Ovulation and Human Social Behavior

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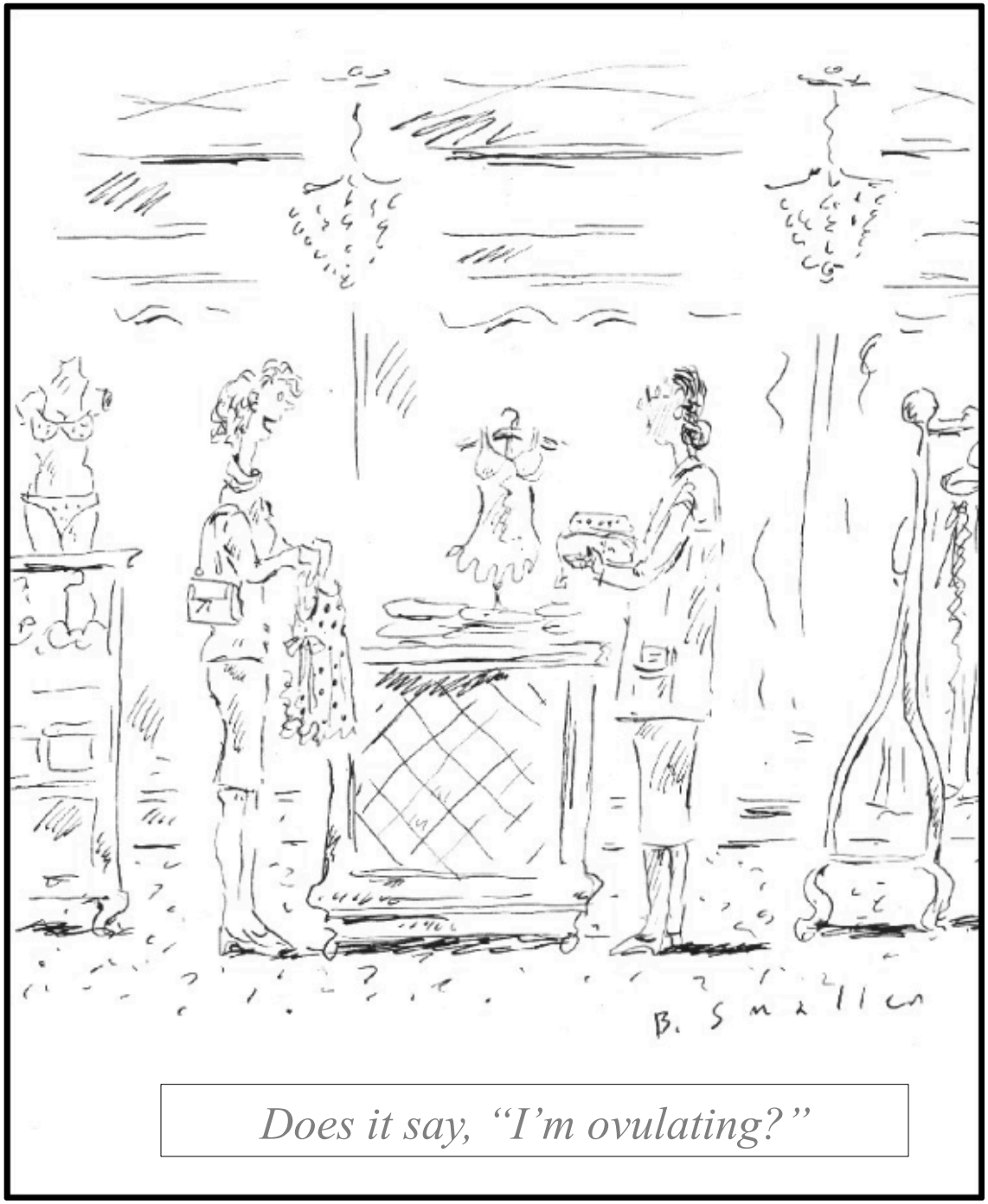


Does it say, "I'm ovulating?"

Overview

- hormones in human social behavior
- Methodological paradigm
- Phenomena
  - –
  - –
    attraction)
- Possible implications for hormone-triggered reproductive cancers

Changes in…

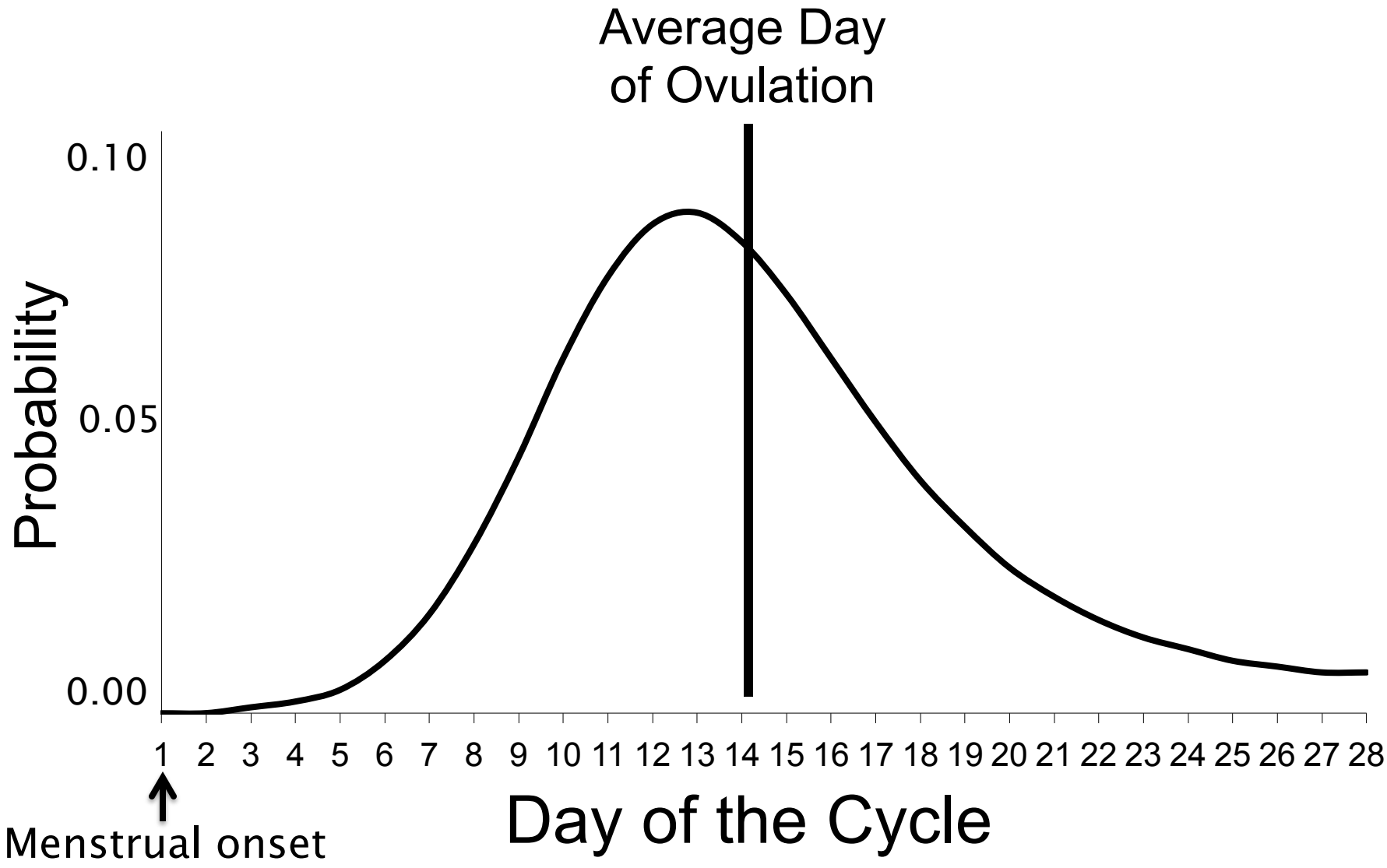
-
-
-
  attractive men
- Attraction to masculine men
- Avoidance of some risks
- Avoidance of male kin
- Self-perceived attractiveness
- Attractiveness of voices and scents
- Clothing worn
- Perceptions of other women's attractiveness
- Tips earned

