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Sperm competition and female procurement of male resources as explanations for a sex-specific time course in the sexual motivation of couples

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Abstract

This study investigates changes in sexual motivation over the duration of a partnership in a population sample stratified by age. The results replicate and extend the results of a previous study that was based on a sample of college students. In the sub-samples of 30 and 45 year olds, male sexual motivation remains constant regardless of the duration of the partnership. Female sexual motivation matches male sexual motivation in the first years of the partnership and then steadily decreases. In the sample of 60 year olds, male sexual motivation always exceeds female sexual motivation and both are little affected by duration of the partnership. This pattern is clearly evident for some measures of sexual motivation and less clearly or not at all for others. Interpretations of the current results from social constructivism or from mainstream psychology are difficult to conceive. The results seem more intelligible from an evolutionary perspective, as reflecting evolved design for sexual motivation, fine-tuned to the different conditions governing the reproductive success of males and females. In this view male sexual motivation promotes a constant frequency of copulation in order to guard against cuckoldry. Female sexual motivation, in contrast, promotes copulation to solve the adaptive problem of procuring male resources by establishing and maintaining a pair bond.

Introduction

The present study investigates changes in sexual motivation over the duration of an ongoing partnership. Inquiries concerning this issue began with an unexpected finding from a survey of sexual behavior in 1865 German college students (Klusmann 2002). Female sexual motivation declined with duration of the partnership, whereas male sexual motivation remained constant. Some measures of sexual motivation, such as the desire to have sex, showed this effect strongly, whereas others, such as the initiative for the most recent sexual act, only weakly or not at all. The current study examines whether the results found for students in the first study can be replicated in a general population sample of three age groups, using the same and additional measures of sexual motivation. Both studies draw longitudinal inferences from cross-sectional data – the methodological implications of which are addressed in the Discussion.

To account for the results of the first study, an evolutionary explanation was proposed, based mainly on the idea that mate guarding, sperm competition, and female procurement of male resources have shaped human sexual motivation in a way that generates the results observed. This explanation is discussed in detail in the following sections.

Sperm competition. Sperm competition can occur when ejaculates from two different males meet in a female reproductive tract. Much of the variation in copulation frequency between species is associated with the possibility of sperm competition and, conversely, with the effectiveness of male mate guarding. When mate guarding is difficult to achieve, a high ratio of copulation to fertilization often is observed and large numbers of sperm are ejaculated (Birkhead 2000; but see Shackelford, Goetz, Guta, and Schmitt, this issue). In paternally investing species, frequent copulation reduces the risk of cuckoldry and may even be a last resort of mate guarding. In mammals, frequent copulation can promote paternity in two ways: First, by catching the window of fertility in species for which ovulation is not advertised and, second, by blocking rival sperm from moving deeper into the reproductive tract, or by removing, defeating, weakening, or destroying rival sperm (Gomendio et al. 1998). There is much evidence for ancestral sperm competition as a factor that has shaped the design of human sexual behavior and psychology (Baker and Bellis 1995; Gallup and Burch 2004; Pound 2002; Shackelford et al. 2002; Smith 1984; Shackelford, Pound, Goetz, and LaMunyon 2005), even though some early claims of Baker and Bellis were not supported (Moore et al. 1999; Simmons et al. 2003; but see Shackelford et al., 2005 for a discussion of these attempted replications). Baker (1996) introduced the term “routine sex” to describe sexual acts which are hardly passionate, yet performed on a regular basis. Routine sex would

characterize male sexual motivation if it were driven predominantly by a need to guard against the risk of cuckoldry, especially the possibility of sperm competition.

Procurement of male resources. Why should a female copulate regularly with the same male within a pair bond when fertilization could be achieved through a very small number of copulations and cuckoldry is not a female concern? Birkhead (2000) offers a tentative answer with reference to birds: A display of sexual receptivity on the part of the female signals her cooperation with male mate guarding. Male motivation toward continued parental investment therefore should be sensitive to signals of female sexual responsiveness. Consequently, persistent female sexual receptivity within a pair bond may have evolved as a result of male preference - it helps to secure the pair bond and thereby furthers female reproductive success.

Establishing the pair bond. The bonding system and the sexual system are largely independent (Fisher et al. 2002; Zeifman and Hazan 1997) and activate different areas of the brain (Bartels and Zeki 2000). However, they often work synergistically. Prairie voles initiate their life-long bond with bouts of frequent copulation for approximately two days after which the bond is firmly established. There is much known about the neurobiological mechanisms connecting frequent copulation with pair bonding (Young and Wang 2004), and these mechanisms seem to be relatively common in mammals. From this it might be conjectured that copulation also is evolutionarily designed to play a role in human pair bond formation, thus making sexual motivation instrumental for its consolidation.

