Supplementary Online Materials

Psychological Cycle Shifts Redux: Revisiting a Preregistered Study Examining Preferences for Musculary

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1a. Factor analysis of 6 male features

Performed in SPSS. Principal axis factoring. Eigenvalue > 1 selection criterion. Oblimin rotation. 50 iterations maximum for rotation convergence.

Pattern matrix

Male feature	1	2	3
Strength	**.71**	-.07	.20
Upper Arm Circumference	**.73**	-.14	-.19
Shoulder-to-Chest Ratio	-.38	**.67**	-.05
Shoulder-to-Hip Ratio	-.10	**.84**	.16
Torso Ratio	.01	.02	**.80**
Log Mean Testosterone	.34	.39	-.01

Note. For convenience, rotated Factors 1 and 2 switched from output. Factor 3 loadings reversed. Loadings > .5 in **bold**.

Factor correlations:

1 and 2	-.11
1 and 3	.03
2 and 3	.18

1b. Factor analysis of 6 male features plus height

Performed in SPSS. Principal axis factoring. Eigenvalue > 1 selection criterion. Oblimin rotation. 50 iterations maximum for rotation convergence.

Pattern matrix

Male feature	1	2	3
Strength	**.75**	-.06	.28
Upper Arm Circumference	**.73**	-.07	-.12
Shoulder-to-Chest Ratio	**-.55**	.48	-.09
Shoulder-to-Hip Ratio	-.40	**.79**	.18
Torso Ratio	-.01	-.00	**.73**
Log Mean Testosterone	.23	.46	-.00
Height	**.56**	-.05	-.23

Note. For convenience, Factor 3 loadings reversed from output. Loadings > .5 in **bold**.

Factor correlations:

1 and 2	-.08
1 and 3	-.09
2 and 3	.20

2. Selection of random components model

Selection of an appropriate random components model is critical to the validity of fixed effects estimates, test-statistics, and *p*-values.

Cross-classified design

Júnger et al.'s data is structured as a cross-classified design: 157 women all observed 80 male bodies. We hence treated women as random units, crossed with men as random units also. Random slope variation was estimated across women.

Cross-classification interaction

Because Júnger et al.'s female participants rated each male body's attractiveness 4 times, one can structure clustering of those 4 observations by estimating random intercepts within female participant-male target cross-classified cells—the cross-classification interaction (Leckie, 2013). This random term accounts for idiosyncratic rating of particular male bodies by particular female participants. For our initial model, we asked whether inclusion of the interaction improves model fit. As seen below, a model with the cross-classified interaction (and final random slopes included; see below) fit much better than a model lacking the cross-classified interaction.

	-2LL[a]	$\chi^2(1)$	BIC[a]	BIC difference
Model without interaction	170827.2		170901.7	
Model with interaction	165973.7	4853.5, $p < .000001$	166058.9	4942.9

[a] -2LL = -2 × log-likelihood; BIC = Bayesian Information Criterion

Hence, for all models we included a random intercept for the cross-classified interaction. This model is effectively a 3-level model: level-3: female units, male units; level-2: unique female-male cells; level-1: individual time-specific ratings within unique female-male cells.

Random slopes

To select random slopes for inclusion, we adopted Matuschek et al.'s (2017) parsimonious models approach (see also Bates et al., 2015). In this approach, one begins with a maximal model: inclusion of all random slope main effects and interactions corresponding to an interaction included as a fixed effect. In the initial model, all terms are constrained to be uncorrelated. One then trims all random slope terms that do not significantly improve model fit ($p < .15$ recommended for criterion of improvement). Once a set of slopes is decided upon, one can examine whether freely estimating covariances between random components improves fit. For this final step, we used the Bayesian Information Criterion as a criterion.

The rationale behind Matuschek et al.'s (2017) parsimonious models approach is that one includes all random components in Barr et al.'s (2013) maximal model approach that make a difference, thereby protecting α, while also not needlessly fitting small terms that don't make a difference, which can compromise power.

Interaction terms

For our models, meaningful random slope components are by-women. E.g., do women's ratings vary in the extent to which they are linearly associated with ln(E/P), male Strength/Muscularity, and so on? In our initial model (Table 3, main text), we could fit 8 random slopes by-women: ww E/P, ww T, BMI, Strength/Muscularity, ww E/P × BMI, ww E/P × Strength/Muscularity, ww T × BMI, ww T × Strength/Muscularity. We fit a model with all random slope components included. (When we ran this model including the cross-classification interaction, it didn't converge. Hence, we dropped the cross-classification interaction for this step.) We compared this model with one that dropped all random slope interaction terms. -2LL for both models was, rounded to a tenth decimal place, identical: 170827.2, $\chi^2(1) = .0$, p > .5. We hence dropped all interaction terms.

Main effect slopes

When we similarly dropped all main effect slopes (ww E/P, ww T, BMI, Strength/Muscularity), model fit worsened considerably, -2LL = 165973.7 vs. 166518.1, $\chi^2(4) = 2501.8$, $p > .000001$. Separate analyses revealed that all individual terms significantly improved fit. Analyses in SPSS generally yielded random slopes in this model 5+ times their estimated standard errors.

We performed the same comparison for a model with grand-centered mean ln(E/P) and ln(T) (see Table 3). Model without random slopes: -2LL = 168523.6; model with random slopes: -2LL = 165991.1; $\chi^2(4) = 2489.9$, $p > .000001$.

In our model with cycle phase substituted for hormone levels (Table 9, three main effect random slopes are possible: cycle phase, BMI, Strength/Muscularity. Model without random slopes: -2LL = 199819.6; model with random slopes: -2LL = 198281.4; $\chi^2(3) = 1505.7$, $p > .000001$. Once again, all individual random slopes are large, 5+ times their estimated standard errors.

For all models, then, we included all main effect random slopes.

Covariances between random components

We ran models with all main effect random slopes by-women, allowing random component covariances to freely vary. For models with 4 random slope components, total number of covariances = 10. For models with 3 random slope components, total number of covariances = 6. We compared the BIC of models with and without random slopes. A BIC difference > 2 is typically considered meaningful; BIC difference > 10 is typically considered large (Vrieze, 2012).

Initial model (Table 4, main text): BIC of models with and without covariances = 16077.8 and 166058.9; BIC difference = 18.9 in favor of the model without covariances.

Model with grand-mean centered hormone values (Table 4, main text): BIC of models with and without covariances = 166105.5 and 166076.3; BIC difference = 29.2 in favor of model without covariances.

For these models, then, we did not estimate random covariances. We note, however, that key results were almost identical when covariances were freely estimated.

3. Retaining extreme outlying hormone values

We visually inspected distributions of progesterone, estradiol, and testosterone values. We identified 2 progesterone and 5 testosterone outliers.

10 largest progesterone values (outliers bolded): 256, 257, 259, 262, 265, 271, 281, **578**, **1480**
10 largest testosterone values (outliers bolded): 22.7, 23.88, 26.9, 28.3, 29.4, **67.8**, **69.1**, **98.67**, **214.17**, **302.0**

We removed these sessions from analyses involving hormone values presented in the main text and Table 3. Results for key terms of interest from analyses not excluding these cases are listed below. Removing outliers does not affect substantive conclusions.

	Full Model			GM centered E/P		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*
S/M x ww E/P	.00/.01	-.35		-.00/.01	-.11	
Rel Stat x S/M x ww E/P	.06/.02	2.54	**.012**	.06/.02	2.85	**.005**

Notes. See Table 4, main text for fuller explanation of the analyses. We present here key effects of interest only, not a full table of effects.

4. Multilevel regression analyses: Predictors of sexual attractiveness with session included

	γ / SE	*t*	*p*
Session	-0.02/0.02	-6.35	**<.001**
BMI	-1.11/.25	-4.45	**<.001**
Strength/Muscularity (S/M)	.87/.25	3.49	**<.001**
Relationship Status	.07/.12	0.52	
ww[a] E/P	.03/.03	0.84	
ww T	-.00/.03	-0.13	
mean E/P	.08/.09	0.90	
mean T	.08/.09	0.95	
ww E/P x Relationship Status	.03/.06	0.55	
ww T x Relationship Status	-.08/.06	-1.27	0.206
mean E/P x Relationship Stat	-.03/.01	-3.08	**0.002**
mean T x Relationship Status	-.02/.01	-2.02	**0.044**
BMI x Relationship Status	-.09/.06	-1.66	*0.098*
BMI x ww E/P	-.01/.01	0.55	
BMI x ww T	.02/.01	1.59	0.111
BMI x mean E/P	-.02/.04	-0.55	
BMI x mean T	.06/.04	1.51	0.133
S/M x Relationship Status	.03/.05	0.70	
S/M x ww E/P	-.00/.01	-0.29	
S/M x ww T	-.01/.01	-1.10	
S/M x mean E/P	.00/.03	0.10	
S/M x mean T	-.03/.03	-1.17	0.245
Rel Stat x BMI x ww E/P	-.02/.02	-1.24	0.216
Rel Stat x BMI x ww T	.03/.02	1.47	0.141
Rel Stat x BMI x mean E/P	-.17/.05	-3.37	**<.001**
Rel Stat x BMI x mean T	-.05/.05	-1.04	
Rel Stat x S/M x ww E/P	.05/.02	2.50	**0.012**
Rel Stat x S/M x ww T	-.02/.02	-1.17	0.241
Rel Stat x S/M x mean E/P	.06/.04	1.51	0.131
Rel Stat x S/M x mean T	.05/.04	1.10	

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (*N* = 157), male targets (*N* = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions.

[a]ww = within-woman centered.

5. Multilevel regression analyses: Predictors of sexual attractiveness excluding between-woman hormone terms

	Full Model			Without T		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.10/.25	-4.41	**<.001**	-1.10/.25	-4.41	**<.001**
Strength/Muscularity (S/M)	.86/.25	3.48	**<.001**	.86/.25	3.48	**<.001**
Relationship Status	.13/.09	1.47	0.142	.31/.09	4.66	**<.001**
ww E/P	.06/.04	1.54	0.126	.06/.03	1.95	0.054
ww T	-.04/.05	-0.79				
ww E/P x Relationship Status	.01/.06	0.22		.01/.06	0.05	
ww T x Relationship Status	-.20/.08	-2.39	**0.018**			
BMI x Relationship Status	-.03/.05	-0.56		-.03/.05	-0.50	
BMI x ww E/P	-.00/.01	-0.47		-.00/.01	-0.33	
BMI x ww T	.02/.01	1.71	*0.087*			
S/M x Relationship Status	.02/.04	0.49		.02/.04	0.49	
S/M x ww E/P	-.00/.01	-0.32		-.00/.01	-0.39	
S/M x ww T	-.01/.01	-1.11				
Rel Stat x BMI x ww E/P	-.02/.02	-1.23	0.220	-.02/.02	-1.11	
Rel Stat x BMI x ww T	.03/.02	1.49	0.136			
Rel Stat x S/M x ww E/P	.05/.02	2.47	**0.013**	.05/.02	2.34	**0.019**
Rel Stat x S/M x ww T	-.02/.02	-1.19	0.233			

Notes. Hormone values log-transformed. See also notes, Table 4 main text.