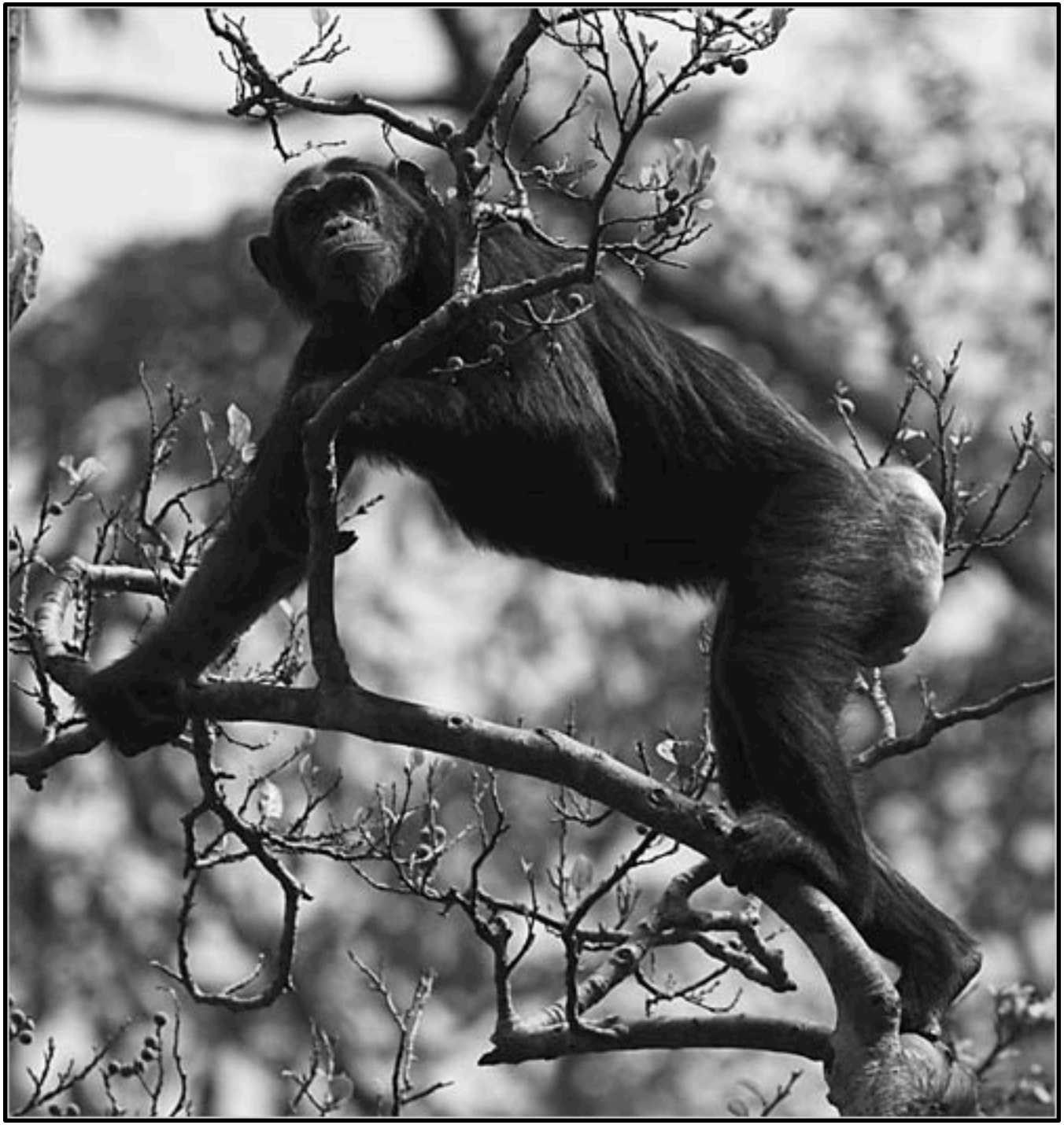
Fundamental Prediction from Sexual Selection Theory:

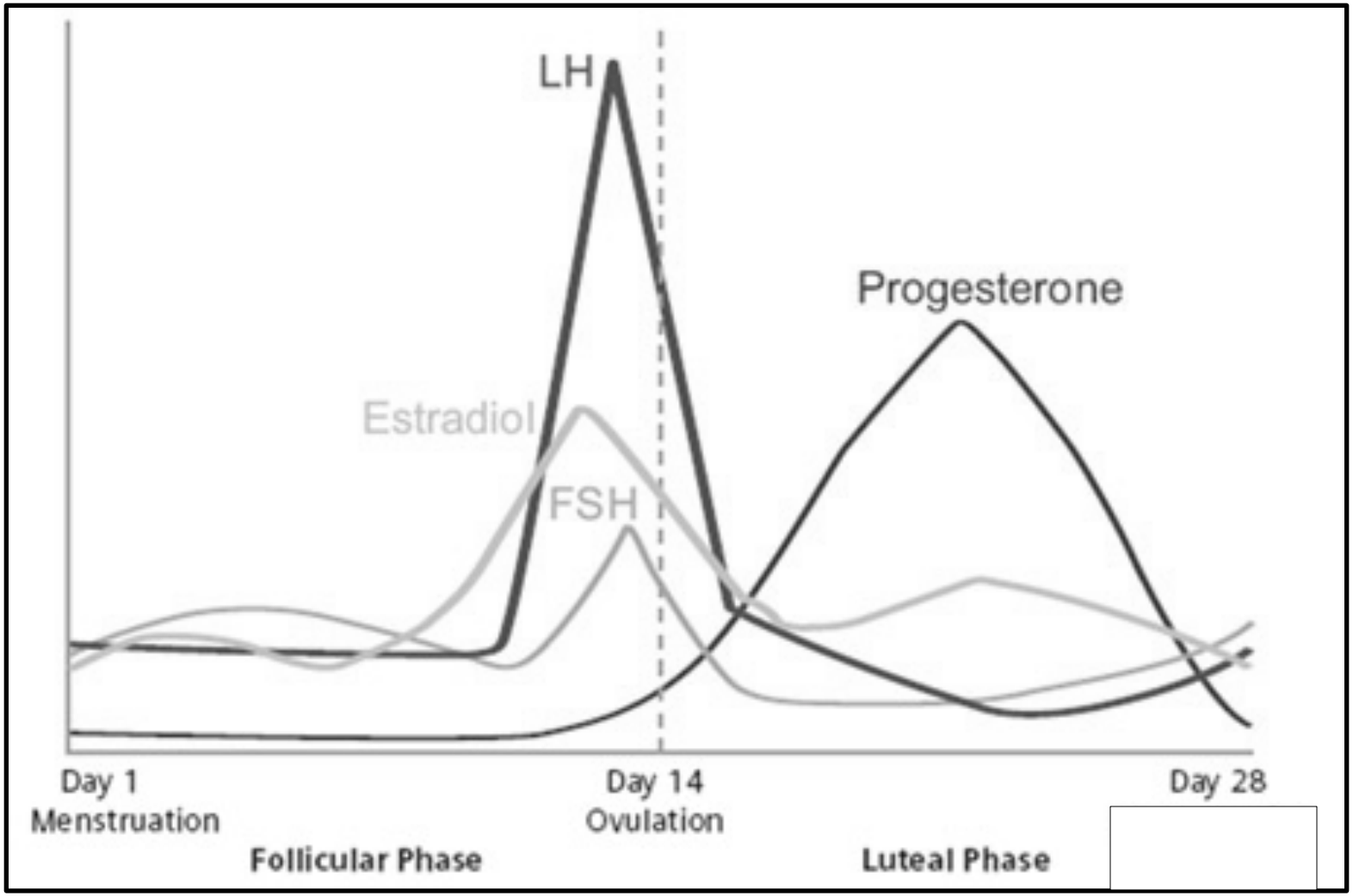
Women's mating adaptations will be sensitive to fertility within the cycle

Probability of Conception After Single Act of Unprotected Sex

(Wilcox, 2001)





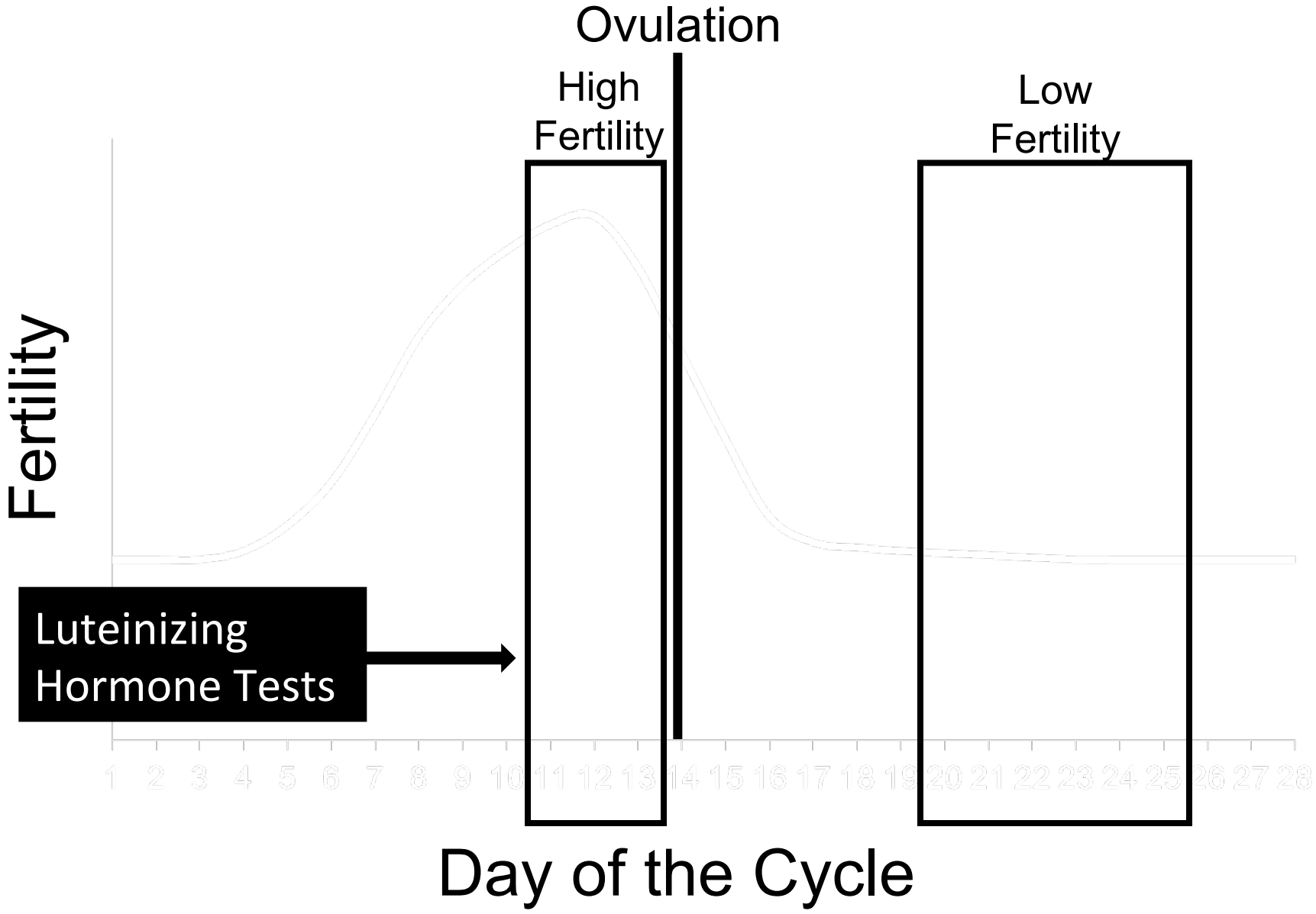

LH
Progesterone
Estradiol
FSH
Day 1
Menstruation
Day 14
Ovulation
Day 28
Follicular Phase
Luteal Phase

