (2003) showed that Kenyan Swahili men who were married to two women (age range: 29–52 years, $n=14$) had higher T levels than single men or men in a monogamous relationship. Similarly, data from Senegal showed that for men younger than 50, morning T levels were significantly higher among men who were polygynously married than among men who were monogamously married (Alvergne et al., 2009). However, the pattern was reversed for men over 50, with polygynous men having significantly lower levels of morning T than monogamously married men (sample size of polygynously and monogamously married men of all ages, $n=53$). A study from North America showed that polyamorous men, men with several intimate sexual relationships, (mean age = 31.98 years, $n=16$) had higher T levels than men with just one partner but not higher T levels than single men (van Anders et al., 2007).

To date, no study has utilized a large non-student sample to test the hypothesis that circulating T levels in adult men are indeed associated with the life time number of sex partners. In the present research we tested if salivary T levels were positively associated with life-time number of opposite sex partners in a large sample of elderly American men. In addition, we examined whether a positive association between salivary T levels and life-time number of opposite sex partners also exists in women. The literature which is available on the challenge hypothesis in women suggests that female T levels, function similarly to male T levels, and are also mediated by a trade-off between parenting and investment (e.g. van Anders and Watson, 2006). For example in women, T rises in response to competition (Bateup et al., 2002), T correlates similarly with personality traits such as aggressiveness (e.g. van Honk et al., 2001), and administration of T typically has positive effects on sexual arousal (e.g. Tuiten et al., 2000). There is some further empirical evidence which suggests that, among women, T levels are intricately associated with the trade-off between mating and parenting as they are in men (see van Anders and Watson, 2006 for a review). For example, in a large sample of women from the Philippines Kuzawa et al. (2010) found that mothers have lower T than women who did not have children. However, only one study so far has explicitly tested whether an association between T and sex partners also exists in women (van Anders et al., 2007). This study showed that polyamorous women had higher testosterone levels than women who were not polyamorous ($n=39$). While it remains an empirical question, based on the evidence for the challenge hypothesis among women, we predict a positive association between T levels and the number of opposite sex partners in women.

In addition, to the reported number of opposite sex partners, we tested whether or not T is associated with marital status, partnership status ("being in a relationship") and remarriage. As argued above, previous research has shown that typically when males marry or settle in a committed relationship, they experience a drop in T (e.g. Burnham et al., 2003; Gray et al., 2002, 2004; Mazur and Michalek, 1998, Sakaguchi et al., 2006). We will explore in these data whether similar associations between current marital and partnership status exist in our sample of elderly men and women. Moreover, we aim to test whether or not remarriage is associated with T. If T is positively associated with the number of opposite sex partners, one should expect a similar positive association between T and remarriage.

Method

Data set

Predictions were tested using an archival data set from the National Social Life, Health, and Aging Project (NSHAP) (Waite et al., n.d., 2007). This is a large data set of older Americans aged 57–85 ($n=3005$). The data set is not representative of the American population as it oversampled men, African–Americans, Latinos, and the eldest age groups. Participants were asked a broad array of questions, via a face-to-face interview but also through questionnaires which were left behind and later returned. In addition, several in-home biomeasures were obtained. Trained professional interviewers from the National Opinion Research Centre (NORC) conducted the interviews between July 2005 and March 2006. Overall participant response rate to the study was 75.5% (for the full description of the data collection (Waite et al., n.d.) or http://www.norc.org/nshap). For the purpose of our analysis we excluded individuals who indicated that they had had sexual contact with a partner of the same sex. This was done mainly in order to compare to previous studies on T and opposite sex partners (e.g. Bogaert and Fisher, 1995; Peters et al., 2008). Moreover, sexual behavior in homosexual men and women has been shown to be different from that of heterosexual men and women, with homosexual men reporting more sex partners than heterosexual men and homosexual women reporting fewer sex partners than heterosexual women (e.g. Bell and Weinberg, 1978; Brody, 1997; Cochran and Mays, 2000). In spite of this, including individuals who had had sex with same-sex partners in the analyses did not alter our key results.[1] However, to make our findings comparable to previous studies focusing on T and opposite sex partners in heterosexual men and women (e.g. Bogaert and Fisher, 1995; Peters et al., 2008), we have chosen to omit men and women who had same-sex encounters from our analyses.