Concealed estrus. Female sexual desire coincides with the peak of female fertility (Wilcox et al. 2004), even though the time of ovulation is usually not detected consciously, and women who believe they have detected it often are wrong (Sievert and Dubois 2005). The lack of advertising of estrus should select for a constantly high level of sexual motivation, not only in males but also females. Differences in male and female sexual motivation therefore cannot be traced back to concealed estrus. Concealment of estrus does, however, have a bearing on male mate guarding because it disperses the necessity of this behavior over a greater time-span, widening the stage for sperm competition. Why signals of estrus appear to have disappeared in the evolution of some primates remains an unanswered question (Alexander and Noonan 1979; Pawlowski 1999; Sillén-Tullberg and Møller 1993). Concealed estrus may support female procurement of male resources by enforcing the continued presence of the male and simultaneously allows the female to pursue clandestine extra-pair fertilization (Gangestad et al. 2005).

Extra-pair mating. There are parallels between the human sexual system and the avian sexual system: both bind a male and a female together for the task of providing for their offspring and both systems supply an additional advantage for extra-pair mating (Birkhead 1998). In many birds, the female copulates freely with her regular partner; then, having laid the first eggs, she displays reluctance to copulate with her partner and seeks extra-pair copulations. This reluctance may be adaptive in that it opens the opportunity for some eggs to be fertilized by other males. If this logic could be applied to human females, it would in the long run of a couple's relationship lead to the expectation of decreased sexual motivation directed toward the in-pair partner accompanied by an increased readiness for sexual attraction toward extra-pair males. Thus, female sexual motivation over the duration of a partnership should not *generally* decline – but rather only with respect to the in-pair partner, and that decline should be limited, in order not to compromise the pair bond. A similar fine-tuning of female sexual motivation has been found for the menstrual cycle: females feel most attracted to extra-pair mates when fertile, but still seek copulations with the in-pair partner (Gangestad and Thornhill 2005; Gangestad et al. 2005). Male psychological design also might include a redirection of sexual motivation toward extra-pair partners over the duration of a partnership, but the risk of cuckoldry always remains and copulating on a regular basis with an in-pair partner therefore retains an adaptive function.

Empirical data. Few studies have investigated the course of sexual motivation in committed partnerships. The topic is treated briefly in two large surveys (Johnson et al. 1994; Lauman et al. 1994). The results of both surveys indicate that copulation frequency is better predicted by the duration of the partnership than by age, but neither study analyzes measures of sexual motivation in relation to sex and duration of the partnership. A Swedish longitudinal study found decreasing sexual desire in middle-aged women interviewed at two occasions 6 years apart; unfortunately, men were not included in this study (Hällström and Samuelsson 1990). A cross-sectional study using the United States National Health and Social Life Survey to assess satisfaction with marital sex indicated lower satisfaction in married women than in married men, but did not analyze sex-specific time courses (Liu 2003).

The evolutionary hypothesis. Sexual motivation is based on sex-specific adaptations. A sex difference in sexual motivation over the course of a relationship may originate from male adaptations to avoid cuckoldry, which are absent in females, and from the greater importance of a stable pair bond for the reproductive success of females. Within a continuing partnership, a fairly constant sexual motivation curve is expected for males (due to the continued risk of

cuckoldry) and, after an initial peak (associated with pair bond formation), a downward-sloping sexual motivation curve is expected for females.

Method

Participants. Three samples consisting of the age groups 30, 45, and 60 years were drawn randomly from the lists of local resident registration offices in Hamburg and Leipzig, Germany. Trained interviewers conducted 776 interviews, yielding a response rate of 30% (Schmidt et al. 2004; Schmidt et al. 2003). The sub-sample analyzed here includes 573 respondents who indicated being in a committed heterosexual partnership at the time of the interview (Table 1). Because the range of possible durations of partnership is restricted by age, some of the cells of the *age x duration* contingency table are empty (Table 2). Therefore, the slope for initial changes in sexual motivation can be assessed fairly well for the younger age groups, but not for the group aged 60.

