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Causes of sexual decline in aging married men: Germany and America

A Mazur[1]*, U Mueller[2], W Krause[3] and A Booth[4]

[1]*The Maxwell School, Syracuse University, Syracuse, NY, USA;* [2]*Institute of Medical Sociology and Social Medicine, Medical School, Philipps University Marburg, Germany;* [3]*Department of Dermatology, Medical School, Philipps University Marburg, Germany; and* [4]*Department of Sociology, Pennsylvania State University, University Park, PA, USA*

Married men in Germany ($n = 48$) and America ($n = 50$) between 50 and 80 years old, none in poor health, provided comparable information on sexual behavior and attitudes, and gave saliva samples from which testosterone was assayed. Sexuality declines with age, as expected. Neither testosterone nor psychological depression explain levels of sexuality. In both nations, wife's desire for intercourse, subject's ability to maintain an erection, and subject's imagination about other women, explain certain aspects of sexuality. Subject's health and marital satisfaction are related to sexuality among Americans but not among Germans. Behavioral models for the two nations are compared.
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Introduction

Surveys document declining sexual vigor and increasing sexual dysfunction as Americans age.[1–3] Female menopause is well understood, but there is disagreement about whether males experience a comparable 'andropause' induced by declining testosterone.[4,5] Here we evaluate hormonal and other potential causes of declining sexuality among 98 men between the ages of 50 and 80 years old, all married and none in poor health. Half our respondents live in Germany, half in the USA, allowing a check for consistency of findings across industrial cultures.

Hypotheses of sexual decline

Testosterone (T)

Once thought to inevitably decrease with age, T now appears to sustain its level among men who maintain a constant body weight.[6,7] Declining T is often blamed for the sexual decline in elderly males, but statistically controlling on T does not fully explain male decline in sexuality with age.[8,9] Unless very low, T is not well correlated with sexual behavior, and T replacement therapy is usually ineffective for erectile dysfunction (ED) in elderly men.[10,11]

Health and fitness

Poor health is sufficient to eliminate sexual interest and ability in aged men, and ED may foretell vascular disease.[3,12,13] Medications and prostate surgery may prevent erection.

Wife and marriage

Sexual intercourse is affected by the quality of the relationship between spouses.[3,14] Sexual desire or lack of it, by one partner may be reflected in the other. Aging spouses lose their objective physical attractiveness, which may affect their own or their partner's interest.

Depression

Sex is inhibited by extreme stress or depression and promoted by a sense of well-being.[3,15]

*Correspondence: A Mazur, 400 Eggers Hall, The Maxwell School, Syracuse University, Syracuse NY 13244, USA.
E-mail: amazur@syr.edu
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Methods

Samples

Men between the ages of 50 and 80 were telephoned by local researchers in Mannheim, Germany, and in State College, PA, and informed of our study of male health and sexuality. Screening out single men and those reporting poor health, we invited confidential, voluntary participation from men of different ages so as to obtain married respondents with uniform age distributions. In each nation, 25% of those invited agreed to participate. We have virtually complete information from 48 Germans (median age 62 years, range 50–80) and 50 Americans (median age 64 years, range 52–73).

Interviews

A professional interviewer visited respondents, measured height and weight and inventoried medications. The 30-min interview had questions about health, lifestyle, background variables, satisfaction with life, and a depression inventory. Then each respondent answered a self-administered questionnaire asking intimate questions about his relationship to his wife, and his sexual behaviors and thoughts; on completion he placed this in a sealed envelope. Each respondent was asked to deposit two saliva samples, about an hour apart, in collection tubes; saliva production was aided by chewing sugarless gum. Usually the sealed envelope and saliva samples were given to the interviewer but sometimes mailed in. Respondents complied fully with these requests except two Germans who did not return sealed questionnaires.

Testosterone

Salivary T is highly correlated with free T in serum.[16] We requested two morning saliva samples of 4 ml each, about an hour apart. Time of sampling was held constant to control for circadian variation. Saliva samples from Americans were each split for independent assays in Germany and the US.

Saliva from all German and American subjects was radioimmunoassayed at Marburg University Medical School using a kit from DPC Diagnostic Products, Los Angeles, CA. Inter-assay variation was 7.1%; intra-assay variation was 7.5%. There was good ordinal agreement between T levels an hour apart (Germans: $r=0.85$; Americans: $r=0.72$; both $P=0.0001$). Each subject's two values were averaged, excepting two Germans who provided only one sample and another who gave none. Mean T for Germans: 53 ± 33 pg/ml (median = 45, range 5–134), is not significantly different than for Americans: 73 ± 40 pg/ml (median = 64, range 7–184).