“

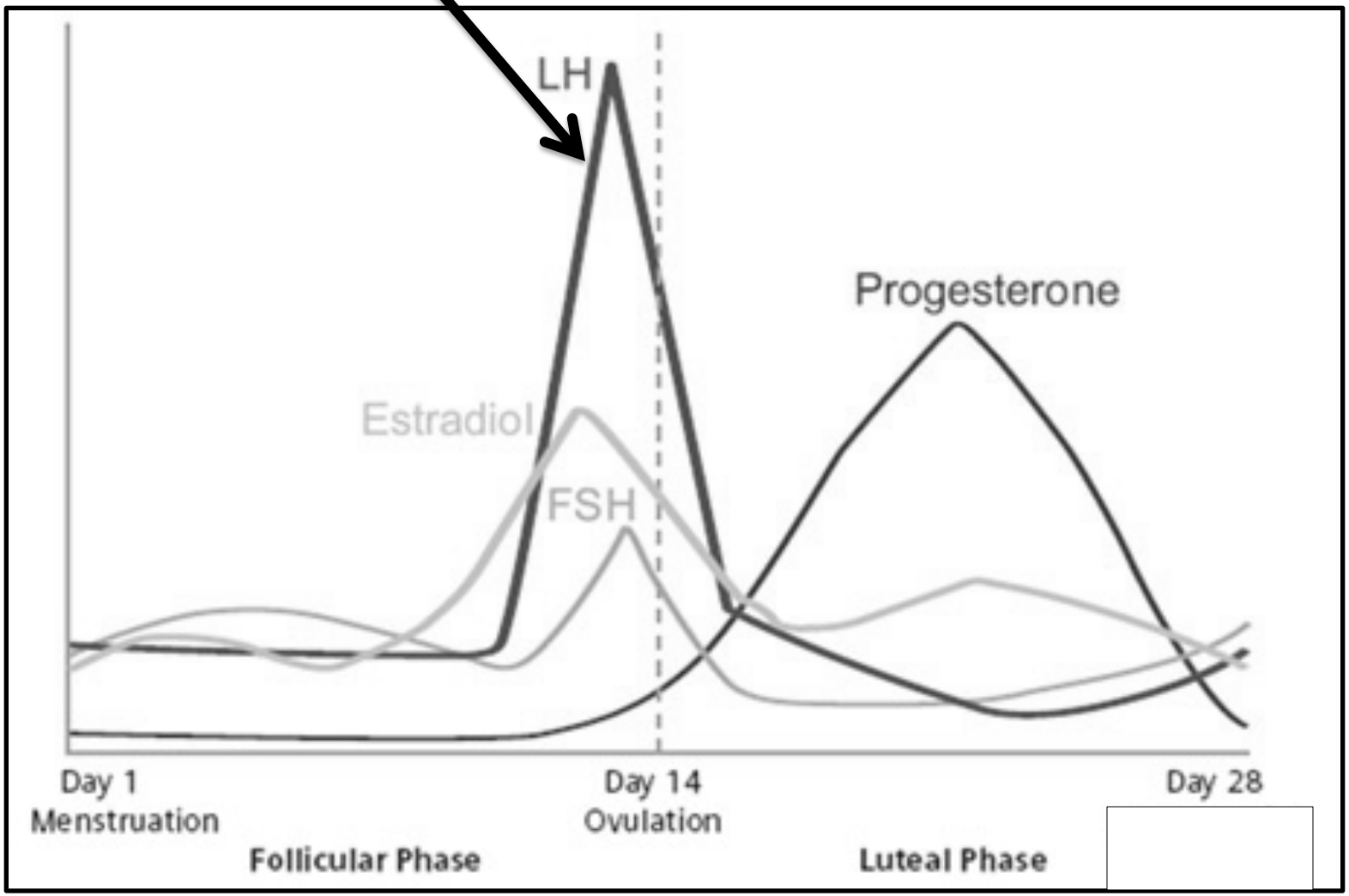
could have made, based on simple reproductive logic and the study of nonhuman animals, would have been that . . . men will be able to detect when women are ovulating and will find ovulating women most sexually attractive. Such adaptations have been looked for in the human male and have never been found . . .”

--Don Symons, 1987 (p. 133)