6. Multilevel regression analyses: Predictors of sexual attractiveness with estradiol and progesterone entered separately

	Full Model			Without T		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.12/.25	-4.49	**<.001**	-1.12/.25	-4.5	**<.001**
Strength/Muscularity (S/M)	.87/.25	3.51	**<.001**	.87/.25	3.51	**<.001**
Relationship Status	.16/10	2.44	**0.015**	.16/11	1.46	0.144
ww E	-.07/.05	-1.53	0.128	-.09/.06	-1.47	0.144
ww P	-.07/.05	-1.43	0.157	-.08/.03	-2.49	**0.014**
ww T	-.05/.05	-1.11				
mean E	.13/.09	1.55	0.123	.15/.09	1.83	*0.070*
mean P	.04/.08	0.46		.00/.08	0.02	
mean T	.04/.08	0.45				
ww E x Relationship Status	.21/.09	2.19	**0.031**	.19/.11	1.82	*0.070*
ww P x Relationship Status	.02/.06	0.31		.05/.05	0.9	
ww T x Relationship Status	-.14/.08	- 0.164	0.103			
mean E x Relationship Status	-.44/.12	-3.65	**<.001**	-.42/.10	-3.86	**<.001**
mean P x Relationship Status	.12/.11	1.1		.08/.10	0.77	
mean T x Relationship Status	.09/.12	0.73				
BMI x Relationship Status	-.11/.06	-1.88	*0.061*	-.10/.06	-1.76	*0.078*
BMI x ww E	.01/.01	0.99		.01/.01	1.05	
BMI x ww P	.01/.01	0.82		.01/.01	0.74	
BMI x ww T	.02/.01	1.53	0.126			
BMI x mean E	.05/.04	1.17	0.244	.06/.04	1.56	0.121
BMI x mean P	.07/.04	1.8	*0.073*	.07/.04	1.90	*0.059*
BMI x mean T	.05/.04	1.14				
S/M x Relationship Status	.03/.04	0.63		.03/.05	0.69	
S/M x ww E	-.02/.01	-1.58	0.114	-.01/.01	-1.26	0.207
S/M x ww P	-.00/.01	-0.25		-.00/.01	-0.11	
S/M x ww T	.02/.01	1.53	0.126			
S/M x mean E	.05/.04	1.47	0.244	-.02/.03	-0.89	
S/M x mean P	.07/.04	1.80	*0.073*	-.01/.03	-0.45	
S/M x mean T	.09/.12	0.73				
Rel Stat x BMI x ww E	.03/.02	1.35	0.178	.03/.02	1.40	0.161
Rel Stat x BMI x ww P	.04/.02	1.77	*0.076*	.03/.02	1.68	*0.093*
Rel Stat x BMI x ww T	.03/.02	1.39	0.164			
Rel Stat x BMI x mean E	-.05/.06	-0.93		-.06/.05	-1.12	
Rel Stat x BMI x mean P	.18/.05	3.70	**<.001**	.18/.05	3.65	**<.001**
Rel Stat x BMI x mean T	-.05/.05	-0.93				
Rel Stat x S/M x ww E	.01/.02	0.37		.01/.02	0.31	
Rel Stat x S/M x ww P	-.05/.02	-2.43	**0.015**	-.05/.02	-2.34	**0.019**
Rel Stat x S/M x ww T	-.02/.02	-1.14				
Rel Stat x S/M x mean E	-.01/.05	-0.22		.00/.04	0.07	

Rel Stat x S/M x mean P	-.08/.04	-1.91	*0.056*	-.07/.04	-1.78	*0.076*
Rel Stat x S/M x mean T	.06/.05	1.25	0.210			

Notes. Hormone values log-transformed. See also notes, Table 4 main text.

7. Multilevel regression analyses: Predictors of sexual attractiveness with male age included

	Full Model			T removed			GM centered E/P[b]			With residual S/M		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.04/0.25	-4.19	**<.001**	-1.04/0.25	-4.19	**<.001**	-1.02/0.25	-4.12	**<.001**			
Strength/Muscularity (S/M)	.89/.24	3.66	**<.001**	.89/.24	3.64	**<.001**	.86/.25	3.63	**<.001**	.65/.18	3.56	**<.001**
Age	-.11/.05	-2.02	**0.047**		-2.01	**0.048**	-.11/.06	- 2.000	**0.049**	-.14/.05	-2.59	**0.011**
Relationship Status	.04/.20	0.18		.24/.19	1.26		.12/.20	0.62		.21/.19	1.11	
ww[a] E/P	.05/.06	0.77		.06/.06	0.96		.07/.07	0.98	*0.084*	.08/.07	1.20	
ww T	-.04/.07	-0.58					-.10/.10	-0.95				
mean E/P	.02/.12	0.13		.07/.12	0.57							
mean T	-.00/.12	-0.02										
ww E/P x Relationship Status	.16/.12	1.25		.12/.12	0.95		.09/.11	0.70		.04/.02	-0.57	
ww T x Relationship Status	-.41/.14	-2.98	**0.003**				-.33/.18	-1.89	**0.059**			
mean E/P x Relationship Stat	-.20/.20	-1.00		-.07/.18	-0.38							
mean T x Relationship Status	.27/.20	1.32	0.187									
BMI x Relationship Status	-.10/.06	-1.61	0.109	-.08/.06	-1.41	0.157	-.03/.05	-0.53				
BMI x ww E/P	-.01/.01	-0.56		-.00/.01	-0.44		-.01/.01	-0.64				
BMI x ww T	.02/.01	1.54	0.122				.03/.02	2.01	**0.044**			
BMI x mean E/P	-.02/.04	-0.58		-.02/.04	-0.47							
BMI x mean T	.06/.04	1.45	0.149									
Age x Relationship Status	-.00/.01	-0.21		.00/.00	0.04		-.00/.00	-0.06		.00/.00	0.59	
Age x ww E/P	.00/.00	0.13		.00/.00	0.06		.00/.00	0.04		-.00/.00	-0.19	
Age x ww T	.00/.00	0.06					.00/.00	0.55				
Age x mean E/P	.00/.00	0.45		.00/.00	0.12							
Age x mean T	.00/.00	0.85										
S/M x Relationship Status	.03/.05	0.71		.03/.05	0.57		.03/.04	0.61		.02/.03	0.55	
S/M x ww E/P	-.00/.01	-0.29		-.00/.01	-0.34		-.00/.01	-0.15		-.00/.01	-0.33	
S/M x ww T	-.01/.01	-1.08					-.02/.02	-1.54	0.124			
S/M x mean E/P	.00/.03	0.09		.00/.03	0.12							

S/M x mean T	-.04/.05	-1.19	0.237									
Rel Stat x BMI x ww E/P	-.02/.02	-1.02		-.02/.02	-0.92		-.04/.02	-1.61	*0.107*			
Rel Stat x BMI x ww T	.02/.02	1.16	0.244				.02/.03	0.60				
Rel Stat x BMI x mean E/P	-.17/.05	-3.31	**0.001**	-.16/.05	-3.19	**0.001**						
Rel Stat x BMI x mean T	-.04/.05	-0.8										
Rel Stat x Age x ww E/P	-.01/.00	-1.2	0.230	-.00/.00	-1.00		-.00/.00	-1.01		-.00/.00	-1.10	
Rel Stat x Age x ww T	.01/.00	1.76	0.078				-.00/.00	-0.28				
Rel Stat x Age x mean E/P	-.00/.01	-0.14		-.00/.01	-0.23							
Rel Stat x Age x mean T	-.02/.01	-2.27	0.023									
Rel Stat x S/M x ww E/P	.05/.02	2.51	**0.012**	.05/.02	2.37	**0.018**	.06/.02	2.82	**0.005**	.04/.02	2.69	**0.007**
Rel Stat x S/M x ww T	-.02/.02	-1.22	0.219				-.00/.03	-0.11				
Rel Stat x S/M x mean E/P	.06/.04	1.5	0.133	.06/.04	1.43	0.153						
Rel Stat x S/M x mean T	.05/.04	1.16	0.246									

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (*N* = 157), male targets (*N* = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions.

[a]ww = within-woman centered.

[b]Grand-mean centered hormone measures reported in this table in rows for within-woman hormone measures.

[c]Strength/Muscularity scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

8. Multilevel regression analyses: Substituting Strength/Muscularity factor scores for Strength/Muscularity composite

Table 3, main document, presents results of multilevel regression analyses using a composite of Strength and Arm Circumference as a measure of Strength/Muscularity. This composite correlates .97 with factor scores of a factor reflecting Strength and Arm Circumference (see SOM, section 1). In the table below, we present results for key terms emerging from analyses substituting these factor scores for the simple two-feature composite. (Results for remaining terms are very similar to those presented in Table 3, main text.)

	Full Model			T removed			GM centered E/P[b]			With residual S/M		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI x ww E/P	-.01/.01	-0.52		-.00/.01	-0.37		-.01/.01	-0.61				
BMI x mean E/P	-.02/04	-0.50		-.02/.04	-0.47							
S/M x ww E/P	-.00/.01	-0.32		-.00/.01	-0.42		-.00/.01	-0.19		-.00/.01	-0.42	
S/M x mean E/P	.01/.03	-0.03		.00/.03	0.12							
Rel Stat x BMI x ww E/P	-.03/.02	-1.33	0.182	-.02/.02	-1.20	0.232	-.04/.02	1.87	*0.061*			
Rel Stat x BMI x mean E/P	-.16/.05	-3.24	**0.001**	-.16/.05	-3.21	**0.001**						
Rel Stat x S/M x ww E/P	.06/.02	2.62	**0.009**	.06/.02	2.47	**0.014**	.07/.03	2.88	**0.004**	.04/.02	2.75	**0.006**
Rel Stat x S/M x mean E/P	.07/.05	1.30	0.194	.07/.05	1.34	0.182						

Notes. See Table 4, main text.

[a]ww = within-woman centered.

[b]Grand-mean centered hormone measures reported in this table in rows for within-woman hormone measures.

[c]Strength/Arm factor scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

[d]For comparison, the *t*-values in Table 3 for this interaction are 2.83, 2.65, 3.08, 2.93—on average, slightly lower, but nearly identical.

9. Multilevel regression analyses: Substituting Strength/Muscularity/Height factor scores for Strength/Muscularity composite

	Full Model γ / SE	*t*	*p*	T removed γ / SE	*t*	*p*	GM centered E/P[b] γ / SE	*t*	*p*	With residual S/M γ / SE	*t*	*p*
BMI	-.97/0.24	-3.96	**<.001**	-.97/0.24	-3.97	**<.001**	-.95/0.24	-3.91	**<.001**			
Strength/Muscularity/Height	.79/.27	2.87	**0.005**	.79/.27	2.87	**0.005**	.78/.27	2.85	**0.006**	.53/.21	2.74	**0.001**
Relationship Status	-.00/.11	-0.02		.25/.08	3.14	**0.002**	.11/.10	1.10		.31/.07	4.35	**<.001**
ww[a] E/P	.06/.04	1.58	0.118	.06/.04	1.91	*0.059*	.07/.04	1.74	*0.084*	.07/.04	1.87	*0.064*
ww T	-.04/.04	-0.84					-.06/.07	-0.77				
mean E/P	-.06/.08	0.72		.08/.08	0.96							
mean T	.08/.08	0.93										
ww E/P x Relationship Status	.03/.06	0.42		.01/.06	0.12		-.02/.07	-0.37		-.03/.06	-0.57	
ww T x Relationship Status	-.21/.08	-2.61	**0.010**				-.37/.10	-3.58	**<.001**			
mean E/P x Relationship Stat	-.22/.10	-2.31	**0.021**	-.11/.07	-1.67	*0.095*						
mean T x Relationship Status	-.13/.11	-1.21	0.226									
BMI x Relationship Status	-.09/.05	-1.6	0.110	-.08/.05	-1.40	0.162	-.03/.05	-0.50				
BMI x ww E/P	-.01/.01	-0.96		-.01/.01	-0.80		-.01/.01	-1.00				
BMI x ww T	.02/.01	2.09	0.036				.04/.02	2.43	**0.015**			
BMI x mean E/P	-.02/04	-0.48		-.02/.04	-0.40							
BMI x mean T	.05/.04	1.44	0.151									
S/M x Relationship Status	.03/.05	0.75		.03/.05	0.61		.03/.04	0.60		.02/.03	0.52	
S/M/H x ww E/P	.00/.01	0.28		.00/.01	0.14		.00/.01	0.34		.00/.01	0.09	
S/M/H x ww T	-.02/.01	-1.90	*0.058*				-.04/.02	-2.15	**0.032**			
S/M/H x mean E/P	-.00/.03	-0.1		-.00/.03	-0.04							
S/M/H x mean T	-.03/.03	-1.10										
Rel Stat x BMI x ww E/P	-.02/.02	-0.93		-.02/.02	-0.81		-.03/.02	-1.60	0.109			
Rel Stat x BMI x ww T	.03/.02	1.60	0.111				.02/.03	0.68				
Rel Stat x BMI x mean E/P	-.17/.05	-3.52	**<.001**	-.16/.05	-3.45	**0.001**						
Rel Stat x BMI x mean T	-.05/.05	-0.98										

Rel Stat x S/M/H x ww E/P	.05/.02	2.21	**0.027**	.05/.02	2.08	**0.037**	.06/.02	2.66	**0.008**	.04/.02	2.52	**0.012**
Rel Stat x S/M/H x ww T	-.03/.02	-1.40	0.161				-.01/.03	-0.26				
Rel Stat x S/M/H x mean E/P	.08/.04	1.84	*0.066*	.08/.04	1.86	*0.064*						
Rel Stat x S/M/H x mean T	.05/.04	1.19	0.235									

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (*N* = 157), male targets (*N* = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity/Height, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions.

[a]ww = within-woman centered.

[b]Grand-mean centered hormone measures reported in this table in rows for within-woman hormone measures.