Saliva from American subjects was independently radioimmunoassayed at Salimetrics of State College, PA. Intra- and inter-assay coefficients of variation were less than 5.0% and 7.0%, respectively.[17] Testosterone is far more dilute in saliva than blood, so bleeding gums could inflate values. Saliva from Americans was tested for blood by measuring transferrin with an enzyme immunoassay kit sold by Salimetrics. The test has a minimum detection limit of 0.12 mg/dl (range up to 6.6 mg/dl), and average intra- and inter-assay coefficients of variation less than 7.0%. There is no detectable cross-reactivity of transferrin with T. First samples of six Americans showed unacceptable blood contamination (>6.0 mg/dl) and relatively high T, so these were dropped. Remaining samples have transferrin ≤ 2.7 mg/dl, which are not significantly correlated with T. One sample without excessive blood was discarded for anomalously high T (459 pg/ml, three times the next highest value for any subject). One American gave insufficient saliva for two values. Finally there were 42 Americans with two valid T values; their mean T assayed at Salimetrics is 55 ± 19 pg/ml.

These 42 Americans each had two T values measured at Marburg and two at Salimetrics. The two values assayed at Salimetrics correlate $r=0.30$ ($P=0.05$); the two values assayed at Marburg correlate $r=0.81$ ($P=0.0001$). Thus Marburg's results are the more reliable. Nonetheless, results from the two labs agree fairly well. For these 42 Americans, mean T assayed at Marburg correlates $r=0.73$ ($P=0.0001$) with mean T assayed at Salimetrics. The results use Marburg values; Salimetrics results are similar.

Results

Age

Nearly all correlations between age and 10 measures of male sexuality are negative, most significantly, for both Americans and Germans (Table 1). Sexual behavior, desire, and capability generally decline as men age.

Testosterone

Testosterone in subjects' first saliva samples average 20 pg/ml higher than in second samples, given an hour later ($P=0.0001$, paired comparison t-test), as

Table 1 Correlation of age with 10 measures of sexuality, for Americans and Germans

	Americans (n ≤ *50*)	*Germans* (n ≤ *50*)
Frequency of intercourse	− 0.15	− 0.39**
Desired frequency of sex with wife	− 0.25	− 0.31*
Imagines sex with woman other than wife	− 0.46**	− 0.38**
Enjoys watching attractive young women	− 0.21	− 0.39**
Wakes up with morning erection	− 0.31*	− 0.26
Ease of erection without penis being touched	− 0.33*	− 0.36**
Maintains erection to complete intercourse	− 0.33*	− 0.43**
Success reaching own orgasm	− 0.13	− 0.24
Orgasm is intense and satisfying	+ 0.21	− 0.22
Frequency of masturbation	− 0.32*	− 0.23

*$P \leq 0.05$; **$P \leq 0.01$.

expected from the circadian decline during the morning. For the remainder of this analysis, each subject's two samples are averaged to obtain his mean T. This mean is inversely correlated with age among Germans ($r = -0.40$, $P = 0.01$), as expected, but not among Americans ($r < 0.12$). Usually T is inversely correlated with the Quetelet index of body fat (defined as weight/height^2), however we find no significant inverse relationship among Germans or Americans.[18]

We ran correlations between mean T and the 10 measures of sexuality in Table 1, separately for Americans and Germans. Only one of 20 relationships is significant, that between T and frequency of masturbation among Germans ($r = 0.30$, $P = 0.04$), which may be a chance outcome. To see if sexuality is markedly different below (or above) a hormone threshold, we divided subjects into quartiles, from lowest to highest in T, comparing them on the 10 outcome measures. No threshold was noted. The sensitivity of this analysis, limited by sample size, does not deny the possibility of a threshold so low that few of our subjects have crossed it.

Depression

Following Araujo *et al*, our interview contained the CES-D inventory of depressive symptoms.[15,19] For Americans, CES-D was not significantly correlated to any of the 10 measures of male sexuality listed in Table 1. For Germans, CES-D score was significantly related only to imagining having sex with a woman other than one's wife ($r = 0.36$, $P = 0.02$), those most depressed reporting more imagined sex. Another indicator of psychic well-being, respondents' satisfaction with their lives, also failed to significantly correlate with the measures of sexuality.