Measures. Sexual motivation is assessed with four measures. The first measure is drawn from a series of statements concerning the partnership, introduced by the question: "Which of the following behaviors and feelings are more characteristic of you, and which are more characteristic of your partner?" The statement pertaining to sexual motivation is, "Want(s) to have sex often" with answer categories (1) *more characteristic of me*, (2) *more characteristic of my partner,* (3) *characteristic of both of us*, (4) *characteristic of neither of us*. For the present study, the categories are combined to form a dichotomous variable with (1, 3) indicating "high" and (2, 4) indicating "low". The second and third measures are drawn from a list of problems: "I wanted to have sex more often than my partner" (yes/no) and (negatively) "I was rarely in the mood for sex" (no/yes). The fourth measure is the statement, "I initiated the most recent sexual act" (yes/no). These measures are combined to form a summary scale (Cronbach´s alpha = .68), which is dichotomized at the median (0-1 vs. 2-4). Additionally, the self-characterization "Just want(s) to be tender" is used, which is coded in the same way as "Want(s) to have sex often".

Tests of model fit. The hypothesis in its simplest form predicts a constant level of motivation for males and a decline for females over the duration of the partnership. The basic model derived from the hypothesis requires the interaction "duration of partnership with sex". Time-dependent influences impinging on both sexes may coexist with the hypothesized relationship, as well as general differences between males and females in level of sexual motivation. Thus, the presence of main effects would not necessarily contradict the hypothesis. Only when the expected variation in trajectory for males and females is absent

must the hypothesis be rejected. To accommodate interactions, deviation coding is used. The data are modeled using logistic regression (Hosmer and Lemeshow 1989).

The logistic model expected to fit the data is: $\hat{Y} = \exp(Z)/(1+ \exp(Z))$, where $\hat{Y}$ is the estimated proportion of "yes" responses (indicating sexual motivation), which depends entirely on Z, the value of the exponent. Z is a linear combination of the variables X_T: Time (T), the duration of the partnership at the time of the interview, X_S, Sex (S), coded -1 for females and +1 for males and the product X_T*X_S, representing the interaction. Time in years is transformed by taking the square root to reduce the effect of differences at the higher end of the time range. One unit of time corresponds to the intervals 1, 3, 5, 7, 9, 11, 13 years, depending on location on the scale. This transformation would straighten declining curves with a downward slope.

The saturated model is: $Z = C + B_1*X_T + B_2*X_S + B_3*X_T*X_S$, denoted T, S, TxS. The model including only the interaction is: $Z = C + B_3*X_T*X_S$, denoted "TxS". Other models might be "T, TxS", "T, S", "S", or combinations with third factors, such as living arrangement or the presence of children in the household. The interaction term reflects the extent to which the difference between female and male sexual motivation depends on the time elapsed since their partnership began. Fitting models to evaluate a hypothesis is not straightforward (Roberts and Pashler 2000). Typically many different models fit the data nearly equally well. Even if the expected model is found among them, this cannot automatically be counted as support, although the model is at least not obviously rejected. Model fit will be assessed by testing the following requirements:

Test 1. The model should be *sufficient*: no significant improvement of fit due to main effects when the interaction already has been included in the equation.

Test 2. The model should be *necessary*: significant improvement of fit due to the interaction, when the main effects already have been included in the equation.

Test 3. The model should be *optimal*: The interaction must be included in a parsimonious model, fitting the data. This model will be generated by a forward stepwise procedure using the likelihood ratio test as the criterion for removal.

Of course the interaction model should provide *significant improvement* compared to the model containing only the constant term. As this is the case in every analysis with one exception (Table 4), this criterion is not informative and is not considered.

Effect modifiers. An effect modifier (Hosmer and Lemeshow 1989, p. 63) of the interaction is a variable which, depending on the value it takes, leads to different courses of

male and female sexual motivation. In the current study, 12 candidate effect modifiers are investigated (see Table 1).

Results

The time courses for sexual motivation and tenderness are displayed in Figures 1a–f. The data points are estimated by means of logistic regression, using the saturated model (see Table 3). Due to empty cells, the trajectories for the age groups cannot extend over the full length of the time scale ranging from 1 to 36+ years. A condensed statistical evaluation of the data displayed in Figures 1a-f is provided in Table 4.

Summary of results. To summarize the results and at the same time describe the analytic procedure used, a logistic regression analysis is presented in detail for one particular dataset (see Table 3). It is based on the combined age groups 30 and 45 and an aggregated measure of sexual motivation as the dependent variable (age group 60 is excluded for reasons explained in the Discussion). In the saturated model, the *B*-coefficient for the interaction TxS is just significant; however, when the main effect for sex S is removed (parsimonious model), the interaction is highly significant. The results for other variables, obtained by the same procedure, are shown in condensed form in Table 4.