[c]Strength/Muscularity/Height scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

10. Multilevel regression analyses: Analyses using raw hormone levels

	Full Model γ / SE	t	p	Without T γ / SE	t	p	GM centered E/P[b] γ / SE	t	p	With residual S/M γ / SE	t	p
BMI	-1.11/.25	-4.45	**<.001**	-1.11/.25	-4.46	**<.001**	-1.10/.25	-4.41	**<.001**			
Strength/Muscularity (S/M)	.86/.25	3.48	**0.001**	.86/.25	3.49	**0.001**	.86/.25	3.49	**<.001**	.63/.19	3.34	**0.001**
Relationship Status	.26/13	-1.94	*0.053*	.05/11	0.45		-.08/13	-0.62		.37/10	3.68	**<.001**
ww[a] E	-.10/.06	-1.55	0.125	-.09/.09	-0.95		-.11/.08	-1.37	0.173	-.11/.11	-1.01	
ww P	-.03/.04	-0.73		-.07/.04	-1.84	*0.071*	-.05/.05	-1.13		-.08/.04	-1.94	*0.057*
ww T	-10/.05	-1.91	*0.06*				-.13/.08	-1.71	*0.09*			
mean E	.21/.09	2.41	**0.017**	.21/.08	2.51	**0.013**						
mean P	.08/.08	0.99		.03/.08	0.37							
mean T	.02/.09	0.24										
ww E x Relationship Status	.20/.12	1.65	*0.102*	.23/.17	1.36	0.176	-.17/.15	-1.18	0.238	-.24/.14	-1.79	*0.073*
ww P x Relationship Status	-.06/.08	-0.74		.07/.07	0.92		-.05/.09	-0.58		.08/.08	1.11	
ww T x Relationship Status	-.29/.10	-2.87	**0.005**				-.51/.13	-3.99	**<.001**			
mean E x Relationship Status	-.59/.14	-4.34	**<.001**	-.44/.12	-3.65	**<.001**						
mean P x Relationship Status	.09/.12	0.81		.14/.12	1.52	0.131						
mean T x Relationship Status	-.00/.01	-0.03										
BMI x Relationship Status	-.10/.06	-1.76	*0.079*	-.09/.06	-1.60	0.111	-.03/.05	-0.50				
BMI x ww E	.00/.01	0.15		.00/.01	0.45		.01/.01	0.58				
BMI x ww P	.01/.01	0.51		.00/.01	0.46		.01/.01	0.72				
BMI x ww T	.02/.01	1.92	*0.055*				.04/.02	2.12	**0.034**			
BMI x mean E	.05/.04	1.17	0.242	.06/.04	1.49	0.137						
BMI x mean P	.09/.12	1.43	0.155	.06/.04	1.52	0.131						
BMI x mean T	.03/.04	0.62										
S/M x Relationship Status	.03/.05	0.67		.03/.05	0.61		.03/.04	0.65		.02/.03	0.51	
S/M x ww E	.00/.01	0.01	0.114	-.00/.01	-0.18		-.01/.01	-0.27		-.00/.01	-0.36	
S/M x ww P	.01/.01	-0.52		.01/.01	0.55		.00/.01	0.15		.00/.01	0.37	
S/M x ww T	.01/.01	-1.23	0.219				-.02/.02	-1.30	0.193			
S/M x mean E	-.01/.03	-0.24		-.01/.03	-0.50							

S/M x mean P	-.01/.03	-0.52		-.02/.03	-0.64							
S/M x mean T	-.02/.03	-0.60										
Rel Stat x BMI x ww E	.04/.02	2.02	**0.043**	.04/.02	2.22	**0.026**	.05/.03	1.92	*0.055*			
Rel Stat x BMI x ww P	.02/.02	1.11		.02/.02	1.16	0.247	.03/.02	1.37	0.169			
Rel Stat x BMI x ww T	.02/.02	0.78					-.00/.03	-0.02				
Rel Stat x BMI x mean E	-.05/.06	-0.80		-.07/.06	-1.23	0.221						
Rel Stat x BMI x mean P	.09/.05	2.02	**0.043**	.09/.04	2.04	**0.041**						
Rel Stat x BMI x mean T	-.06/.06	-1.07										
Rel Stat x S/M x ww E	-.01/.02	-0.53		-.01/.02	-0.66		-.02/.03	-0.61		-.01/.02	0.31	
Rel Stat x S/M x ww P	-.05/.02	-2.30	**0.021**	-.05/.02	2.32	**0.021**	-.05/.02	-2.29	**0.022**	-.04/.02	-2.36	**0.018**
Rel Stat x S/M x ww T	-.01/.02	-0.54					.01/.03	0.26				
Rel Stat x S/M x mean E	-.03/.05	-0.59		-.01/.05	-0.25							
Rel Stat x S/M x mean P	-.02/.04	-0.42		-.02/.04	-0.40							
Rel Stat x S/M x mean T	.05/.04	0.93										

Notes. Hormone measures are *not* log-transformed. All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (*N* = 157), male targets (*N* = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions.

[a]ww = within-woman centered.

[b]Grand-mean centered hormone measures reported in this table in rows for within-woman hormone measures.

[c]Strength/Muscularity scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

11. Multilevel regression analyses: Predictions from Strength/Muscularity for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
Analysis with ln(E/P)												
BMI	-1.07/.25	-4.24	**<.001**	-1.16/.25	-4.6	**<.001**						
Strength/Muscularity (S/M)	.85/.25	3.42	**<.001**	.88/.25	3.54	**<.001**						
ww E/P	.04/.05	0.94	**0.073**	.07/.05	1.46	0.146	.04/.05	0.69		.11/.05	2.03	**0.044**
ww T	.07/.06	1.16	0.249	-.01/.06	-2.35	**0.021**						
mean E/P	.17/.10	1.80	*0.073*	-.05/.10	-0.52							
mean T	.14/.10	1.48	0.141	.01/.10	0.10							
BMI x ww E/P	.01/.01	0.47		-.02/.01	-1.27	0.202						
BMI x ww T	.00/.01	0.07		.03/.01	2.16	**0.030**						
BMI x mean E/P	.06/.05	1.29	0.197	-.11/.05	-2.22	**0.027**						
BMI x mean T	.09/.05	1.84	*0.067*	.03/.05	0.71							
S/M x ww E/P	-.03/.01	-1.92	*0.055*	.02/.01	1.58	0.114						
S/M x ww T	.00/.01	0.06		.03/.02	1.45	0.109						
S/M x mean E/P	-.03/.03	-0.85		.03/.03	1.01							
S/M x mean T	-.05/.03	-1.62	0.106	-.01/.03	-1.03							

Notes. Hormone values log-transformed. All quantitative predictors with *s* = 1. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. S/M at 5th percent = zero-centered at 5th percentile. S/M at 95th percent = zero-centered at 95th percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with γ ± 2 × SE.

12. Multilevel regression analyses: Predicting sexual attractiveness from Strength/Muscularity/Height and grand-mean centered hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
Analysis with ln(E/P)												
BMI	-.94/.24	-3.83	**<.001**	-.96/.25	-3.93	**<.001**						
Strength/Muscularity/Height	.77/.28	2.79	**0.007**	.80/.28	2.88	**0.005**						
E/P	.08/.05	1.63	0.106	.06/.05	1.12		.01/.06	0.14		.11/.06	1.90	*0.059*
T	.13/.09	1.49	0.139	-.24/.09	-2.72	**0.007**						
BMI x E/P	.01/.02	0.42		-.03/.01	-1.86	*0.063*						
BMI x T	.03/.02	1.26	0.208	.05/.02	2.30	**0.022**						
S/M/H x E/P	-.03/.02	-1.62	0.105	.04/.02	2.14	**0.033**						
S/M/H x T	-.03/.02	-1.33	0.182	-.04/.02	-1.77	*0.076*						
Analysis with ln(E) and ln(P)												
E	-.04/.09	-0.42		-.17/.10	-1.68	*0.096*	-.13/.10	-1.28	0.200	-.20/.10	-1.92	*0.057*
P	-.09/.04	2.20	**0.030**	-.05/.05	-1.21	0.229	.00/.05	0.06		-.11/.05	-2.21	**0.028**
BMI x E	.00/.02	0.09		.03/.02	1.86	*0.062*						
BMI x P	-.01/.02	-0.60		.04/.01	2.43	**0.016**						
S/M/H x E	-.03/.02	-1.48	0.138	-.02/.02	0.35							
S/M/H x P	.02/.02	1.30	0.194	-.04/.02	-2.61	**0.008**						

Notes. Hormone values log-transformed and grand-mean centered. All quantitative predictors with $s = 1$. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. For analysis with ln(E) and ln(P), BMI and S/M/H main effects are not repeated. S/M/H at 5^{th} percent = zero-centered at 5^{th} percentile. S/M/H at 95^{th} percent = zero-centered at 95^{th} percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with $\gamma \pm 2 \times SE$.

13. Multilevel regression analyses: Predicting sexual attractiveness from Strength/Muscularity/Height and within-woman and woman-mean hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
Analysis with ln(E/P)												
BMI	-.92/.24	-3.76	**<.001**	-1.01/.25	-4.1	**<.001**						
Strength/Muscularity/Height	.77/.28	2.79	**0.007**	.80/.28	2.91	**0.005**						
ww E/P	.04/.05	0.94		.07/.05	1.46	0.146	.03/.05	0.59		.11/.05	2.1	**0.037**
ww T	.07/.06	1.16	0.249	-.01/.06	-2.35	**0.021**						
mean E/P	.17/.09	1.80	*0.073*	-.05/.10	-0.52							
mean T	.14/.10	1.48	0.141	.01/.10	0.10							
BMI x ww E/P	-.02/.01	-0.02		-.02/.01	-1.36	0.173						
BMI x ww T	.00/.01	0.33		.04/.01	2.64	**0.008**						
BMI x mean E/P	.07/.05	1.44	0.152	-.10/.05	-2.25	**0.025**						
BMI x mean T	.08/.04	1.76	*0.080*	.03/.05	0.68							
S/M/H x ww E/P	-.02/.02	-1.35	0.177	.03/.01	1.80	*0.072*						
S/M/H x ww T	-.01/.02	-0.33		-.04/.02	-2.35	**0.019**						
S/M/H x mean E/P	-.04/.05	-1.25		.04/.03	1.09							
S/M/H x mean T	-.05/.05	-1.64	0.102	-.00/.03	-0.06							

Notes. Hormone values log-transformed. All quantitative predictors with *s* = 1. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. S/M/H at 5th percent = zero-centered at 5th percentile. S/M/H at 95th percent = zero-centered at 95th percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with $\gamma \pm 2 \times$ SE.

14. Multilevel regression analyses: Predicting sexual attractiveness from Bodily Dominance

	Full Model			T removed			With residual S/M		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.07/0.15	-7.24	**<.001**	-1.07/0.15	-7.25	**<.001**			
Bodily Dominance (BD)	1.39/.15	9.20	**<.001**	1.39/.15	9.21	**<.001**	1.26/.15	8.54	**<.001**
Relationship Status	-.01/.10	-0.07		.24/.08	3.08	**0.002**	.31/.07	4.36	**<.001**
ww[a] E/P	.06/.04	1.61	0.110	.07/.03	1.95	*0.054*	.07/.04	1.87	*0.064*
ww T	-.04/.04	-0.85							
mean E/P	.06/.08	0.69		.08/.08	0.93				
mean T	.08/.08	0.96							
ww E/P x Relationship Status	.02/.06	0.36		.03/.06	0.06		-.03/.06	-0.57	
ww T x Relationship Status	-.22/.08	-2.60	**0.010**						
mean E/P x Relationship Stat	-.22/.10	-0.82		-.11/.07	-1.67	*0.095*			
mean T x Relationship Status	-.14/.11	-1.24	0.216						
BMI x Relationship Status	-.10/.05	-2.00	**0.046**	-.09/.05	-1.82	0.070			
BMI x ww E/P	-.00/.01	0.09		.00/.01	0.14				
BMI x ww T	.01/.01	0.98	0.114						
BMI x mean E/P	-.03/04	-0.82		-.03/.04	-0.72				
BMI x mean T	.05/.04	1.36	0.175						
BD x Relationship Status	.09/.05	1.59	0.113	.08/.05	1.41	0.158	.08/.05	1.67	*0.094*
BD x ww E/P	-.02/.01	-2.55	**0.011**	-.02/.01	-2.46	**0.014**	-.02/.01	-2.36	**0.018**
BD x ww T	-.00/.08	0.11							
BD x mean E/P	.03/.04	0.62		.03/.04	0.66				
BD x mean T	-.03/.04	-0.73							
Rel Stat x BMI x ww E/P	-.01/.02	-0.73		-.01/.02	-0.64				
Rel Stat x BMI x ww T	.02/.02	1.07							
Rel Stat x BMI x mean E/P	-.12/.04	-2.89	**0.004**	-.12/.04	-2.76	**0.006**			
Rel Stat x BMI x mean T	-.04/.05	-0.77							
Rel Stat x BD x ww E/P	.05/.02	3.28	**0.013**	-.12/.04	3.15	**0.002**	.05/.02	3.14	**0.002**

Rel Stat x BD x ww T	-.01/.02	-0.58		
Rel Stat x BD x mean E/P	.01/.05	0.31	.07/.05	0.15
Rel Stat x BD x mean T	.05/.05	1.06		

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (N = 157), male targets (N = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Bodily Dominance, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions. P-values < .05 bolded. P-values < .10 in italics. P-values > .25 not shown.