Testosterone and immuno-assays

Mean scores for testosterone were used as the key independent variable. T scores were collected and measured via saliva samples. Prior research has validated that measuring T levels via saliva is highly correlated to serum levels (Read, 1993). Participants provided one saliva sample which yielded two T values. Individuals for which one of the T analyses was flagged as problematic were excluded (see,

[1] Including participants who had at least one same-sex encounter showed similar baseline results. For men, we found a significant baseline correlation between T and opposite sex partners ($r(834)=0.136$, $p<0.00001$). For women we also found a baseline correlation between T and opposite sex partners ($r(813)=0.073$, $p=0.038$). However, as described below in the results section, limiting the sample to women reporting twenty opposite sex partners or more (<2%) abolished the association entirely ($r(801)=0.038$, $p=0.283$).

Gavrilova and Lindau, 2009). We calculated a mean T score from these two T values which was used for analysis (correlation between both T values was >0.98).

Saliva samples were transported from interviews using cold packs and dry ice as they were shipped to Salimetrics for analysis (see Gavrilova and Lindau, 2009 for review of procedure). Upon receiving samples Salimetrics stored specimens in a lab grade freezer at −80 °C. Before analysis samples were defrosted and centrifuged at 3000 rpm for 15 minutes. Analysis was conducted according to the Salimetrics Salivary Testosterone Enzyme Immunoassay Kit instructions (Salimetrics, 2010). Samples that were clear were pipetted into wells for enzyme immunoassay. A reaction of 40–50 µl of a testosterone enzyme conjugate with horseradish peroxidase on 25 ml of the substrate tetramethylbenzidine (TMB) was initiated. This reaction generates a blue color, until 2-M sulfuric acid stops the reaction and changes the solution to a yellow color. To measure testosterone levels the quantity of the testosterone peroxidase is measured; this value is inversely proportional to the actual value of testosterone present. Optical density can be read on a plate reader at 450 nm. This procedure allowed for an assay range which is sensitive to >0.5 pg/ml. Further information on the saliva sampling procedure and analysis of T samples in the NSHAP can be found in Gavrilova and Lindau (2009) and the references therein. We excluded outliers of two standard deviations above the means in our samples (for males: >132 pg/ml; for females: >93 pg/ml), a practice which is a common method for dealing with outliers (e.g. Fokidis et al., 2011; Wilcox, 2003). For men, including these outliers leads to stronger effects than those reported below. In contrast, for women inclusion of outliers leads to weaker effects than those reported below.

Variable: lifetime number of opposite sex partners

The lifetime number of self-reported opposite sex partners was used as the dependent variable. This was captured by the item, "In your entire life so far, about how many women (men) have you had sex with, even if only one time?" (Waite et al., n.d.: p. 219). Sex was not explicitly defined. In order to reduce skew and kurtosis, we log-transformed this variable. This transformation successfully reduced skew and kurtosis (males: skewness statistic = 0.728; Fisher's kurtosis statistic = 0.428; females: skewness statistic = 0.932; Fisher's kurtosis statistic = 0.661; a skew or kurtosis below I2I is considered normal). This transformation does, however, imply that only men and women who have at least one opposite sex partner were included (93% of the sample).[2]

We also reran analyses in which we limited the amount of opposite sex partners to a 100 (roughly two standard deviations for men). We also restricted the sample to respondents who reported 50 sex partners, 20 sex partners, 10 sex partners and 5 sex partners or less. These extra analyses should indicate that the effect is not driven by outliers or individuals drastically overreporting the amount of opposite sex partners they have had.