Modeling

The remaining results are conveniently displayed in a path model from which we exclude T and depression since they have no more measurable impact on sexuality of our respondents than is expected from chance. This model differs slightly for Americans and Germans and therefore is diagrammed separately for each nation. Variables appearing in both diagrams are boldfaced. For ease of presentation, variable names are written in capital letters.

Our models assume ability to maintain an erection is directly affected by age and, in turn, affects other difficulties. Clinically, the quality of erection — whether it is maintained long enough to complete intercourse — is central to diagnosis of sexual problems.[20] Our data bear this out, showing four coital-oriented variables — frequency of intercourse, ease of erection without penis being touched, success reaching own orgasm, and intensity of orgasm — significantly correlated with ability to maintain an erection ($r \geq 0.34$, $P \leq 0.02$ for Germans; $r \geq 0.50$, $P \leq 0.001$ for Americans).

To obtain an integrated picture of important results, we model AGE as a determinant of the variable, MAINTAINS ERECTION (yes = +), which we regard as a precursor to four dependent variables: FREQUENCY OF INTERCOURSE (high = +), SUCCESS REACHING OWN ORGASM (yes = +), INTENSITY OF ORGASM (intense = +), and ERECTION WITHOUT PENIS TOUCHED (yes = +). (MAINTAINS ERECTION is not related to FREQUENCY OF MASTURBATION).

The model for Americans is shown in Figure 1. As usual in path diagrams, standardized regression coefficients (betas) indicate strength of direct effects, and only significant ($P \leq 0.05$) relationships are shown. For Americans, WIFE'S DESIRED FREQUENCY of intercourse (high = +) and MARITAL SATISFACTION (high = +) have significant effects on FREQUENCY OF INTERCOURSE but not on the other three dependent variables. Also, respondents who describe their HEALTH as excellent are significantly less likely to need their penis touched to achieve an erection. It is surprising that among Americans, the direct effect of AGE on INTENSITY OF ORGASM is significantly positive when HEALTH and MAINTAINS ERECTION are controlled.

Much of this model applies to the German sample (Figure 2), but the indirect effects of AGE — via MAINTAINS ERECTION — on the dependent variables are not as strong or consistent as for the Americans. HEALTH does not affect ERECTION WITHOUT PENIS TOUCHED among the Germans. Also for Germans, FREQUENCY OF INTERCOURSE is directly affected only by WIFE'S DESIRED FREQUENCY (which reflects respondent's age).

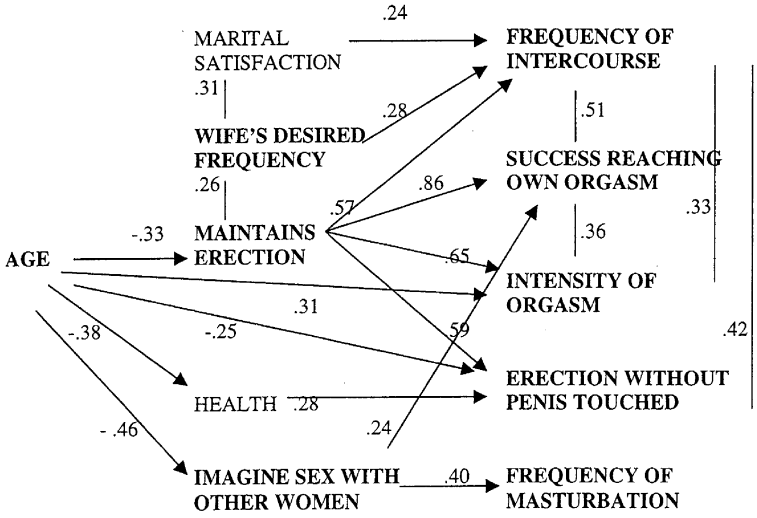

Figure 1 Model for American respondents.

A model consistent with both German and American data shows aging having indirect effects (via quality of erection) on most dependent variables as well as some direct effects. Furthermore, the wife's desire influences a couple's frequency of intercourse but does not affect her husband's other sex problems.

With modeling results in hand, we may evaluate the remaining hypotheses.

Health and fitness

Three American respondents could not have erections after surgery for prostate cancer. Otherwise specific illnesses and drugs were too diverse to be evaluated here. For Americans, but not German men, the better their self-reported health, the less likely they needed their penis touched to achieve erection. In both nations, measures of smoking, alcohol consumption, and daily exercise were generally unrelated to sexuality.