[a]ww = within-woman centered.

[b]Strength/Muscularity scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

15. Multilevel regression analyses: Predicting sexual attractiveness from Strength/Formidability

	Full Model			T removed			With residual S/M		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.48/0.21	-7.12	**<.001**	-1.48/0.21	-7.14	**<.001**			
Strength/Formidability (S/F)	1.43/.21	6.94	**<.001**	1.43/.21	6.95	**<.001**	1.06/.16	8.54	**<.001**
Relationship Status	-.00/.11	-0.02		.25/.08	3.14	**0.002**	.31/.07	4.36	**<.001**
ww[a] E/P	.06/.04	1.58	0.118	.06/.04	1.91	*0.059*	.07/.04	1.87	*0.064*
ww T	-.04/.04	-0.84							
mean E/P	.06/.08	0.72		.08/.08	0.96				
mean T	.08/.08	0.94							
ww E/P x Relationship Status	.03/.06	0.42		.07/.05	0.12		-.03/.06	-0.57	
ww T x Relationship Status	-.22/.08	-2.61	**0.010**						
mean E/P x Relationship Stat	-.22/.10	-2.31		-.11/.07	-1.67	*0.095*			
mean T x Relationship Status	-.13/.11	-1.21	0.226						
BMI x Relationship Status	-.13/.06	-2.13	**0.034**	-.11/.06	-1.90	*0.058*			
BMI x ww E/P	.00/.01	0.24		.00/.01	0.30				
BMI x ww T	.01/.01	1.31	0.190						
BMI x mean E/P	-.03/04	-0.72		-.03/.04	-0.64				
BMI x mean T	.06/.04	1.46	0.146						
S/F x Relationship Status	.07/.06	1.19	0.235	.06/.06	1.01		.05/.04	1.08	
S/F x ww E/P	-.01/.01	-1.47	0.140	-.01/.01	-1.47	**0.141**	-.01/.01	-1.42	0.154
S/F x ww T	-.01/.01	-0.69							
S/F x mean E/P	.02/.04	0.42		.02/.04	0.43				
S/F x mean T	-.04/.04	-0.96							
Rel Stat x BMI x ww E/P	-.03/.02	-1.79	*0.073*	-.03/.02	-1.65	*0.098*			
Rel Stat x BMI x ww T	.03/.02	1.39	0.163						
Rel Stat x BMI x mean E/P	-.16/.05	-3.08	**0.002**	-.16/.05	-2.95	**0.003**			
Rel Stat x BMI x mean T	-.06/.05	-1.05							
Rel Stat x S/F x ww E/P	.07/.02	3.39	**0.001**	.06/.02	3.24	**0.001**	.05/.02	3.41	**0.001**

Rel Stat x S/F x ww T	-.02/.02	-1.08				
Rel Stat x S/F x mean E/P	.05/.05	1.08		.05/.05	0.95	
Rel Stat x S/F x mean T	.05/.05	1.04				

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (N = 157), male targets (N = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Formidability, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions. P-values < .05 bolded. P-values < .10 in italics. P-values > .25 not shown.

[a]ww = within-woman centered.

[b]Strength/Formidability scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

16. Multilevel regression analyses: Predicting sexual attractiveness from Bodily Dominance and grand-mean centered hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
Analysis with ln(E/P)												
BMI	-1.04/.15	-6.95	**<.001**	-1.08/.15	-7.21	**<.001**						
Bodily Dominance (BD)	1.35/.15	8.84	**<.001**	1.43/.15	9.37	**<.001**						
E/P	**.09/.05**	1.69	*0.094*	**.06/.05**	1.11		.05/.06	0.91		.07/.06	1.26	0.208
T	.13/.09	1.50	0.136	-.24/.09	-2.72	**0.007**						
BMI x E/P	.01/.01	0.80		-.01/.01	-0.85							
BMI x T	.01/.02	0.62		.03/.02	1.43	0.151						
BD x E/P	-.05/.01	-3.91	**<.001**	.01/.01	0.62							
BD x T	-.00/.02	-0.15		-.00/.02	0.05							
Analysis with ln(E) and ln(P)												
E	-.04/.09	-0.40		-.17/.10	-1.66	0.100	-.13/.10	-1.20	0.234	-.21/.11	-1.95	*0.053*
P	-.10/.04	-2.26	**0.026**	-.05/.05	-1.19	0.237	-.04/.05	-0.72		-.11/.05	-1.58	0.115
BMI x E	.00/.01	-0.05		.03/.02	2.04	**0.041**						
BMI x P	-.01/.01	-1.01		.02/.01	1.52	0.127						
BD x E	-.04/.01	-2.35	**0.019**	-.02/.02	-1.5	0.134						
BD x P	.04/.01	3.23	**0.001**	-.01/.01	-1.19	0.235						

Notes. Hormone values log-transformed and grand-mean centered. All quantitative predictors with *s* = 1. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. BD at 5^{th} percent = zero-centered at 5^{th} percentile. BD at 95^{th} percent = zero-centered at 95^{th} percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with γ ± 2 × SE.

17. Multilevel regression analyses: Predicting sexual attractiveness from Bodily Dominance and within-woman and woman-mean hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.02/.15	-6.80	**<.001**	-1.12/.15	-7.45	**<.001**						
Bodily Dominance (BD)	1.34/.15	8.80	**<.001**	1.43/.15	9.30	**<.001**						
ww E/P	.05/.05	1.01		.07/.05	1.45	0.149	.06/.05	1.21	0.229	.08/.05	1.58	0.116
ww T	.07/.06	1.15		-.01/.06	-2.34	**0.021**						
mean E/P	.17/.10	1.78	*0.076*	-.05/.10	-0.54							
mean T	.15/.10	1.51	0.132	.01/.10	0.10							
BMI x ww E/P	.01/.01	0.58		-.01/.01	-0.46							
BMI x ww T	-.00/.01	-0.07		.02/.01	1.47	0.143						
BMI x mean E/P	.03/.04	0.77		-.10/.04	-2.18	**0.030**						
BMI x mean T	.07/.04	1.57	0.117	.03/.04	0.75							
BD x ww E/P	-.05/.01	-4.05	**<.001**	.01/.01	0.54							
BD x ww T	.01/.01	0.49		-.00/.01	0.69							
BD x mean E/P	.02/.05	0.39		.03/.05	-0.33							
BD x mean T	-.06/.05	-1.17	0.243	-.00/.05	-0.09							

Notes. Hormone values log-transformed. All quantitative predictors with $s = 1$. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. BD at 5^{th} percent = zero-centered at 5^{th} percentile. BD at 95^{th} percent = zero-centered at 95^{th} percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with $\gamma \pm 2 \times$ SE.

18. Multilevel regression analyses: Predicting sexual attractiveness from Strength/Formidability and grand-mean centered hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	*γ* / SE	*t*	*p*	*γ* / SE	*t*	*p*	*γ* / SE	*t*	*p*
Analysis with ln(E/P)												
BMI	-1.44/.21	-6.95	**<.001**	-1.49/.21	-7.13	**<.001**						
Strength/Formidability (S/F)	1.40/.21	8.84	**<.001**	1.46/.21	7.03	**<.001**						
E/P	.08/.05	1.63	0.106	.06/.05	1.12		.03/.06	0.46		.10/.06	1.68	*0.094*
T	.13/.09	1.49	0.139	-.24/.09	-2.72	**0.007**						
BMI x E/P	.03/.02	1.62	0.105	-.02/.02	-1.53	0.127						
BMI x T	.02/.02	0.83		.04/.02	1.78	*0.074*						
S/F x E/P	-.05/.03	-3.37	**<.001**	.02/.02	1.60	0.110						
S/F x T	-.01/.02	-0.57		-.02/.02	-0.91							
Analysis with ln(E) and ln(P)												
E	-.04/.09	-0.42		-.17/.10	-1.68	*0.096*	-.12/.10	-1.17	0.245	-.21/.11	-1.98	**0.050**
P	-.09/.04	-2.19	**0.030**	-.05/.05	-1.21	0.229	-.01/.05	-0.22		-.11/.05	-2.15	**0.041**
BMI x E	.01/.02	0.54		.03/.02	1.98	*0.047*						
BMI x P	-.03/.02	-1.66	*0.096*	.03/.01	2.19	**0.028**						
S/F x E	-.04/.02	-2.08	**0.037**	-.02/.02	-1.22	0.222						
S/F x P	.04/.02	2.83	**0.005**	-.03/.01	-2.05	**0.040**						

Notes. Hormone values log-transformed and grand-mean centered. All quantitative predictors with $s = 1$. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. S/F at 5^{th} percent = zero-centered at 5^{th} percentile. S/F at 95^{th} percent = zero-centered at 95^{th} percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P* < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with $\gamma \pm 2 \times$ SE.

19. Multilevel regression analyses: Predicting sexual attractiveness from Strength/Formidability and within-woman and woman-mean hormone levels for single and partnered women

	Single			Partnered								
	Mean-Centered S/M			Mean-Centered S/M			S/M at 5th percent			S/M at 95th percent		
	γ / SE	*t*	*p*	*γ* / SE	*t*	*p*	*γ* / SE	*t*	*p*	*γ* / SE	*t*	*p*
BMI	-1.41/.21	-6.75	**<.001**	-1.54/.21	-7.33	**<.001**						
Strength/Formidability (S/F)	1.40/.21	6.72	**<.001**	1.47/.21	7.02	**<.001**						
ww E/P	.05/.05	0.94		.07/.05	1.46	0.146	.04/.05	0.82		.10/.05	1.93	*0.056*
ww T	.07/.06	1.16	0.249	-.01/.06	2.35	**0.021**						
mean E/P	.17/.10	1.80	*0.073*	-.05/.10	-0.52							
mean T	.14/.10	1.47	0.141	.01/.10	0.10							
BMI x ww E/P	.02/.01	1.41	0.157	-.02/.01	-1.12							
BMI x ww T	-.00/.01	0.07		.03/.01	1.93	*0.053*						
BMI x mean E/P	.05/.05	0.93		-.11/.05	-2.18	**0.030**						
BMI x mean T	.09/.05	1.81	*0.072*	.04/.05	0.70							
S/F x ww E/P	-.05/.01	-3.39	**0.001**	.02/.01	1.39	0.163						
S/F x ww T	.00/.01	0.27		-.02/.01	-1.27	0.205						
S/F x mean E/P	-.01/.05	-0.21		.05/.05	0.93							
S/F x mean T	-.06/.05	-1.38	0.168	-.01/.05	-0.24							

Notes. Hormone values log-transformed. All quantitative predictors with $s = 1$. For Single estimates, relationship status coded Single = 0, Partnered = 1; for Partnered estimates, Single = 1, Partnered = 0. Interactions involving relationship status are redundant with Tables 3 and 4 and are not shown. S/F at 5th percent = zero-centered at 5th percentile. S/F at 95th percent = zero-centered at 95th percentile. See SOM for discussion of random components. Effects of primary theoretical interest **bolded**. *P*-values < .05 bolded. *P*-values < .10 in italics. *P*-values > .25 not shown. Confidence intervals are not explicitly reported. However, they can be calculated with $\gamma \pm 2 \times$ SE.