General Methods



LH surge occurs 24-48 h before ovulation

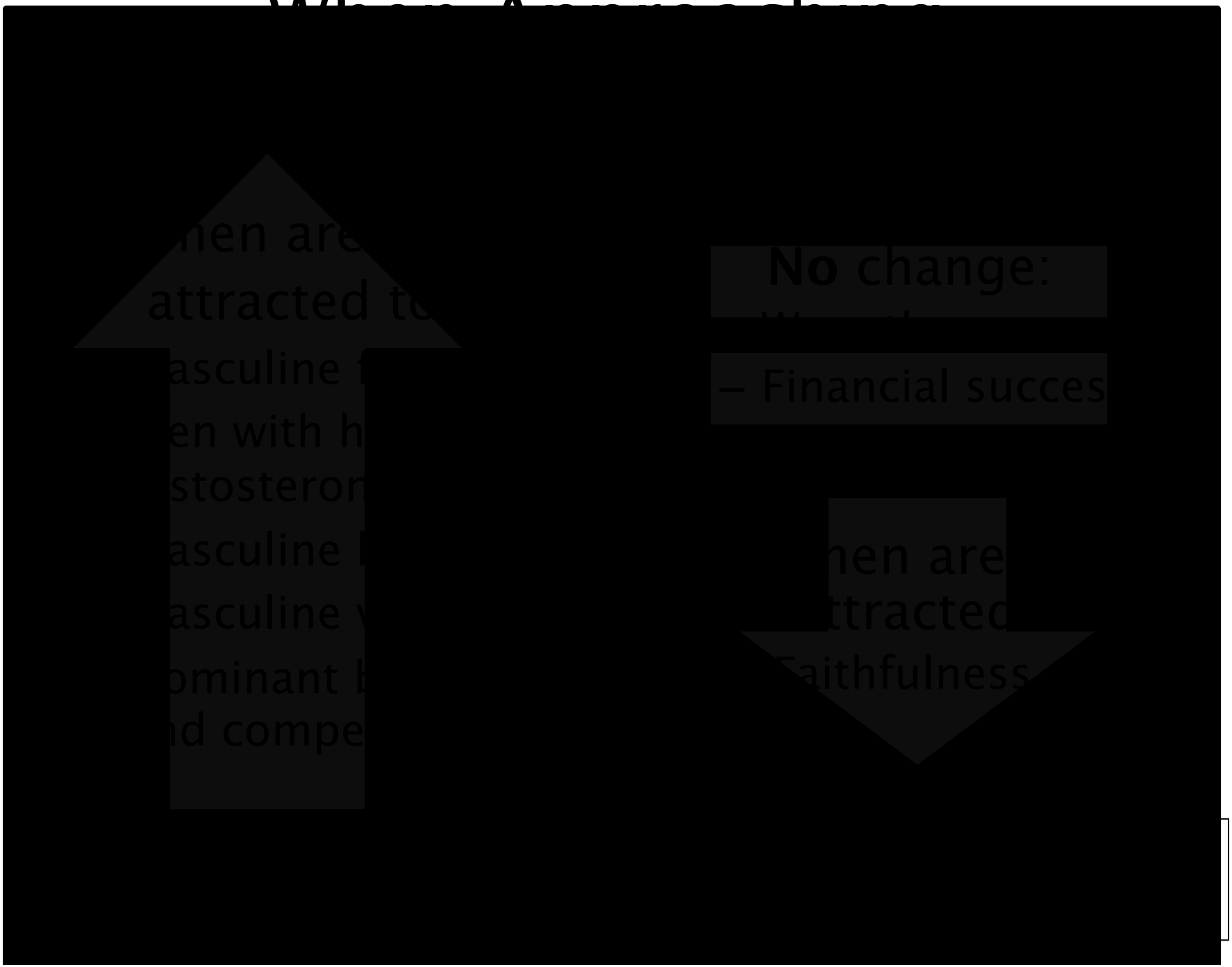


General Methods

- “ ”

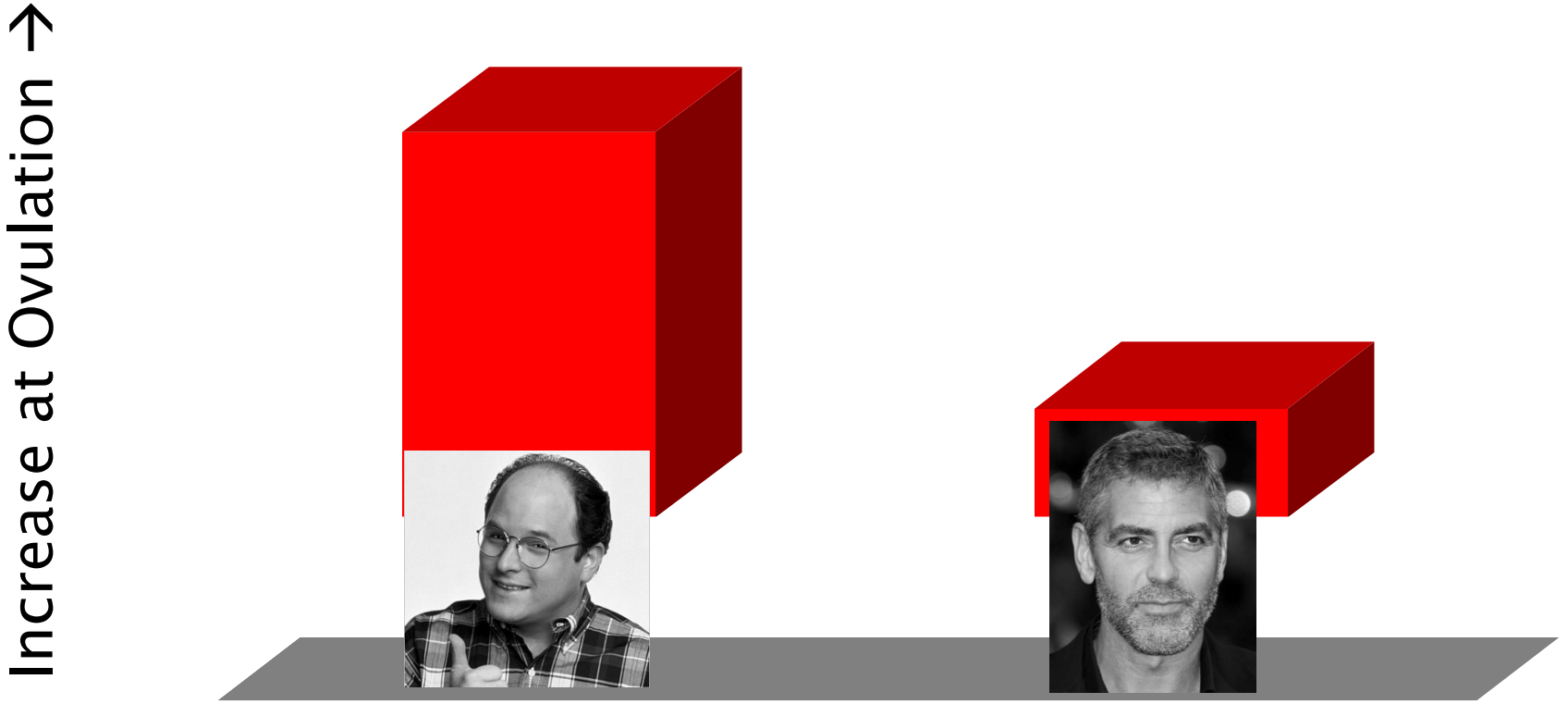
  LH tests (order controlled)
- All regularly cycling women (not taking hormonal contraceptives)
- Young women, mostly college students

Shifts in Women's Desires


No change:
– Financial succes

Implications for Relationships

Increase in Extra-Pair Attraction at Ovulation Occurs only for Women with Partners Low in Sexual Attractiveness