Results in detail. Inspection of Figures 1a-e gives the impression that male sexual motivation remains fairly constant or even slopes upwards whereas female sexual motivation declines in the two younger age groups. This impression can be evaluated by examining Table 4, where the results of corresponding statistical tests are shown, as explained in the Methods: If the code for model fit improvement is 11, 10, or 01 and TxS is included in the parsimonious model, the data are in accordance with the hypothesis; if the code is 00 or TxS does not appear in the parsimonious model, the hypothesis is rejected. Some results fall in between, suggesting weak support or weak rejection.

The best model fit is achieved with variables (a) and (b), both using the words "want to have sex often" in different contexts of questioning. Except for the group aged 60, the interaction TxS appears with these variables; in 3 of 4 cases it accounts for enough model fit to render the main effects unnecessary, and with the main effects already present, it significantly improves model fit. This pattern is not evident for variable (c) "I was rarely in the mood for sex" in the two younger age groups, but an interaction effect does occur for the age group 60. From visual inspection, variable (d) "Initiation of sex" appears to display the predicted pattern, but the interaction effect just fails to achieve statistical significance for the age group 30, and is not selected by the stepwise procedure as a parsimonious model for any of the age groups. The summary variable for sexual motivation mirrors the results for

variables (a) and (b), being highly determined by these components. The results for the total group are included for the sake of completeness. As will be discussed, they should not be used for hypothesis testing. Overall the results are mixed, tending to support the predicted pattern, but not unanimously. As an aside, the desire for tenderness also was analyzed, yielding an inverse trajectory with respect to sex for age groups 30 and 60, but not for age group 45.

Effect modifiers. The influence of 12 possible effect modifiers (see Table 1) was investigated in the combined sample of age groups 30 and 45. A forward stepwise analysis with the likelihood ratio criterion was performed for each variable, starting with the full model, which includes the candidate effect modifier with all its interactions. For example, adding the factor C, presence of children in the household (yes/no), generates the saturated model T, S, C, TxS, TxC, SxC, TxSxC. The parsimonious model generated by the forward stepwise procedure reduces the model to T, TxS. From this it can be concluded that no factor, including C, improves the fit achieved by T and TxS, the factors with the largest initial contribution to the model. This procedure places high demands on the explanatory power of the candidate variables. To surpass the combined effect of T, TxS, the interaction TxC or TxSxC must improve model fit by replacing, supplementing, or conditionally changing the effect of S. This was not the case with variable C, "Children in the household," but 4 of the 12 candidate effect modifiers did produce such a pattern (Figures 2a-c):

1. Living arrangement A (separate vs. together) with model A, TxSxA. Due to limited data on couples living separately for more than 9 years, the full time scale was not used.
2. Difference in educational achievement between partners E (partner higher, same, partner lower) with model SxE, TxSxE
3. Feelings of love L (very often vs. often and less) with model T, SxL, TxS
4. Quality of sex life Q (good or very good) with model SxQ, TxS

When the effect modifier is associated with the interaction TxS, the slope for sexual motivation changes for some subgroups of males or females: less decline in males and females living separately compared to those sharing a residence, no decline in females partnered to males with an educational level exceeding their own level, and some decline in males partnered to females with an educational level exceeding the own level (Figures 2a, b). The variable "Feelings of love" was associated with a higher level of sexual motivation when present, but did not modify the sex-specific trajectory (Figure 2c). "Quality of sex life" is not included in Figure 2, due to the nature of its relation to sexual motivation - it roughly parallels the pattern shown in Figure 2c.

The other 8 candidate variables were rejected by the forward stepwise procedure, which in each case yielded the simple T, TxS model. These variables are: married (yes, no), having any children with the partner (yes, no), presence of children living in the household (yes, no), preschool children living in the household (yes, no), high school equivalent - self (yes, no), high school equivalent - partner (yes, no), feeling much at ease in the present partnership (yes, no), ever had an affair (yes, no).