20. Multilevel regression analyses: Predicting long-term mate attractiveness from Strength/Muscularity

	Full Model			T removed			GM centered E/P[b]			With residual S/M		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-.99/.23	-4.38	**<.001**	-.99/.23	-4.40	**<.001**	-.98/.23	-4.33	**<.001**			
Strength/Muscularity (S/M)	.71/.22	3.18	**0.002**	.71/.22	3.18	**0.002**	.71/.22	3.18	**0.002**	.52/.17	3.02	**0.003**
Relationship Status	-.27/.11	-2.39	**0.017**	-.03/.08	-0.35	**0.002**	-.14/.10	-1.36	0.173	.07/.07	0.85	
ww[a] E/P	.06/.04	1.48	0.142	.07/.04	1.72	*0.09*	.07/.05	1.47	*0.143*	.08/.05	1.70	*0.078*
ww T	-.04/.05	-0.79					-.06/.08	-0.71				
mean E/P	.10/.09	1.15		.10/.09	1.19	,235						
mean T	.05/.09	0.55										
ww E/P x Relationship Status	-.02/.06	-0.32		.01/.06	0.23		-.09/.07	-1.26	0.207	-.06/.06	-0.95	
ww T x Relationship Status	-.15/.09	-1.7	*0.091*				-.43/.11	-3.75	**<.001**			
mean E/P x Relationship Stat	-.30/.10	-2.86	**0.004**	-.19/.07	-2.61	**0.009**						
mean T x Relationship Status	-.25/.12	-2.09	**0.037**									
BMI x Relationship Status	-.09/.06	-1.52	0.130	-.08/.06	-1.34	0.180	-.02/.06	-0.27				
BMI x ww E/P	-.00/.01	0.18		-.00/.01	0.22		-.00/.01	-0.01				
BMI x ww T	.01/.01	1.00					.03/.02	1.47	0.141			
BMI x mean E/P	-.06/.05	-1.17	0.246	-.05/.05	-1.09							
BMI x mean T	.07/.04	1.40	0.165									
S/M x Relationship Status	.00/.05	0.03		-.01/.05	-0.16		.01/.05	-0.11		.00/.04	0.04	
S/M x ww E/P	-.03/.02	-0.82		-.01/.01	0.79		-.01/.01	-0.58		-.01/.01	-0.71	
S/M x ww T	-.00/.01	-0.37					.01/.03	-0.65				
S/M x mean E/P	.01/.03	0.3		.01/.03	0.46							
S/M x mean T	-.02/.03	-0.71										
Rel Stat x BMI x ww E/P	-.03/.02	-1.31	0.189	-.03/.02	-1.19		-.04/.02	-1.78	*0.075*			
Rel Stat x BMI x ww T	.03/.02	1.24	0.213				.01/.03	0.36				
Rel Stat x BMI x mean E/P	-.18/.05	-3.24	**0.001**	-.17/.05	-3.18	**0.001**						
Rel Stat x BMI x mean T	-.06/.06	-0.99										

Rel Stat x S/M x ww E/P	.04/.02	2.09	**0.037**	.04/.02	1.93	*0.053*	.05/.02	2.19	**0.028**	.04/.02	2.08	**0.037**
Rel Stat x S/M x ww T	-.03/.02	-1.24	0.215				-.00/.03	-0.02				
Rel Stat x S/M x mean E/P	.04/.04	0.8		.04/.05	0.76							
Rel Stat x S/M x mean T	.07/.05	1.49	0.135									

Notes. All hormone measures log-transformed. Hence, ln(E/P) = ln(E) - ln(P). All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Observations cross-classified by female raters (N = 157), male targets (N = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM. Effects of primary theoretical interest **bolded**. Blank rows separate main effects, two-way interactions, and three-way interactions. P-values < .05 bolded. P-values < .10 in italics. P-values > .25 not shown.

[a]ww = within-woman centered.

[b]Grand-mean centered hormone measures reported in this table in rows for within-woman hormone measures.

[c]Strength/Muscularity scores regressed on BMI to remove confounding with BMI. Grand-mean centered hormone measures reported in rows for within-woman hormone measures.

21. Figures: Attraction to men at extremes of Strength/Muscularity/Height, Bodily Dominance, and Strength/Formidability as a function of relationship status and ln(E/P)

Figure S1. Model-based estimates of the association between the log of E/P when Strength/Masculinity/Height is at the 5th percentile and 95th percentile for partnered women (top panel) and single women (bottom panel). Shaded areas represent 95% confidence intervals.

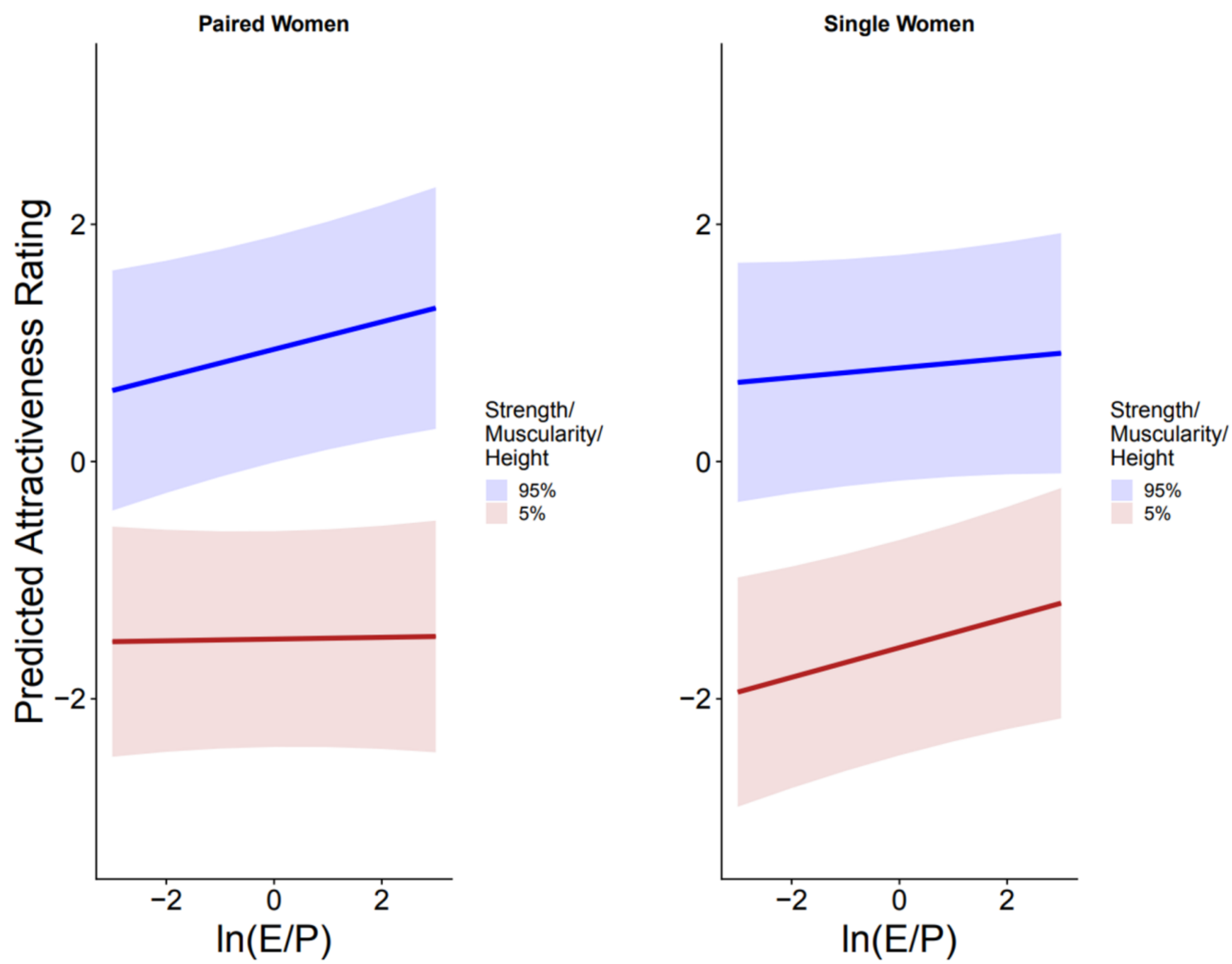


Figure S2. Model-based estimates of the association between the log of E/P when Bodily Dominance is at the 5th percentile and 95th percentile for partnered women (top panel) and single women (bottom panel). Shaded areas represent 95% confidence intervals.

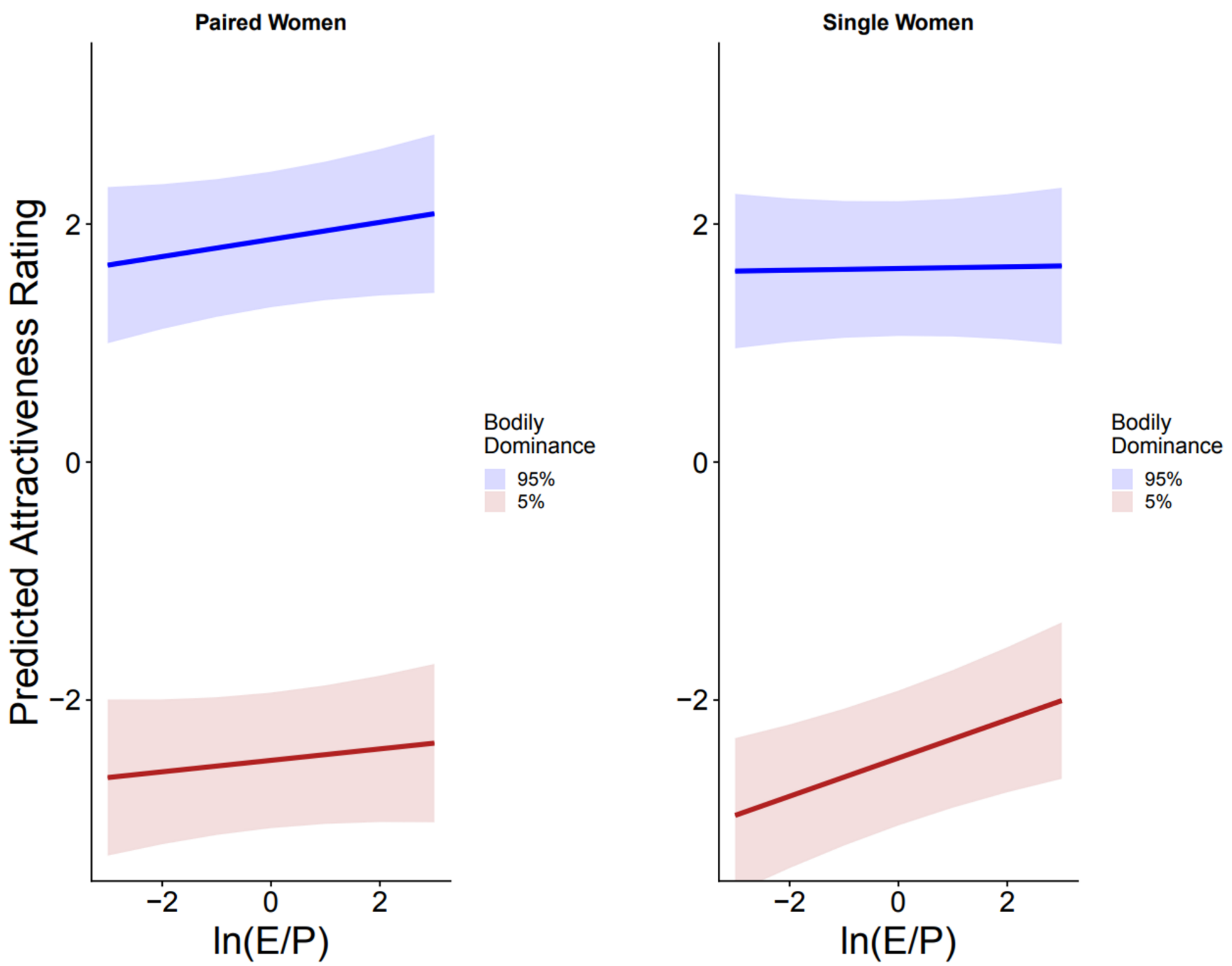
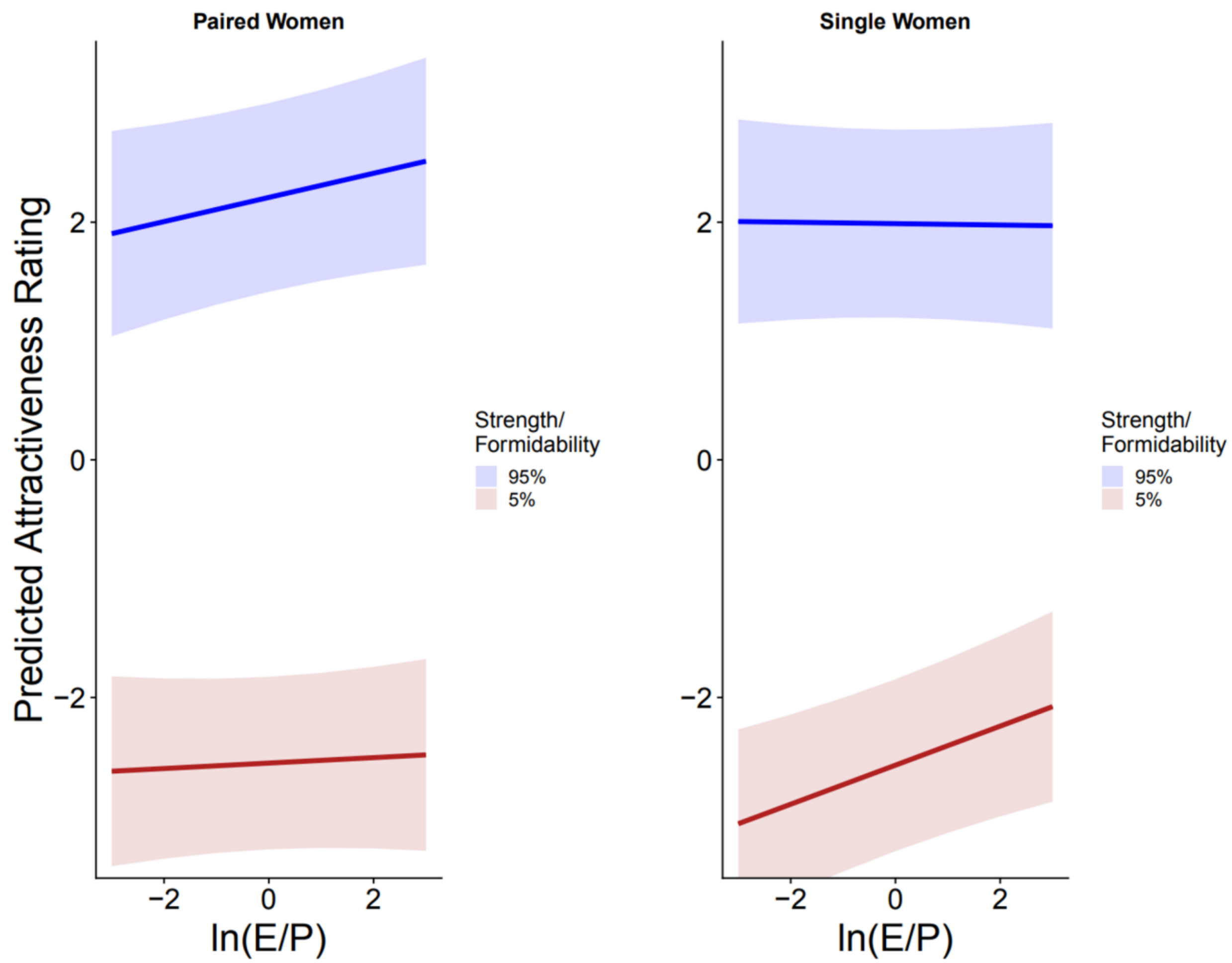