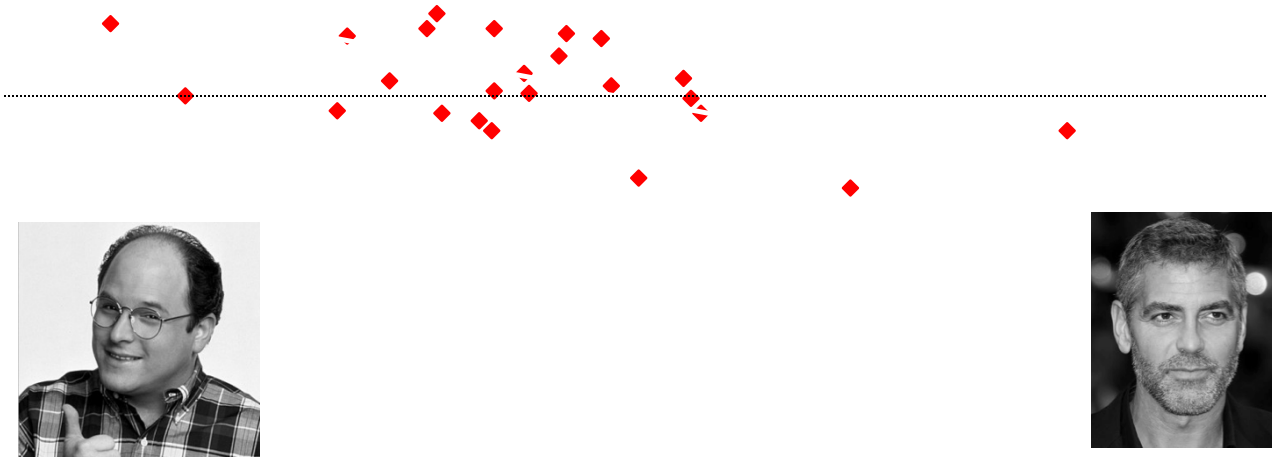


From Haselton & Gangestad (2006). *Hormones and Behavior.*

Increase in Attraction to Other Men at Ovulation Occurs only for Women with Partners Low in Sexual Attractiveness

$r = -.58$, $p < .01$

Attraction to Other Men: High Minus Low Fertility



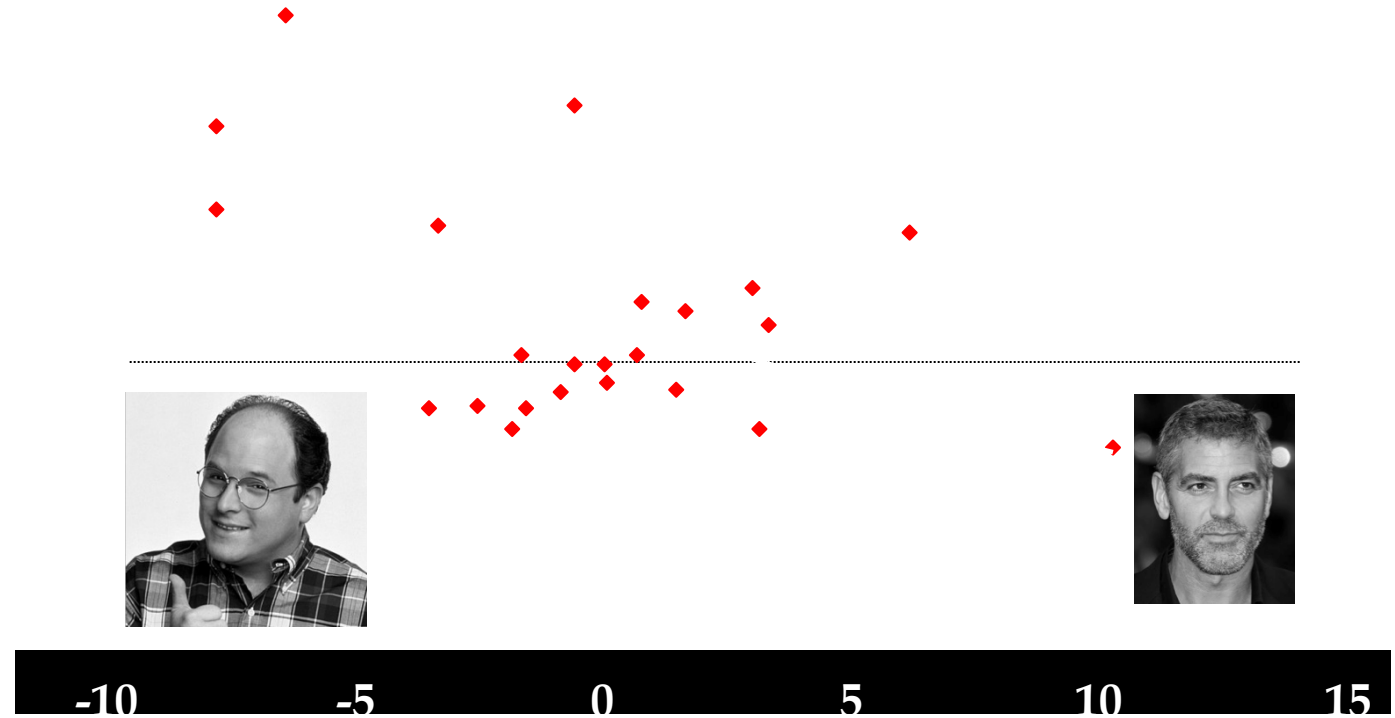
Partner Sexual Attractiveness

From Haselton & Gangestad (2006). *Hormones and Behavior.* Replicated in Pillsworth & Haselton (2006), Haselton et al., (2011), Gangestad et al. 2010.

Increase in Partner Mate Retention at Ovulation Occurs Primarily for Less Sexually Attractive Partners (Haselton & Gangestad, 2006)

$r = -.42$, $p < .05$

Male Possessiveness and Jealousy: High Minus Low Fertility



Increase in Partner Mate Retention at Ovulation Occurs Primarily for Less Sexually Attractive Partners (Pillsworth & Haselton, 2006)

$r = -.35$, $p = .02$

Partner Attention and Love: High Minus Low Fertility

Partner Sexual Attractiveness

- Women's flirtation and attraction to men other than their partners increases near ovulation (primarily among women with low sexual attractiveness partners)
- Parallel pattern of shifts in women's reports of partner's mate retention efforts
- *Implication: coregulation of sex hormones in humans*