Prediction. Model fit is always stronger than prediction because it exploits chance associations ("overfitting"). Prediction can be assessed approximately by comparing the parsimonious model equation derived for the sub-sample of 267 students aged 29-31 from the preceding study (Klusmann 2002) with that derived for the age group 30 in the present study. It is $\hat{Y}_{students}=.95-.37*X_T+.35*X_T*X_S$ compared to $\hat{Y}_{present\ sample}=1.04-.36*X_T+.23*X_T*X_S$. The general shapes of the curves are similar, with the interaction effect playing a more prominent role in the student sample.

Discussion

The results for the age groups 30 and 45 are strikingly similar to those found in the preceding study of a college student sample (Klusmann 2002). The predicted pattern emerged for the two measures referring to the desire to have sex, but less so or not at all for the other two measures. Why did the item "Who initiated sex on the most recent occasion?" fail to show the predicted time-dependent course? This could be explained by insufficient validity: initiative to have sex may be determined by sex-specific role expectations and also by reactance. Males who are rejected sexually may grow cautious when it comes to initiating sex. This line of reasoning also might apply to the stated problem, "I was rarely in the mood for sex". After repeated sexual rejection, males might enter this mood as a form of self-defense. Defensive mechanisms also may affect females and can be expected to influence answers to the first two items, which directly refer to the desire to have sex.

Desire for tenderness. Baker's (1996) idea of associating the specific component of male sexual motivation originating from an adaptation to the risk of sperm competition with a specific style of behavior - sex on a regular basis ("routine sex"), requires sexual motivation to prevail when passion and tenderness are no longer at their peak. Therefore, a decline in male desire for tenderness is expected to coexist with an unabatedly high level of sexual motivation. This pattern of results is found for the age groups 30 and 60. In contrast, female desire for tenderness remains at the same high level across all stages of the partnership. This may reflect the importance of retaining male resources for female reproductive success, and it

is tempting to recognize here symmetry with the importance of paternity as a factor having shaped male motivational design.

Exceptions to the rule. Female sexual motivation does *not* slope downwards when (1) the female is not living with her partner or (2) her partner's educational level exceeds her own. In the first instance, the partnership might be experienced as not being fully established, and in the second instance the male partner might be identified as a valuable mate choice. Both exceptions to the rule of female sexual motivation declining with time may tell an evolutionary story, but also may tell other stories. The evolutionary story: Given that the desire to retain the partner is strong, sexual motivation also will be strong, not as an effect of conscious calculation but because the design of female sexual motivation was shaped by reproductive success of this sort of fine-tuning. Slightly contrary to this argument, however, is that relatively strong "feelings of love" do not stop female sexual motivation from declining, although the decline occurs at a higher level, closer to that of male sexual motivation. Age, presence of children, and being more or less at ease with the relationship have been found to influence sexual motivation (Johnson et al. 1994; Lauman et al. 1994). This is not revealed in the present analysis, due to statistical control for the duration of partnership, and its interaction with sex.

The explanatory factors in the hypothesis are motivational dispositions assumed to have evolved in response to the contingencies of the human sexual system in the ancestral past: For males this is a disposition for maintaining sexual motivation - regardless of other factors, and for females it is a subtle tuning of sexual motivation in accordance with the benefit of securing male assistance and, perhaps later, the benefit of redirecting sexual desire to extra-pair partners. The results appear to support this ultimate explanation, but they also may fit explanations based on proximate psychological processes guiding response behavior or based on the "scripted" nature of human sexual behavior.

Measuring sexual motivation. In this study, sexual motivation is assessed by responses to simple questions (Figures 1a-e) which are interpreted at face value. It is not clear to what extent these self-ratings are valid measures of sexual motivation. Sexual desire might be present on an unconscious level but not consciously felt, for example, due to social norms and scripts that discourage its experience, psychological defense against the risk of sexual rejection, or threatening conflicts (Wilson 2002). It is even possible for an individual to be inclined to sexual desire, perhaps due to the wish to please, when in fact sexual attraction is absent at a deeper emotional level. Sex differences in the prevalence of such distortions may account for differences in reported sexual motivation. However, this would suggest a simple

main effect rather than a time-dependent effect. Why should such biases in the experience or report of sexual desire depend on the duration of the partnership - and this only in females?

Sexual scripts. Prior to the sexual revolution of the 1960s, a more subdued expression of sexual motives was expected from females than from males. In the game of chivalry a man was expected to cope better with sexual rejection than a women. Her cues indicating sexual desire were to be subtle and her partner's sensitivity to these cues high. The large sex differences in sexual motivation found in the cohort aged 60 may be explained by an adherence to this traditional non-egalitarian sexual script. The egalitarian sexual script, which emerged from the sexual revolution, assumes that sexual motivations and emotions are not sex-differentiated. There might nevertheless be a residual bias toward the non-egalitarian script even in the younger groups, making it harder for a female to admit that her sexual desire exceeds that of her partner than vice versa. This speculation does not, however, explain sex-specific variation with the duration of a partnership.