Figure S3. Model-based estimates of the association between the log of E/P when Strength/Formidability is at the 5th percentile and 95th percentile for partnered women (top panel) and single women (bottom panel). Shaded areas represent 95% confidence intervals.



22. Additional analyses on long-term mate attractiveness ratings as a function of Bodily Dominance

In general, we do not expect that static bodily features (e.g., arm circumference) themselves reflect much information with regard to personality related to how good a long-term partner a man would be. Bodily Dominance ratings reflect how a man would be to win a fight, given a body. Though most information related to these ratings are likely physical features such as muscularity and size, it is possible that some information about "personality" may be conveyed through stance (e.g., a more "aggressive" stance), despite Kordsmeyer et al.'s (2018) attempts to standardize stance. We also performed, then, exploratory analyses on long-term mate attractiveness ratings as a function of Bodily Dominance (see notes, Table 7, main text). As can be seen below, a robust negative BD × E/P effect emerged: As E/P increased, women's attraction to men seen as able fighters as long-term, committed partners *decreased*. What explains this effect is unclear.

In the instance in which stimulus features convey personal information pertinent to how good a long-term mate a male will be, it may make sense to examine predictors of sexual attractiveness with long-term mate attractiveness controlled (i.e., independent of long-term mate attractiveness; Gangestad et al., 2018b). As can be seen, the ln(E/P) × Bodily Dominance × Relationship Status emerges as significant in this model. The ln(E/P) × Bodily Dominance interaction in this model is slightly positive, in contrast to when long-term mate attractiveness is not controlled.

Whether these results reflect the fact that Bodily Dominance ratings partly reflect "personality" information given by is unclear, but may be investigated in future studies.

	Long-Term Attractiveness			Sexual Attractiveness w/ LT Attract. Controlled		
	γ / SE	*t*	*p*	*γ* / SE	*t*	*p*
BMI	- .94/.15	-6.47	**<.001**	-.31/.04	-7.59	**<.001**
BD	1.11/.15	7.61	**<.001**	.49/.05	10.87	**<.001**
Relationship Status	.14/.10	1.37		.17/.05	3.62	**<.001**
E/P	.07/.04	1.56		.02/.02	1.00	
E/P x Relationship Status	.10/.07	1.37		.04/.03	1.15	
T	-.06/.08	-.74		-.00/.03	-.13	
T x Relationship Status	.43/.11	3.72	<**.001**	-.04/.05	-.82	
BMI x Relationship Status	.03/.05	.64		-.03/.02	-1.23	
BMI x E/P	.00/.01	.39		-.01/.01	-1.19	
BMI x T	.02/.01	1.06		.01/.01	1.18	
BD x Relationship Status	.04/.05	.76		.06/.03	1.96	.052
BD x E/P	-.03/.01	-2.95	**.004**	.00/.01	.57	
BD x T	.01/.01	.80		-.01/.01	-1.34	
Rel Stat x BMI x E/P	-.03/.02	-1.88	.061	-.01/.01	-.57	
Rel Stat x BMI x T	.04/.03	1.49		-.01/.01	-.47	
Rel Stat x BD x E/P	.06/.02	2.19	**.030**	.03/.01	2.67	**.008**
Rel Stat x BD x T	-.05/.03	-1.94	.054	.04/.02	2.63	**.009**
Long-term mate attractiveness				.79/.00	304.6	**<.001**

23. Trimming cycle phase cases with aberrant progesterone levels

We performed a series of analyses trimming cases either (a) peri-ovulatory with relatively high progesterone (P) levels or (b) luteal with relatively low P levels. In the first scenario, we identified the P level at which an equal proportion of peri-ovulatory cases were over and luteal cases were under—i.e., cases that created overlap in P levels. The value was 12.6 and 22% of cases created overlap. Subsequently, we identified the 75th, 70th, and 65th percentile of P levels for peri-ovulatory cases, and removed all luteal cases with P below those values. We identified the comparable cutoffs—the points at which 75%, 70%, and 65% of P were above—for luteal cases, and removed all peri-ovulatory cases with P above those values. With the least stringent cut-off, just 7% of peri-ovulatory cases were trimmed, vs. 14% of luteal phases. In all instances, the Strength/Masculinity × Phase × Relationship Status interaction was significant.

	No overlap			75% criterion			70% criterion			65% criterion		
	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*	γ / SE	*t*	*p*
BMI	-1.10/.25	-4.39	**<.001**	-1.10/.25	-4.39	**<.001**	-1.10/.25	-4.41	**<.001**	-1.10/.25	-4.42	**<.001**
Strength/Muscularity (S/M)	1.00/.29	2.49	**<.001**	1.00/.29	3.49	**<.001**	1.00/.29	2.50	**<.001**	1.00/.29	3.50	**<.001**
Relationship Status	.36/.07	-4.87	**<.001**	**.34/.07**	**-4.60**	**<.001**	**.33/.07**	-4.56	**<.001**	**.33/.07**	-4.52	**<.001**
Cycle Phase	.08/.06	1.49	0.138	.10/.05	1.97	*0.051*	.11/.05	2.37	**0.019**	.12/.05	2.41	**0.017**
Phase x Relationship Status	.08/.10	0.84		.05/.09	0.55		.04/.09	0.46		.03/.05	0.37	
BMI x Relationship Status	-.04/.06	-0.74		-.03/.06	-0.53		-.02/.05	-0.37		-.02/.05	-0.31	
BMI x Phase	-.04/.02	-1.55	0.123	.04/.02	-1.57	0.118	-.03/.02	-1.38	0.169	-.02/.02	-1.15	
S/M x Relationship Status	.06/.05	1.04		.05/.05	0.91		.04/.05	0.75		.04/.05	0.69	
S/M x Phase	.03/.03	1.02		.02/.03	0.95		.02/.03	0.73		.02/.02	0.82	
Rel Stat x BMI x Phase	-.08/.05	-1.77	*0.077*	-.07/.05	-1.43	0.153	-.07/.04	-1.49	0.137	-.06/.04	-1.42	0.157
Rel Stat x S/M x Phase	.15/.05	2.83	**0.005**	.14/.05	2.70	**0.007**	.15/.05	2.94	**0.005**	.13/.05	2.60	**0.008**
Percent cases trimmed:												
Peri-ovulatory		22.0			13.7			8.7			7.2	
Luteal		22.0			21.7			18.1			13.7	
Total		22.0			17.7			13.4			10.5	
Cut-points:												
Peri-ovulatory		12.6			17.3			24.6			35.6	
Luteal		12.6			11.8			9.2			7	

Notes. All quantitative predictors z-scored. Relationship status effect coded: single = -.5, partnered = .5. Phase effect codes: -.5 = luteal; .5 = peri-ovulatory. Observations cross-classified by female raters (*N* = 157), male targets (*N* = 80), and their interaction. Random intercepts for all are modeled. Random slopes, across women, modeled for BMI, Strength/Muscularity, and within-woman hormone measures. Inclusion of random slope interactions and covariances selected through model Bayesian Information Criterion fit statistic. Random components and fit statistics reported in SOM.

24. Fit statistics: Effect of inclusion vs. exclusion of random slope of cycle phase on cycle phase analyses

Jünger al. did not include a random slope for cycle phase, by-women, in their multilevel analyses. As noted in the text, inclusion of a random slope affects model fit substantially.

	Without Cycle Phase Random Slope[a]				With Cycle Phase Random Slope			
	γ	SE	*t*	*p*	γ	SE	*t*	*p*
Relationship Status	.17	.05	3.46	**<.001**	.19	.06	3.54	**<.001**
Cycle Phase	.08	.01	5.55	**<.001**	.07	.04	2.09	**.038**
Relationship Status x Cycle Phase	.12	.03	4.59	**<.001**	.12	.06	1.95	.052
Bayesian Information Criterion (BIC)		199852.1				199219.6		
BIC difference: random slope vs. none				-632.5				

Notes. Smaller BIC values reflect better fit, controlled for number of free parameters.

[a]This model is inadequate, as (a) the random slope effect is highly robust, and (b) relative to a model with the random slope component, parameter-adjusted fit is poor. Fixed effect test statistics are biased, largely due to underestimated error. Shown here for illustrative purposes only.

25. Analysis of mean ratings, high and low ln(E/P) sessions, partnered women

We computed average ratings of men by romantically involved women when ln(E/P) was above the mean (i.e., *z*-scored ln(E/P) > 0) and when ln(E/P) fell below the mean. In a repeated measures MANOVA, we regressed those sets of ratings on men's Strength/Muscularity and BMI. Results revealed differential slopes for both male features, $F(1,77) = 13.64$, $F(1,77) = 41.94$, respectively, both $p < .0005$. In particular, the slopes for high ln(E/P) women's mean ratings were 13% and 20% greater than the slopes for low ln(E/P) women, reflecting the greater impact of these features on ratings of sexual attractiveness detected by analyses we report above (Strength/Muscularity: .958 vs. .848; BMI: -1.081 vs. -.904). Nonetheless, the *correlation* between the two sets of ratings is exceedingly high, $r = .993$ ($\varrho = .991$). Differential weighting largely affects the relative *variances* of the two sets of mean ratings; high ln(E/P) women's mean ratings have 8.3% greater variance (3.50 vs. 3.23; $t(78)$ for difference = 2.93, $p = .004$). We regressed each set of mean ratings on Strength/Muscularity and BMI and saved unstandardized residuals. The variances of these residuals, with effects of Strength/Muscularity and BMI removed, differ by just 2.3% (2.78 vs. 2.71; $t(78)$ for difference = .87, $p > .25$), meaning that greater weightings of Strength/Muscularity and BMI largely drive differences in variance.[1]

Repeated Measures MANOVA: Predicting Mean Male Sexual Attractiveness Ratings When Partnered Women are Above and Below Mean on ln(E/P)

Descriptives	Mean	SD	Variance	Tests of differences: High vs. Low — Means	Variances
Mean rating by high ln(E/P) women	-.537	1.871	3.50	t(79) = .13, *ns*	*t*(78) = 2.93, *p* =.004
Mean rating by low ln(E/P) women	-.540	1.798	3.23		

r between mean ratings by high and low ln(E/P) women: .993.