Variables: marriage, partnership status, remarriage

Respondents provided data on their current marital status (married, living with partner, separated, divorced, widowed or never married), whether or not they currently had a partner (derived from marital and status and from the item, does unmarried respondent have a romantic, intimate or sexual partner?), and whether or not their current marriage was their first marriage or not. Less than 2% of men and 1.5% women reported that they were married more than two times. We therefore did not further analyze the number of marriages but focused on being remarried or not. The descriptive statistics for these variables can be found in Electronic Supplementary Material 1 (ESM 1).

Control variables

In research measuring changes in testosterone it is typically pertinent to consider the time of day at which sampling occurred since testosterone follows a circadian rhythm. Although prior research indicates that in older men the circadian rhythm is greatly reduced or even lost, we still chose to consider the possibility of sampling time effects (coded as am/pm) (see Tenover et al., 1988). Further, as male testosterone levels are known to decrease with age (Bremner et al., 1983), participant age was also used as a control variable.

In addition, we controlled for ethnicity (White vs. non-White) as a dichotomous variable, as ethnicity potentially influences circulating T levels (e.g. Lasley et al., 2002). This dichotomous measure was used as roughly 75% of the participants were White. Specific analyses on non-White ethnic groups were not carried out as this left us with too few cases for analyses. (Individuals were coded as White, Black, Hispanic, Asian and 'Other' with certain categories containing as few as 2.8% of the sample.) Educational attainment (four categories) and body mass index (BMI; measured by a trained interviewer) were also included as these may be factors which influence circulating testosterone. The descriptive statistics for all of these variables can be found in the Electronic Supplementary Material 1. Finally, we aimed to test whether any documented significant relationship between T and opposite sex partners could be driven by use of specific medications which may influence circulating T. A list of all medications and estimates of the effect of T on sex partners while controlling for each medication can be found in ESM 4. The final working sample consisted of 749 males and 766 women.

Data analysis

The data were analyzed separately for men and women. First we present correlations (between T and the log values for opposite sex partners) and partial correlations controlling for the variables listed above. For marriage, partnership status and remarriage we also conducted correlational analyses. If an association was found, we used partial correlations, controlling for potential confounds, to test whether or not these correlations were statistically robust.

Subsequently, we use a generalized linear mixed modeling approach (GLMM; SPSS, 2005), to confirm our results from these correlational analyses on sex partners. For an outline of these analyses please see ESM 2. These results can be found in the Electronic Supplementary Material (ESM 3 and 5). We did not conduct GLMMs for marital status, partnership status or remarriage as these outcome variables are categorical.

Results

Men: opposite sex partners

Fig. 1 displays the positive association between salivary T and lifetime number of sex partners among men (ceiled to 100), without controls. Fig. 1 uses quartiles for graphical representation. All statistical analyses are conducted, however, with the full range as described above. A Pearson correlation showed that salivary T was

[2] Incidentally, using a square-root transformation leads to similar baseline results to those below for males, albeit weaker (raw correlation between T and square-root (opposite sex partners): males: $r(857) = 0.07, p < 0.05$; females: $r(887) = 0.02; p = 0.502$). This square-root transformation allows inclusion of those who did not have at least one opposite sex partner but this transformation is not successful at reducing skew and kurtosis (males: skewness statistic = 3.47; Fisher's kurtosis statistic = 18.44; females: skewness statistic = 2.12; Fisher's kurtosis statistic = 10.34). Therefore we chose the log transformation over the square-root alternative.