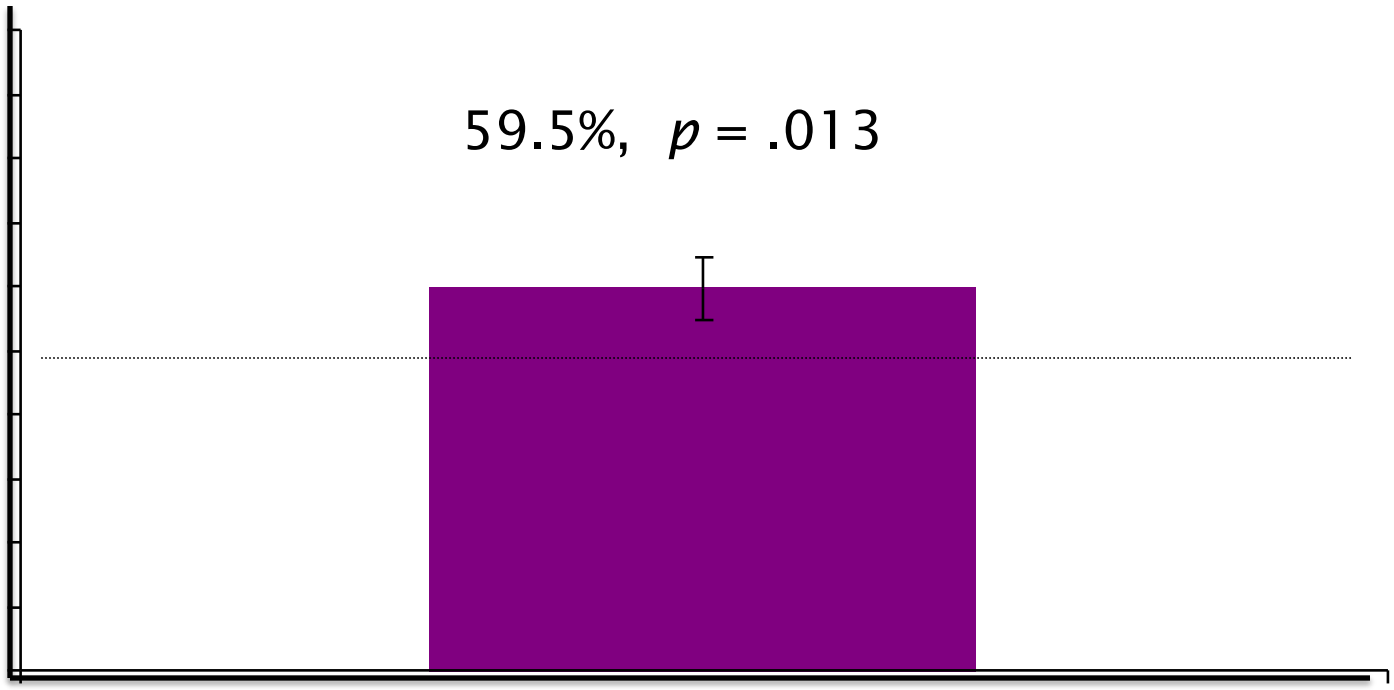
Behavioral Cues of Ovulation

Dress to Impress

(Haselton, Mortezaie, Pillsworth, Bleske-Rechek & Frederick, 2007, *Hormones and Behavior*)

QUESTION: In which photo is she "trying to look more attractive?"