Combining age groups. When the three age groups are combined, the first part of the curve relating sexual motivation to partnership duration is generated from responses provided by the younger groups and the later part is generated from responses provided by the group of 60 year olds. In this case, the sex-specific time course of sexual motivation stands out more clearly than in any other sample and the results seem plainly in favor of the evolutionary hypothesis (Table 4). This combination and the associated results are limited by methodological problems, however. There is likely to be a cohort difference in the way that males and females perceive sexual motivation, originating from the historically different conditions of socialization. The relatively low level of female sexual motivation may be attributed to the traditional sexual script as discussed above and perhaps even more so to the lack of data for the initial years of partnership. Without these data, it cannot be discerned whether there has been a time in the age group 60 during which a typical female's sexual motivation equaled that of her male partner. Without these data on the initial years of partnership, the logistic regression procedure can only estimate a nearly flat line.

Self-selection. If women who are highly motivated to have sex with their partners were particularly prone to cause an early end to their partnerships, then after some years only women with a low level of sexual motivation would be left in the sample. This would generate a picture of decline produced by the attrition of women who are strongly motivated to have sex with their mate - a logically possible but counterintuitive scenario: Why should high sexual motivation in women hasten the end of a partnership? Applied to men this line of reasoning may be more in accordance with intuition. As there is no limit to conceiving

confounding factors such as these, longitudinal interpretations of cross-sectional data should be made with caution.

The evolutionary account of sexual motivation was formally the initial hypothesis of this study. This hypothesis still has a *post-hoc* feeling to it, however, due to the lack of an alternative hypothesis - except for the null hypothesis - against which it could be tested. Questions therefore remain, not only about whether the now established findings from cross-sectional studies will emerge in a longitudinal study, but also whether alternative explanations are able to successfully compete with an evolutionary account of sex-specific time courses in sexual motivation.

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Tables

Table 1. Sample description

		Age 30		Age 45		Age 60	
		Men	Women	Men	Women	Men	Women
1	Married to partner	29.1	33.3	65.4	68.8	83.2	86.2
2	Shares household with partner	64.0	72.7	81.5	80.4	93.1	90.4
3	Has children with partner	20.9	26.3	63.3	59.8	69.3	68.8
4	Children in household	24.4	32.3	79.0	71.4	21.8	9.6
5	Children of less than school-age in household	16.3	25.3	27.2	14.3	5.0	0.0
6	High school and above (self)	62.8	67.7	48.1	45.5	39.1	29.8
7	High school and above (partner)	43.3	71.7	42.0	49.1	27.7	42.6
8	Own educational level above partner's	15.1	11.1	14.8	12.5	18.8	7.4
	Own educational level below partner's	15.1	15.2	8.6	16.1	6.9	20.2
9	Feels very much at ease with partner	73.6	73.7	63.3	55.8	69.3	68.8
10	Feelings of love experienced very often	85.6	84.9	87.7	82.9	82.5	78.7
11	Quality of sex-life judged as good or very good	74.4	63.7	67.9	59.8	48.4	40.5
12	Ever had an affair during present partnership	20.9	26.3	33.3	30.4	40.4	18.1
	Median frequency of coitus within last 4 weeks	8	5	5	4	4	2
	Median age of partner	28	31	42	47	56	62

Table 2. Age by duration, cell frequencies

	Duration of partnership (years) at the time of the interview							
Age group	0-1	2-4	5-9	10-16	17-25	26-36	37+	total
30 years	38	60	57	30	0	0	0	185
45 years	13	24	17	35	76	28	0	193
60 years	1	5	10	19	23	63	74	195
Total	52	89	84	84	99	91	74	573

Table 3. Logistic regression with a dichotomized summary measure of sexual motivation[1] as the target variable, dependent on time, sex, and the interaction time x sex with the combined sample of age groups 30 and 45.