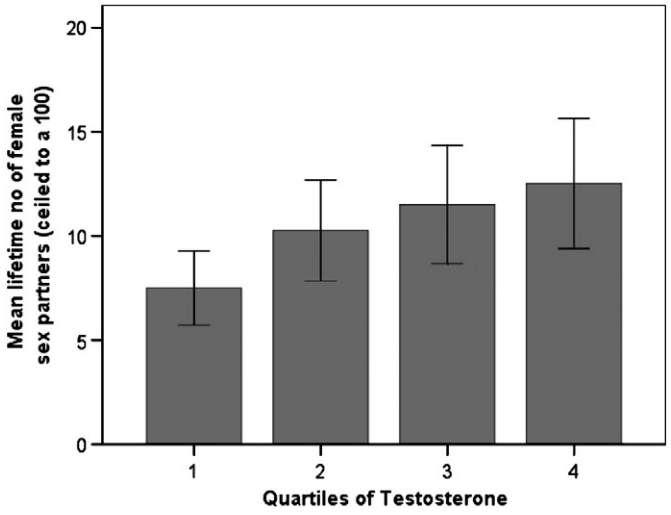

Fig. 1. Quartiles of testosterone, from lowest (1) to highest (4), and number of female sex partners (raw data ceiled to a 100; 98% of the male sample). Error bars represent 95% confidence intervals.

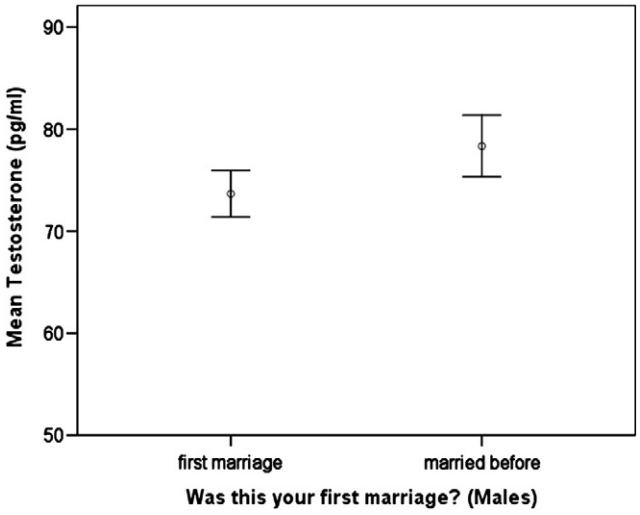

Fig. 2. Mean testosterone by remarriage. Error bars are 95% confidence intervals.

positively and significantly related to reported opposite sex partners ($r(747) = 0.137$, $p = 0.0002$). This remained the case after partialling out ethnicity, BMI, education, time of sampling and age (partial $r(742) = 0.122$, $p = 0.0009$). Thus, among men the level of salivary T appears positively and significantly related to the number of opposite sex partners reported. Results via GLMM showed similar results (ESM 3). Limiting the sample to men reporting 100 female sex partners or less, or 50 sex partners or less showed similar results (respectively partial $r(727) = 0.128$, $p = 0.0005$; partial $r(727) = 0.103$, $p = 0.005$). Limiting the sample even further also did not alter the significant finding (partial correlations: 20 partners or less: $r(653) = 0.124$, $p = 0.002$; 10 sex partners or less: $r(568) = 0.120$, $p = 0.004$; 5 sex partners or less: $r(409) = 0.133$, $p = 0.007$). Thus, even with a restricted range, we still found a positive association between T and the number of opposite sex partners reported.

The GLMM showed similar positive associations between T and the number of opposite sex partners reported (ESM 3). The effect of T remained positive and sizeable after controlling for potential confounds (see ESM 3).

In ESM 4, the parameter estimates for testosterone and all medications can be found for all mixed models. In all these models, T proved a significant predictor of the number of opposite sex partners among men, with similar strength to the baseline model presented in ESM 4 ($0.120 < \beta < 0.130$; all $p < 0.004$). It thus appears unlikely that the association between T and the number of opposite sex partners can be explained by use of a specific type of medication.