	Ratings by high ln(E/P)				Ratings by low ln(E/P)				*F*(1,77) test:
	b	SE	*t*(77)	*p*	*b*	SE	*t*(77)	*p*	high vs. low *b*
BMI	-1.081	.24	-4.42	<.001	-.904	.24	-3.73	<.001	41.94, *p* < .001
Strength/Masculinity	.958	.28	3.42	.001	.843	.28	3.05	.003	13.64, *p* < .001

Notes. *N* of males = 80. Test for difference between variances in dependent samples from Pitman, E. G. (1939). A note on normal correlation. *Biometrika*, *31*, 9-12.

[1] These analyses illustrate an important counterpoint to Jünger et al.'s arguments. The multilevel analyses we present above appropriately model variations across female raters and male targets; these analyses (and hence *p*-values) do not. We note that a similar analysis on mean ratings of women classified by phase does not yield the same "significant" associations (though, again, these *p*-values are not highly meaningful).

We note too that Jünger et al.'s means combine partnered and single women. If effects are not consistent across these groups, as analyses indicate, grand means represent neither.

Finally, we note that differential use of cues won't always generate different variances, as greater weight of some cues may be compensated by lesser weight of remaining cues.

For 80 male bodies, mean sexual attractiveness values for high and low ln(E/P), Strength/Muscularity, BMI, and Bodily Dominance

MaleID	Mean Ratings Hi EP partnered	Mean Ratings Lo EP partnered	Strength/ Muscularity	BMI (z)	Bodily Dominance
2	0.39	0.06	-0.34	-1.216	-0.5
3	1.98	1.63	0.7	-0.067	0.4
5	-4.43	-4.19	2.07	4.102	0.4
6	0.98	0.65	-0.14	-1.197	1.1
8	-0.46	-0.34	-0.09	0.674	1.4
10	-3.33	-2.97	0.49	2.384	-1.5
12	-2.63	-2.57	-0.03	0.083	1.4
14	-1.08	-1.28	-0.75	-0.818	-1.1
15	-0.96	-1	0.06	0.121	1.5
16	-1.99	-1.44	-1.15	-0.350	0.7
17	-0.67	-0.48	-0.47	0.941	0.1
19	-0.43	-0.44	-0.1	0.577	3.4
21	-0.53	-0.86	0.02	-0.302	0.2
23	-3.66	-3.45	0.79	1.514	0.6
24	0.87	0.84	-0.94	-1.203	0.2
25	-1.83	-1.84	-0.44	-0.991	-1.9
26	-0.13	-0.43	-0.49	-0.697	0.5
28	-0.47	-0.66	-0.45	-0.409	1.7
29	-3.29	-2.97	0.06	1.679	2.5
31	0.43	0.75	0.1	0.514	1.9
34	0.65	0.96	-0.85	-0.885	0.8
37	1.55	1.39	-0.11	-0.450	0.4
38	0.17	0.34	0.89	0.171	0.7
40	-0.94	-1.19	-0.48	-0.692	-1
41	-3.93	-3.57	0.59	1.916	-0.7
44	3.17	3.09	0.47	0.260	3.1
49	-0.82	-1.07	-0.1	-0.775	-1.2
50	-1.54	-1.48	0.45	0.026	-0.9
51	-1.48	-1.72	-0.31	-0.311	-1
52	1.3	1.24	-0.01	0.031	1.8
53	0.82	0.96	-0.37	-0.094	-0.4
55	0.04	0.5	-1.64	-0.500	-1.4
57	1.12	0.91	0.01	-0.338	1.1
58	-2.97	-2.7	-0.81	-0.540	-1.8
60	0.12	-0.34	-0.13	-0.989	-1.1
63	-2.2	-2.16	-0.67	-0.260	-0.5
64	-3.61	-3.75	-2.15	-2.440	-4.3
65	-1.87	-1.92	0.09	0.782	-0.2
69	0.98	1.07	-0.43	-0.586	1.8
70	-1.26	-0.98	0.32	-0.134	-1.1
71	-1.83	-1.74	0.95	0.605	0.2
72	0.02	0	0.43	0.212	-0.4
74	1.63	1.27	0.34	-0.972	0.5
75	-2.45	-2.32	-0.59	0.308	-0.4
76	1.89	1.84	-1.06	-0.958	1.7

77	-0.27	-0.28	-0.23	-0.847	-0.3
78	0.29	0.45	0.99	0.252	4
79	-2.06	-1.71	2.63	2.527	3.6
80	-2.26	-2.37	-0.96	-0.467	-1.7
81	1.58	1.65	1.66	0.441	2.3
82	3.19	3.02	1.33	0.819	2.7
83	1.13	1.1	-1.63	-1.004	-0.2
85	-3.28	-3.09	0.16	0.423	-0.5
86	-0.23	-0.3	-0.71	-0.482	0.6
88	-2.34	-2.52	-0.85	-0.190	-1.9
89	1.45	1.73	0.35	0.562	2.7
90	1.91	1.71	0.17	0.498	2.8
95	2.37	2.35	0.01	-1.005	1.6
98	-3.68	-3.79	1.25	0.720	-1
99	-2.56	-2.57	0.62	0.813	-0.2
100	-1.51	-1.49	-0.67	-0.579	-1.6
101	1.77	1.21	-0.81	-0.489	0.6
102	1.67	1.71	-0.99	0.001	1.8
103	-2.66	-2.42	-1.17	0.196	1
104	1.6	1.89	0.73	0.883	3.7
107	-0.34	-0.2	1.01	1.282	2.4
109	2.34	1.82	0.82	-0.382	0.8
110	-4.17	-4.24	-1.39	-1.680	-4.2
111	-0.33	-0.2	0.07	-0.830	-1
112	1.27	1.29	-0.59	-0.273	0.9
113	-1.52	-1.42	0.7	0.362	1.6
114	-1.75	-1.93	-0.33	-0.896	-0.5
115	1.24	1	0.64	-0.414	2.8
116	0.08	-0.02	1.67	1.473	2.7
117	-2.6	-2.36	0.51	0.908	1.3
121	-0.66	-1.01	-0.77	-0.450	0.2
123	0.2	0.18	1.8	0.489	2.2
125	2.02	1.92	0.86	-0.878	1.4
127	-1.38	-1.46	-0.67	-1.239	0.1
129	-0.71	-0.49	0.06	0.731	0.7

26. Discussion of Jünger and Penke's (2016) preregistered Hypothesis 1: Does it pertain to main effects of fertility status on ratings of male bodies, or does it pertain to preferences for masculine bodies?

Jünger and Penke (2016) preregistered 4 primary hypotheses that pertain to female ratings of male bodies, voices, and behavior. The first two parts of Hypothesis 1 (H1a and H1b) read as follows:

> a) Naturally cycling women in their fertile window, compared to their luteal phase, evaluate masculine stimuli (bodies, voices, and flirting behavior) as more attractive for short-term relationships.
> b) Mediation: In both investigated menstrual cycles, the effect is mediated by a high estradiol and a low progesterone level.

One straightforward reading is that the hypothesis refers to *preferences* for "masculine" bodies (and other stimuli) over less masculine bodies (and other stimuli). H1b then would refer to hormonal mediation of *preferences* for masculine bodies.

Jünger et al. (2018), however, claimed that this hypothesis referred to something different: a *main effect of fertility status* on ratings of attractiveness of male bodies, independent of preferences. They tested this hypothesis by simply examining mean ratings of short-term attractiveness across fertile and luteal phases. They claimed that hormonal mediation pertains to this main effect. Their Hypothesis 2 reads, "This effect should be mediated by increases in estradiol and decreases in progesterone." No other hypothesis in Jünger and Penke's (2016) preregistration refers to hormonal mediation of female ratings. Hence, in a signed review of our commentary, Penke, Jünger, and Arslan claimed that Jünger and Penke (2016) did not preregister the hypothesis that preferences for masculine bodies (over non-masculine bodies) is mediated by steroid hormones.

For multiple reasons, the former interpretation, and not Jünger et al.'s (2018), is supported by the preregistration.

First, the first two pages of Jünger and Penke's preregistration explicitly concerns ovulatory shifts in mate preferences (pp. 2-3). On the top of p. 3, the preregistration states that these shifts are "assumed to be regulated by steroid hormonal changes (primarily by estradiol and progesterone)." Immediately thereafter, the preregistration goes on to state that "the planned study aims to clarify the following research questions" (p. 3). The first two research questions are the primary ones that address the existence of mate preference shifts and hormonal mediation. Hence, question #1 is "Do naturally cycling women evaluate men differently for short-term relationships in their fertile window, relative to their non-fertile days?; Do ovulatory cycle shifts on females' *preferences* of men's body masculinity, voice masculinity and socially flirtatious behavior exist?" (emphasis added). Question #2 is "Which variables mediate and moderate ovulatory cycle shifts in female mate *preferences* for short-term partners?" (emphasis added). And the first specific question under this broader question is "Are menstrual cycle shifts in *preferences* mediated by changes in steroid hormones?" (emphasis added). The meaning of this language is unmistakable: The study seeks to test ideas about preference shifts (e.g., for masculine over non-masculine men), as well as whether these preference shifts are mediated by hormonal changes. In their review, Penke et al. claimed that their preregistration did not seek to test hormonal mediation of preferences. Their own preregistration directly contradicts this claim.

Second, Penke et al. argue that the only preregistered hypothesis that explicitly mentions hormonal mediation is H1. (Main hypotheses H1 to H4 are detailed in the preregistration immediately after the listing of main research questions.) In that case, then the only specific hypothesis that could represent the primary research question concerning hormonal mediation of preferences for masculine bodies ("Are menstrual cycle shifts in preferences mediated by changes in steroid hormones?") is H1. If, as Jünger et al. (2018) assert, H1 concerns main effects and not preferences, then one of Jünger and Penke's primary research aims, to assess hormonal mediation of preferences, was not represented in any hypothesis. Accordingly, if H1 does not refer to preferences for masculine stimuli, Jünger and Penke's preregistration is internally inconsistent.

Third, nowhere in the introduction (pp. 2-3) do Jünger and Penke lay the foundation for expecting a main effect of fertility status on ratings of male stimuli. They do not cite a single source, finding, or theoretical basis for expecting such an effect. Indeed, nowhere in the research questions do Jünger and Penke state that a primary research question is to address whether such main effects exist. Every one of the 6 research questions they list (pp. 3-4) that pertain to female ratings of male stimuli explicitly mentions preferences for some male stimuli over others. (Questions 4 and 5 [of 8] pertain to changes in women's morphology, appearance, or behavior.) If, as Jünger et al. (2018) claim, H1 pertains to main effects and not preferences, then H1 comes out of the blue; though the very first hypothesis mentioned, the question it addresses is not one Jünger and Penke list as a question the research aimed to address. In this way too, under Jünger et al.'s (2018) interpretation, Jünger and Penke's preregistration is internally inconsistent.

Fourth, although H1 is stated in what could be the form of a main effect ("Naturally cycling women in their fertile window, compared to their luteal phase, evaluate masculine stimuli … as more attractive"), so too are H2 to H4, which pertain to specific male features. Hence, H2b states, "When evaluating men as potential short-term partners based on their bodies, women in their fertile window, compared to their luteal phase, report increased attraction to men with taller body height and visual cues of upper-body strength..." This statement too could be read as specifying a main effect: e.g., when in the fertile window, women are predicted to rate muscular men as more attractive than women in the luteal-phase. But clearly it refers to an interaction: Women in their fertile window, compared to those in their luteal phase, are predicted to rate men with certain attributes attractive*, relative to men lacking those attributes*. Hypothesis H1a says the same thing, except that "masculine stimuli" in general are referred to rather than particular masculine stimuli. Throughout the introduction, Jünger and Penke used the term "masculine" to refer to some features [more masculine features] in comparison to others [less masculine features], as opposed to the quality of being male.

Fifth, language in the section on H1 (which concerns the hypothesis about "masculine stimuli") clearly resolves the ambiguity we note above concerning whether H1 refers to preferences. In addition to H1a and H1b, Jünger and Penke preregistered H1c and H1d. H1c states, "Cycle shifts in *preferences* for masculine stimuli are attenuated during menstrual cycles where self-reported stress is high during the fertile phase" (emphasis added). This hypothesis very clearly reveals the meaning here: H1 refers to *preferences* for masculine stimuli (over non-masculine ones). It unambiguously refutes Jünger et al.'s (2016) and Penke et al.'s claims that H1 refers to main effects of ratings on *all* bodies and not preferences.

Sixth, the title of Jünger and Penke's (2016) preregistration is "The effects of ovulatory cycle shifts in steroid hormones on female mate preferences for body masculinity, voice masculinity, and social dominant behavior." Once again, the intent is clear: The preregistration concerns effects of steroid hormones on female *preferences*.

In sum:

1. Jünger and Penke *did* preregister the hypothesis that estradiol and progesterone mediate cycle phase effects on preferences for masculine bodies.