Wife and marriage

One American reported he had no sex because he and his wife are estranged. More generally, marital satisfaction is related to frequency of intercourse among Americans but not Germans. Since marital satisfaction does not decrease with age, this cannot explain the decline in sexuality with age.

Men's reports of their wife's attractiveness, relative to other women of the same age, are not related to male sexuality. Also, wife's health

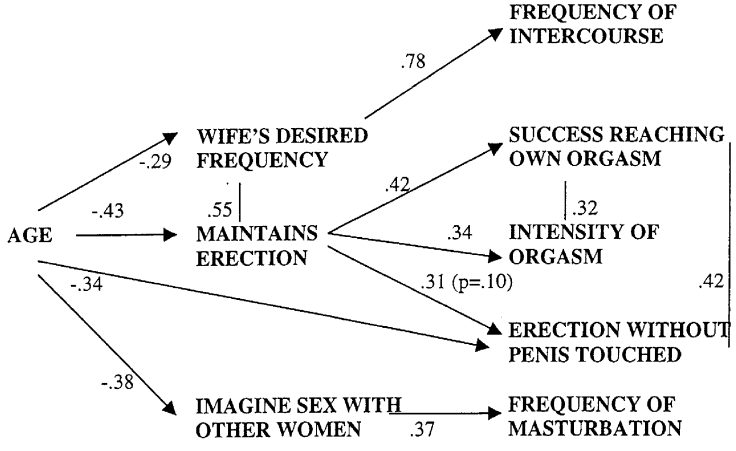

Figure 2 Model for German respondents.

(reported by her husband) is unrelated to the couple's frequency of intercourse or other measures of male sexuality. These findings, taken at face value, argue against a woman's declining beauty or health as causes of her husband's declining sexual vigor.

In both nations the wife's desired frequency of intercourse (as reported by her husband) is related to the couple's frequency of intercourse. For Germans, but not Americans, wife's desire declines with (husband's) age.

Discussion

The reliability of our findings, based on small samples, is fortified by independent repetitions in Germany and the USA. Foremost of these findings is a null result, that T is *not* correlated to diverse measures of male sexuality beyond the level expected by chance. Salivary T is a measure of free testosterone in serum, making absence of effect weightier than if total T were measured from blood. Wary that this failed relationship might be due to errors in hormone measurement, we independently assayed half our saliva samples in two labs, obtaining good ordinal agreement and enhancing our confidence in the null result. Our finding is consistent with past research that fails to identify level of circulating T as a cause of male sexuality, if it is not exceedingly low. All our saliva samples contained measurable T, so possibly few if any subjects were at this exceedingly low level, despite their advanced ages. In any case, we do not attribute low sexuality in any of these men to low T.

The role of wives in regulating frequency of intercourse is indicated by both German and American data. If the wife's sexual appetite wanes with age, this would produce a lessening in the husband's sexual activity. In effect, spouses negotiate a (hopefully) mutually satisfactory decline in their frequency of sex and its importance to their lives. This interpretation accepts as valid the respondent's report of his wife's desired frequency of intercourse, a problematic assumption.

We also question the validity of respondents' evaluations of their wife's physical attractiveness, relative to other women of her age. But taken at face value, wife's 'attractiveness' does not affect her husband's sexual response.

Our modeling assumes ED is a precursor to additional problems. Aging acts partly by degrading the erection, which in turn diminishes orgasm and frequency of intercourse, effects shown more consistently in the American than the German model. While clinically reasonable, the assumed primacy of erectile quality requires verification. An experiment might be conducted on men suffering from moderate ED, randomly giving half an erection-enhancing drug and the rest a placebo. We predict men whose erections are improved will enjoy collateral benefits: requiring less tactile stimulation, achieving easier and more intense orgasms, and having intercourse more often.

Direct effects of aging on sexuality remain in our model, especially the arrow from AGE to MAINTAINS ERECTION. In a population of aging men less healthy than ours, some of this link would be explained by poor health and fitness, however these general variables have insufficient variance in our samples and therefore no explanatory capacity. We do have a few men who cannot have erections because of surgery for prostate cancer. Also we detect a small negative effect on erection of blood-pressure lowering medication. Possibly erectile tissue in the penis or sexual centers in the brain suffer from essential aging, losing their functions as a simple result of longevity.

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