Men: marriage, partnership status and remarriage

Married men tended to have lower T than divorced or separated men ($r(637) = -0.069$, $p = 0.08$). However, this correlation was not significant after controlling for potential confounds (partial $r(630) = -0.045$, $p = 0.254$). Never married men did not differ in T from men who were ever married ($r(747) = 0.044$, $p = 0.234$). Current partnership status was not significantly associated with T, but men in a relationship did tend to have lower T levels than men who currently were not in relationship ($r(747) = -0.06$, $p = 0.11$). After controlling for confounds, this relationship between T and partnership status remained of the same size (partial $r(740) = -0.063$, $p = 0.08$). For ever married men, there was, however, a clear association between remarriage and T; remarried men tend to have higher T than men who did not remarry ($r(666) = 0.091$, $p = 0.018$) (Fig. 2). This positive association between T and remarriage remained significant after controlling for potential confounds (partial $r(661) = 0.093$, $p = 0.017$).

Women: opposite sex partners

For women the baseline correlation between salivary T and opposite sex partners was positive but not statistically significant ($r(764) = 0.062$; $p = 0.088$). After partialling out ethnicity, BMI, education, time of sampling and age, the strength of this correlation improved mildly (partial $r(759) = 0.08$; $p = 0.026$). However, when limiting the sample to women reporting twenty partners or less, the association between T and opposite sex partners was non-significant (partial $r(747) = 0.055$; $p = 0.135$). Thus removing as few as 1.6% of the sample, i.e., the women who reported a relatively large number of sex partners, made the association between T and opposite sex partners statistically insignificant.

As for men, we subsequently constructed a GLMM; these results can be found in ESM 5. The results for the GLMM are similar to those of the correlational analyses. Given that the association between T and opposite sex partners was not robust when limiting the sample, we did not examine whether the effect of T could be attributed to medication use.

Women: marriage, partnership status and remarriage

Married women did not differ from divorced or separated women in T ($r(475) = 0.01$, $p = 0.83$) nor did ever married women differ in T from ever married women ($r(764) = -0.036$, $p = 0.324$). Current partnership status was associated with T, with women in a relationship having lower T levels ($r(764) = -0.08$, $p = 0.026$). However after controlling for confounds, the relationship between T and partnership status was non-significant (partial $r(759) = -0.057$, $p = 0.116$). For ever married women, there was no association between remarriage and T ($r(730) = 0.03$, $p = 0.47$).

Discussion

Using a large scale data set, we showed that levels of T in elderly males were positively associated with self-reports of number of opposite sex partners. This relationship could not be explained by educational attainment, ethnicity, age, BMI, time of T sampling, or prescription medication use. To our knowledge, our study is the first to demonstrate a positive relationship between T levels and the number of opposite sex partners towards the end of a male's lifespan.

This result is in line with other studies based on student samples (e.g. Bogaert and Fisher, 1995) and community samples (e.g. van Anders et al., 2007), which show a positive relationship between T level and the number of sexual relationships a male currently has. While in theory men in our sample may still have more female sex partners, many of these men are likely to be close to the end of their sexual lifespan as the mean age of men in our sample is close to 70 years. Thus, our findings suggest that male T levels are positively associated with the lifetime number of sex partners a male has. For women, there was no robust evidence for an association between T and the amount of opposite sex partners reported. The GLMM for women did show a weak and positive association between T level and reported number of opposite sex partners, but upon closer inspection this weak effect appeared to be driven by a small subgroup of women (less than 2% of the working sample).

Results also suggest that there is no strong evidence for an association between current partnership status or marital status and T, in either women or men in this sample. One potential reason for why no associations between T and marital status or partnerships status were found is that while the transition into marriage is associated with testosterone these effects potentially do not last into old age. Our study is different from other studies on marriage and pairbonding documenting a decrease in T in males (e.g. Gray et al. 2002) as the mean age was much higher. It thus appears that in old age, marital and partnership statuses are not strongly associated with levels in T, in either men or women. Nevertheless, our data did show that T was positively associated with remarriage in men but not in women. This finding appears to be in line with our findings on the relationship between T and opposite sex partners in males.