Model	B	P(Wald)	Exp(B)[2]	CfI lower	CfI higher
Saturated model T, G, TxS					
Time T	-.17	.028	0.84	.72	.98
Sex S	.22	.379	1.25	.76	2.04
Time x Sex TxS	.16	.049	1.17	1.00	1.37
Constant	.95	.000	2.59		
Parsimonious model T, TxS					
Time T	-.17	.035	.85	.72	.99
Time x Sex TxS	.22	.000	1.25	1.16	1.34
Constant	.93	.000	2.53		

[1] defined in Tab. 4 as variable (e)

Exp(B) reflects the change of the odds for obtaining a yes-response (indicates "high" sexual motivation) with each step of one unit in the predictor variable. In the saturated model the value Exp(B)=1.25 for sex means: The odds for a yes-response increase by 1.25 if sex is male, and they decrease by 1/1.25=.80 if sex is female (deviation coding). With each time unit the mean odds for a yes-response decrease by the factor .84. The interaction term TxS additionally changes the odds per time unit by 1.17 if sex is male and by 1/1.17=.85, if sex is female.

Table 4. Condensed Evaluation of logistic regression models for the effect of duration of partnership and sex on measures of sexual motivation and desire for tenderness in 3 age groups

Variables	Age 30	Age 45	Age 60	Total
(a) I want to have sex often – more than or same as my partner (self-characterization).	10 TxS	01 T, TxS	10 S	01 T, TxS
(b) I wanted to have sex more often than my partner (stated as a problem)	11 TxS	11 T, TxS	10 S	11 TxS
(c) I was rarely in the mood for sex (stated as a problem).	00 T, S	10 S	11 TxS	11 TxS
(d) I initiated the most recent sexual act.	00	01 S	01 S	11 TxS
(e) Sum of items a-e dichotomized at the median	00 T, TxS	10 TxS	10 S	01 T, TxS
(f) I just want to be tender – more than or same as my partner (self-characterization).	10 T, TxS	00 S	10 TxS	00 T, S

The evaluation of model fit improvement is coded by two numbers, which represent the results for tests 1 and 2, followed by the abbreviation for a parsimonious model (test 3).
Test 1: Is the interaction sufficient? Code of first number = 1, if model fit cannot be improved by main effects T, S after interaction TxS, was entered first, otherwise 0.
Test 2: Is the interaction necessary? Code of second number = 1, if model fit can be improved by interaction TxS after main effects T, S were entered first, otherwise 0.
Test 3: Is the interaction included in a parsimonious model? Model resulting from a stepwise forward selection procedure with the likelihood ratio test as the criterion of removal, T=Time, S=Sex, TxS=Interaction Time x Sex.
Example: The result for variable (a) examined in age group 30 is "10 TxS". This means: when the interaction effect is entered first, goodness of fit cannot be improved further by the main effects (first code = 1), when the main effects are entered first, goodness of fit cannot be improved further by the interaction effect (second code = 0). The most parsimonious model to describe the relation of sexual motivation time and sex in this particular dataset is a model containing just the interaction effect (TxS).
This table corresponds to figures 1a-f.

Figures

Figure 1a-f. Five measures of sexual motivation and one measure of desire for tenderness as dependent on duration of partnership (time) and sex in three age groups.

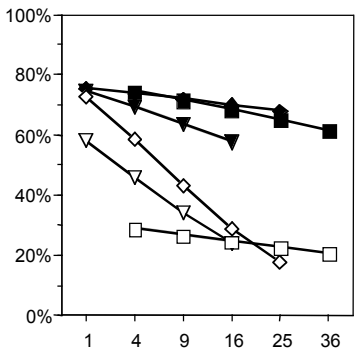

Fig. 1a. "I want to have sex often."

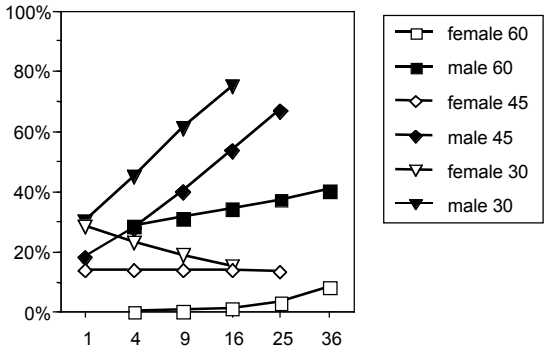

Fig. 1b. "I wanted to have sex more often than my partner" (stated as a problem).

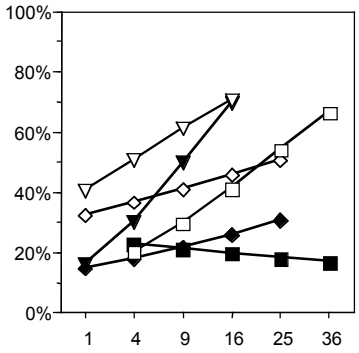

Fig. 1c. "I was rarely in the mood for sex" (stated as a problem).