2. Jünger and Penke did *not* preregister the hypothesis that fertility status has main effects on attractiveness ratings of male bodies, contrary to the claims of Jünger et al. (2016). That is, Jünger et al.'s (2016) Hypotheses 1 and 2 were not preregistered, despite their claims.

The only alternative to 1 and 2 being true is that Jünger and Penke's preregistration is internally inconsistent: Contrary to what the preregistration explicitly states, a primary research question was not to assess hormonal mediation of preferences (as no hypothesis addressed that question); contrary to what H1c states, H1 did not pertain to "preferences for masculine stimuli"; the title of the preregistration mistakenly refers to phenomena the preregistration does not address. That the preregistration is confused in these multiple ways is simply not plausible.

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27. Raw vs. log-transformed measures and ratios

One reviewer, who identified himself as Jim Roney, worried that log-transformation of hormone values may distort associations. In fact, log-transformation or hormone levels is common practice within endocrinology. Distributions of hormone levels tend to be positively skewed. Log-transformation tends to produce distributions that are closer to normal (e.g, Blake et al., 2017; Puts et al., 2013; McIntyre, Chapman, Lipson, & Ellison, 2007)—and, indeed, estradiol and progesterone levels are highly skewed in Jünger et al.'s dataset. A second reason to transform, however, is to increase linearity with other variables. Hence, for instance, Sherry, McGarvey, Sesapasara, and Ellison (2014) state, "hormonal variables typically require log transformation prior to data analyses to improve linearity." By increasing linearity, log-transformation can increase size of associations with other variables. That said, one cannot typically expect massive differences between results using raw and log-transformed hormone levels, as raw hormone values and log-transformed values generally covary highly. In Jünger et al.'s data, the correlation between estradiol and log-estradiol values is .88; the correlation between progesterone levels and log-progesterone values is .87 (with outliers removed). As we note in the text, though we used log-transformed levels in primary analyses (as we preregistered these values in our own work), we also analyzed data by entering raw estradiol and progesterone levels separately. The relationship status by progesterone interaction was about 10% weaker in these analyses (though p remained < .05), consistent with there being slightly stronger associations with log-transformed levels.

We use the log of the E/P ratio in analyses. As we emphasize in our paper, however, these analyses also capture additive linear effects only. Ln(E/P) simply reflects joint linear additive effects of log-transformed E and P, where each is given equal but opposite weights: ln(E) – ln(P). If E and P have opposite but near-equal weights (when log-transformed), the ln of their ratio captures those effects. Statistical power is enhanced by using ln(E/P) if indeed these opposite effects exist, the reason we preregistered the measure as a first-pass test of joint E and P effects opposite in direction. As we also emphasize, however, one should also want to examine the effects of each by entering ln(E) and ln(P) separately. In a regression analysis, that simply amounts to allowing ln(E) and ln(P) to be estimated freely, without constraining them to have equal but opposite weights. In our own re-analyses, for instance, we find that the interaction effect involving ln(E/P) is largely driven by ln(P). We do not expect that researchers will use ln(E/P) as a predictor without also examining the additive linear effects of estradiol and progesterone separately.

Others too have examined the predictive additive effects of estradiol and progesterone on outcomes. Roney and Simmons (2013), for instance, found that both within-woman variations in estradiol and progesterone predicted self-reported sexual desire across natural cycles, when entered as additive predictors. Though they used raw hormone values, we strongly suspect that log-transformed values would yield similar results—again, raw and log-transformed values correlate with one another very highly. As the question of which values—raw or log-transformed—ultimately predict outcomes better, we encourage researchers to report analyses using both sets of values. Over time, we may better understand which values, on average, yield stronger associations.

Some researchers encourage use to the raw E/P ratio as a predictor. This ratio is associated with conception probability; on average, it peaks just before the peak LH surge in an ovulatory cycle (Baird et al., 1991). Of course, any monotonic transformation of the E/P ratio, including ln(E/P), will also peak at this same time. Nonetheless, E/P may potentially reflect fertility status best.

In his review, Roney presented two curves based on Stricker et al.'s (2006) paper reporting normative hormone levels relative to an LH surge, one for E/P and one for ln(E/P). We reproduce those curves below (Figure S4):

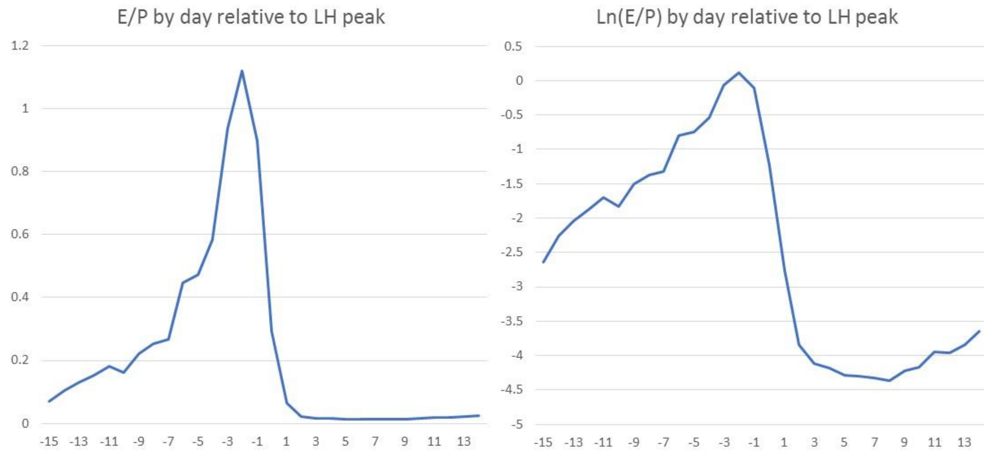


Figure S4. E/P and ln(E/P) by day relative to LH peak (day 0), from Stricker et al. (2006). These graphs were created by taking ratios of mean values, not taking the mean of individual E/P values. The former need not correspond precisely to the latter, but the latter are not available.)

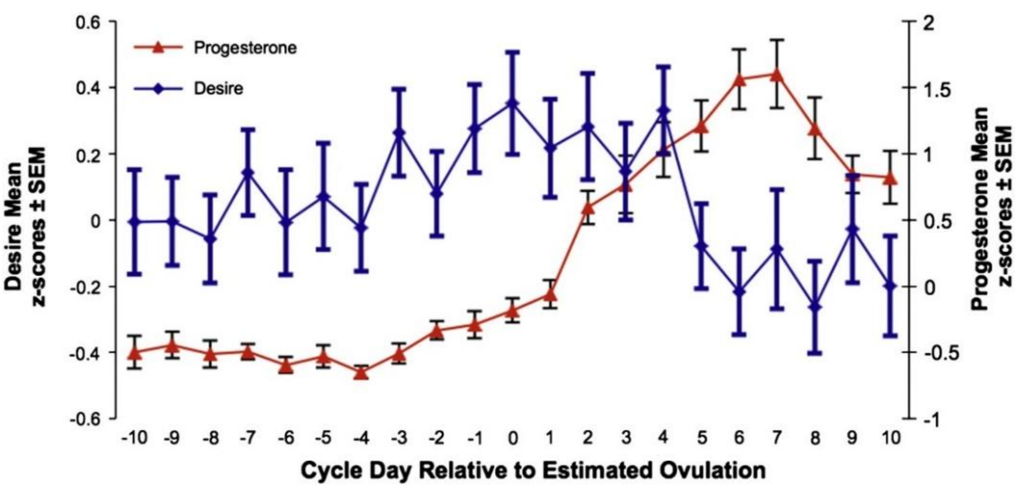
As Roney notes, E/P (left graph) appears to track fertility status better than ln(E/P) (right graph). (As noted in footnote 8 of the main text, this pattern is contrary to what is seen in Jünger et al.'s (2018) data.)

Despite these data, there are multiple reasons to not treat E/P in analyses in ways similar to how we treat ln(E/P). First, unlike ln(E/P), E/P does not capture the joint linear effects of E and P. Indeed, as we note in the paper, E and P linear effects capture only a mere 20% of the variance in E/P—a stunningly small amount. If E and P do have linear effects, as Roney and Simmons (2013) find with regard to sexual desire, then, E/P will capture those effects very poorly. Of course, once again, 100% of the variance in ln(E/P) is captured by ln(E) and ln(P) (the former merely being the additive difference of the latter). And indeed, because E and P covary strongly with ln(E) and ln(P), respectively, ln(E/P) potentially captures joint additive effects of untransformed E and P well – in Jünger et al.'s data, *raw* E and P account for 76% of the variance in ln(E/P), far exceeding the 20% of the variance in E/P. By the logic that hormones may well have additive linear effects, then, ln(E/P) is a superior measure to E/P. In any event, the rationale for why we preregistered ln(E/P)—it captures joint opposite effects of E and P—is completely lacking with respect to E/P.

Second, Sollberger and Ehlert (2016) recently reviewed issues pertaining to use of hormone ratios. As they describe in detail, use of hormone ratios entails multiple statistical and interpretational problems. If one uses such a ratio to get at the "balance" of hormones, one might expect P/E to do so as well. Yet these variables do not covary perfectly negatively. (By contrast, the *r* between ln(E/P) and ln(P/E) *is* -1.) Measurement errors in the denominator of a ratio magnify when denominator values are small (here, where progesterone values are small.) And it can be very difficult to interpret hormone ratios. Again, they do not capture joint linear effects of the two hormones. But they also need not reflect simple interactive effects of the hormones. In Jünger et al.'s data, the linear by linear interaction between E and P accounts for just 4% of the variance in E/P after additive effects are accounted for. Hence, 76% of the variance in E/P is independent of simple linear effects or the linear x linear interaction of E and P, instead reflecting complex additive and interactive effects. For these reasons, Sollberger and Ehlert (2016) discourage use to hormone ratios in statistical analyses. If one is interested in interactive effects of two hormones, they recommend entering the interaction effect into analyses (here, E × P) along with main effects. (Exceptions they make, we note, are log-transformations of hormone ratios. Just as we emphasize, they note that this ratio is readily interpreted as simply an unweighted aggregation of opposing additive effects of the two hormones.)

We add one final note in this regard. The theory that non-conceptive sex and conceptive sex should have somewhat different functions (potentially specific to partnered and single women) may seem to suggest that the immediate fertility status of women should be the critical controlling variable. Of course, selection must operate on physiological mechanisms. Constraints imposed by how endocrinological mechanisms work can lead selection to produce hormonal effects not perfectly reflective of immediate fertility status, even *if* immediate fertility status dictates the benefits and costs of these effects. (I.e., the causal role of immediate fertility status is to affect the phenotypes that selection favors, whereas evolved endocrinological mechanisms are the means by which those phenotypes are produced or approximated; one must distinguish these causal accounts [ultimate vs. proximate].) One can also wonder, however, if immediate fertility status does actually dictate the costs and benefits of hormonal effects. In the mid-follicular phase, probability of conception is very low. In the mid-luteal phase, it is similarly low. Yet there may be a functional difference between these two time points: In the mid-follicular phase, high fertility status is impending; within a few days, conception probability will rise. In the mid-luteal phase, high fertility status has passed; it will not return until the next cycle (unless conception has taken place). It seems plausible that, on average, there will be a time lag between the onset of a shift in attraction and the act of copulation with an attractive partner (i.e., copulation will generally not occur on exactly the same day during which preferences begin to shift). If so, the costs and benefits of patterns of attraction during the mid-follicular and mid-luteal phases may differ, despite these time points being characterized by similar levels of conception probability. In particular, a gradual shift in preferences starting from the mid-follicular phase—tracking the gradual rise of ln(E/P) in the top panel of Figure S1—might be more adaptive than an abrupt shift in the vicinity to the LH surge, as suggested by the sharp rise of E/P in the bottom panel.

In this regard, Figure 2 from Roney and Simmons' (2013) analysis of hormonal predictors of women's sexual desire is interesting. As shown below, sexual desire during the early-to-mid follicular phase, while less elevated than during the peri-ovulatory phase, exceeds that of the mid-luteal phase, when it reaches its mean minima. This pattern is consistent with ln(E/P) better predicting sexual desire than does E/P, despite the latter possibly better tracking conception probability.



Naturally, the potential explanation for this pattern that we lay out above is speculative. We discuss it here to say that, even if selection were able to produce optimal patterns of shifts, it is not completely obvious that shifts should be expected to perfectly reflect changes in fertility status. In light of the statistical and interpretational problems of raw E/P, we do not favor its use as a predictor of outcomes, even if it tracks conception probability fairly well. As noted above, we prefer to examine additive effects of E, P, or their log-transformations. If interactions between E and P are of interest, we favor entering the E × P interaction term (Sollberger & Ehlert, 2016).

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