Broadly speaking the results for men on sex partners and remarriage provide support for the challenge hypothesis, at least in men. It appears that, as in other animals (e.g. Raouf et al., 1997), T levels are intricately related to regulating a trade-off between mating and parenting behavior in human males. In general, the proximate mechanisms through which T leads to a higher number of sex partners are not yet completely clear. Several pathways could exist. First, men with high T levels could more actively and aggressively pursue mating opportunities. Second, it may be that women, especially when they are fertile, prefer men with high T levels. Peters et al. (2008) found that circulating T levels were associated with mating success but not with masculinity or attractiveness. This could suggest that the first option, men with high T levels actively pursuing more mating opportunities than men with low T levels, is more likely than the second option, women preferring men with high T levels over men with low T levels, but more research is necessary to document which proximate mechanism is operating.

At first sight, our results on sex partners seem at odds with the findings of Alvergne et al. (2009), who showed that, in a sample of Senegalese males of 50 years or older, polygynous men had lower morning T levels than monogamous men. However, polygyny may not equate to having many sex partners. In addition, it is possible that cross-cultural variation in the age dependent decline of T (Ellison et al., 2002) may explain why the effect of T is positively related to opposite sex partners in our sample of elderly American men but negatively in the older sample used by Alvergne et al. (2009). While other variables (e.g. diet, ecology) may also explain why our study finds the inverse relationship to that of Alvergne et al. (2009), future research is necessary to examine if the relationship between T and the number of sexual partners, rather than the number of marriages, extends to non-Western populations.

A limitation of our findings on sex partners, as with any study using self reports of sexual behavior, is that the reporting may be biased by factors such as social desirability (e.g. Schroeder et al., 2003). For example, men and women could have different definitions of what sex constitutes, especially given the fact that sex was not explicitly defined in our study. Moreover, men could have boasted and/or drastically misrepresented their total number of sex partners (and this boasting behavior, rather than the actual amount of sex partners, could be related to circulating T levels). However, given the fact that we find a significant relationship between T and opposite sex partners, albeit weaker, even in a very restricted range of opposite sex partners (five opposite sex partners or less), it appears unlikely that over-reporting could explain this association. In addition, self-reported data on the number of opposite sex partners have been shown to relate to the likelihood of contracting an STD, which suggests that the data capture some aspect of 'real behavior' (e.g. Burk et al., 1996). Nonetheless, the question remains to what extent these self-reports map onto to actual behavior (e.g. Schroeder et al., 2003; Wiederman, 1997) and we cannot rule out that misrepresentation of sex partners may be driving the effect. An additional limitation is that, strictly speaking, these correlational data do not allow causality to be inferred. As there is evidence that engaging in sexual activity may enhance T levels at least in the short term (Dabbs and Mohammed, 1992), one might argue that higher T levels are an effect rather than a cause of having many sexual partners. In the present sample, this explanation seems quite implausible given that, for these older men, the sexual activity with most partners they report will likely have occurred many years before. Finally, our interpretation of the association between T level and the number of opposite sex partners assumes that individual differences in T levels are stable over time. There is indeed some evidence that this is the case. For example, Harman et al. (2001) find a correlation of 0.5 in free T in a longitudinal study covering around 900 men for 30 years. Our data are cross-sectional, however, and it is therefore desirable to replicate our findings with a longitudinal set in order to confirm the positive association between T levels and the number of reported opposite sex partners.

Our study contributes to a growing body of literature documenting associations between T and the number of sexual relationships in men. Our findings are especially important given a number of key benefits of our study, i.e., a large sample from the general population, the use of standardized protocols, and the relatively old age of the sample (on average), due to which the number of partners reported will be close to the lifetime number of sexual partners. The data presented here strengthen the conclusions from various smaller studies that, among males, T is generally positively associated with the number of opposite sex partners, regardless of the life stage at which this association is measured. In contrast, for females there appears no support for a robust positive association between T and the number of reported opposite sex partners, at least in this sample of elderly Americans.

Supplementary materials related to this article can be found online at doi:10.1016/j.yhbeh.2011.03.005.

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