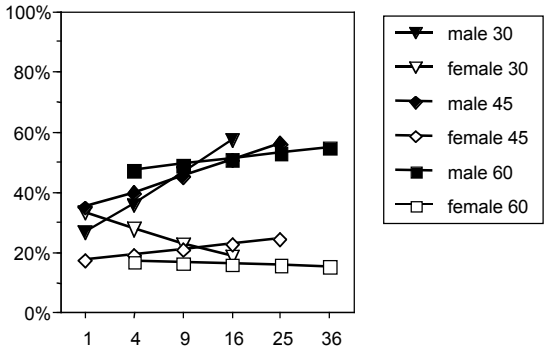

Fig. 1d. Initiated sex at the most recent occasion.

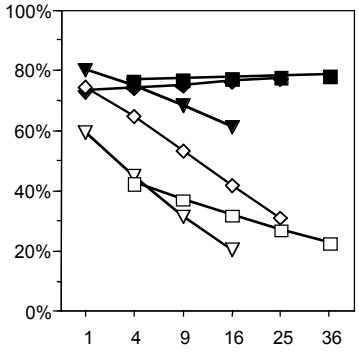

Fig. 1e. Sexual motivation: Sum of items a, b, c, d - dichotomized (≤1 vs. >1).

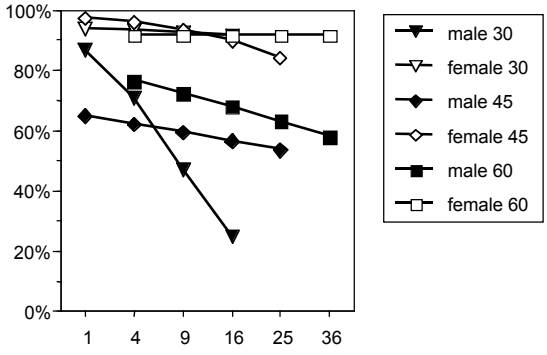

Fig. 1f. "I just want to be tender."

Y-axis: Percentage of "yes"-responses, X-axis: Duration of partnership in years

Curves estimated by logistic regression, saturated model

Figure 2a-c. Factors modifying the relation between sex, time, and sexual motivation.

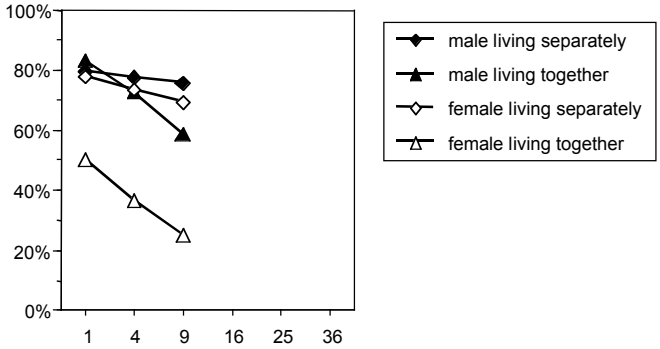

Fig. 2a. Effect modifier: Living together vs. living separately.

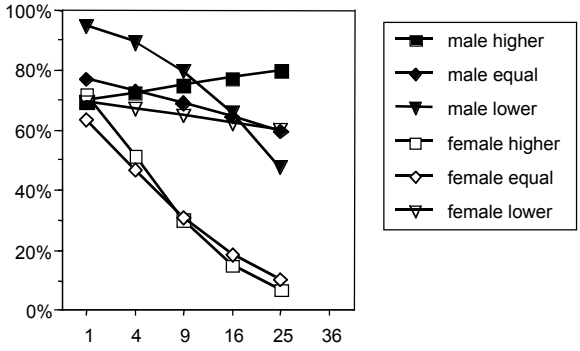

Fig. 2b. Effect modifier: Difference in educational attainment.

Fig. 2c. Effect modifier: Feelings of love.

Sample: Age groups 30 and 45 combined.

Measure: Sexual motivation: Sum of items a, b, c, d (see Fig. 1), dichotomized (≤1 vs. >1).

Y-axis: Percentage of responses in the "high" category of sexual motivation,

X-axis: Duration of partnership in years

Curves estimated by logistic regression, saturated model