Judges choose high fertility photos at above-chance levels



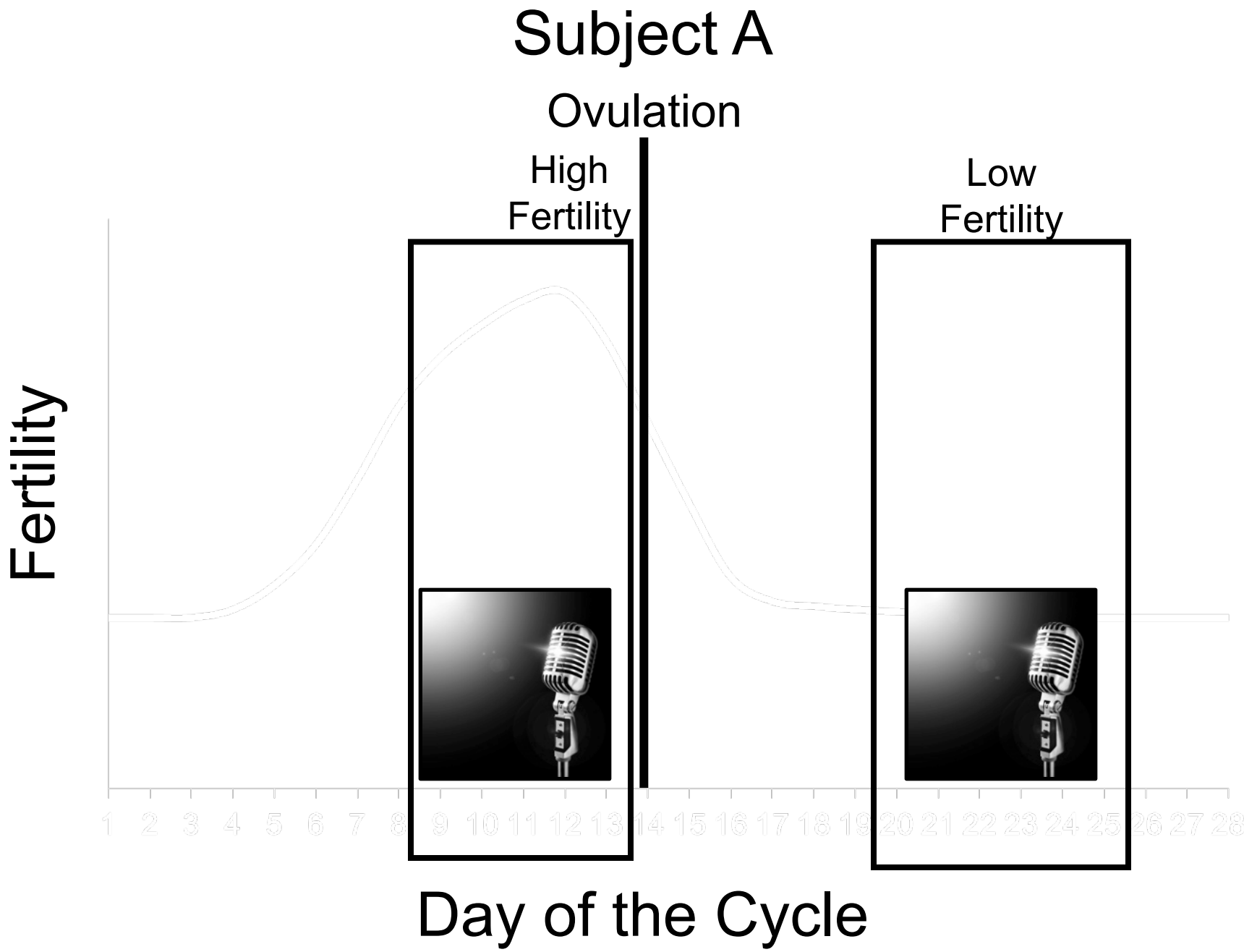
N = 30 Stimulus Women; N = 42 Judges

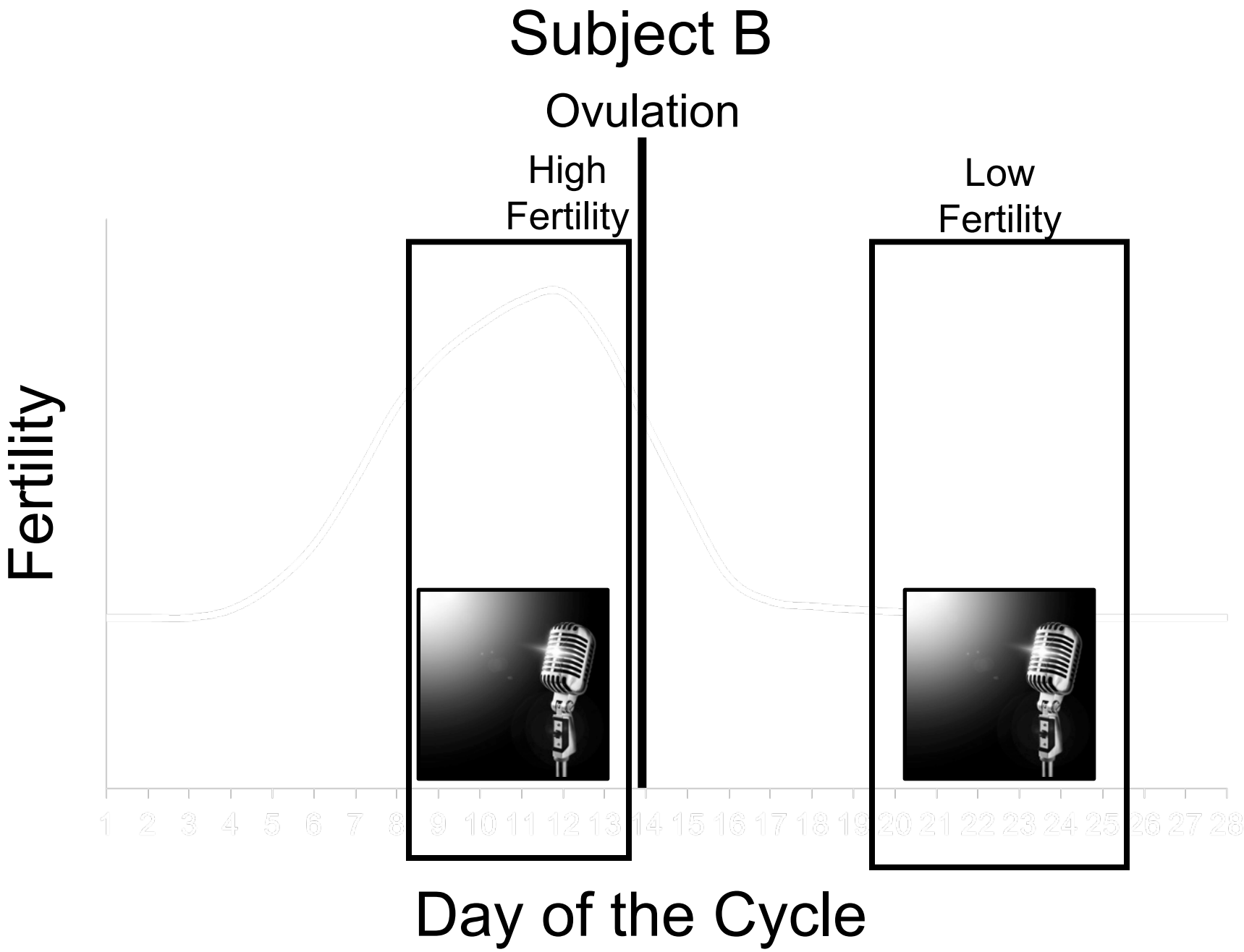
Vocal Cues of Ovulation

Changes in Voices

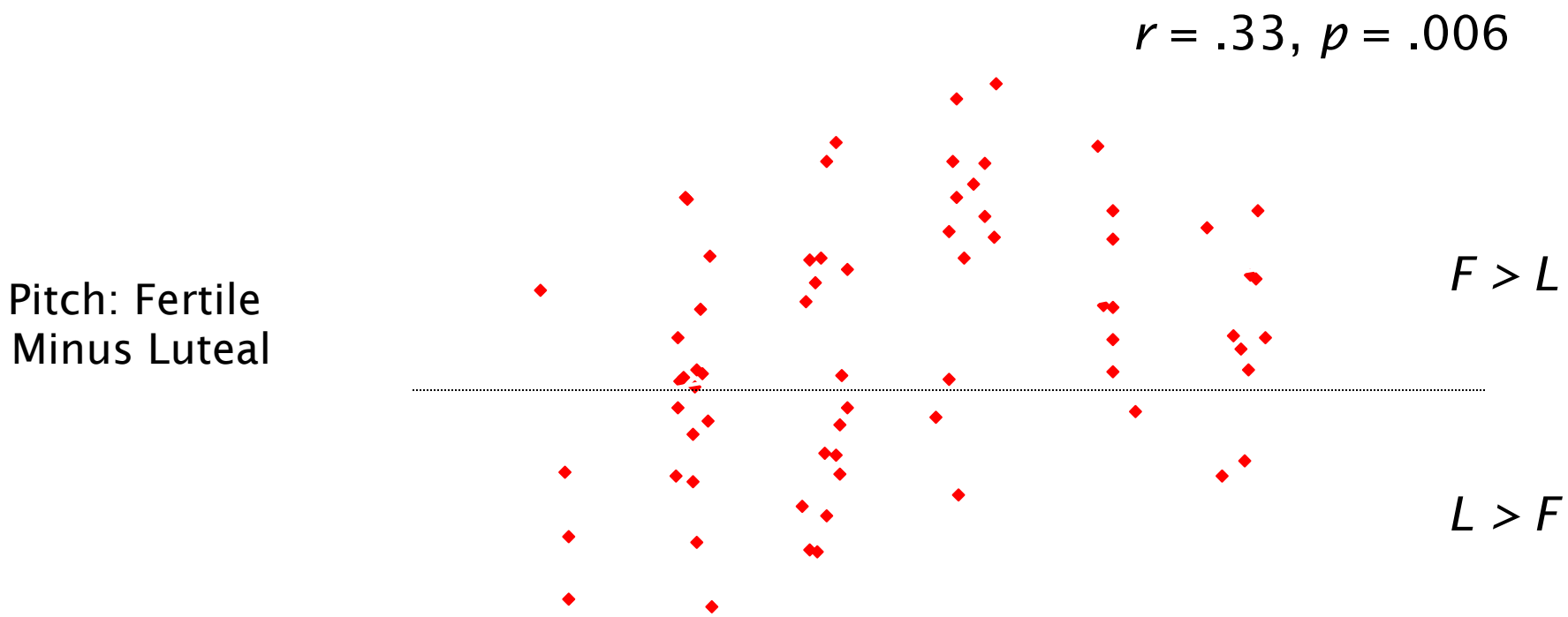
(Bryant & Haselton, 2009, *Biology Letters*)

- Hint from previous research
  - estrogen associated with higher pitch
  - voices higher in pitch are rated as more attractive
- N=69 pairs of vocal clips
- Vowels and a standardized introductory sentence


Subject A
Ovulation
High Fertility
Low Fertility
Fertility
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Day of the Cycle

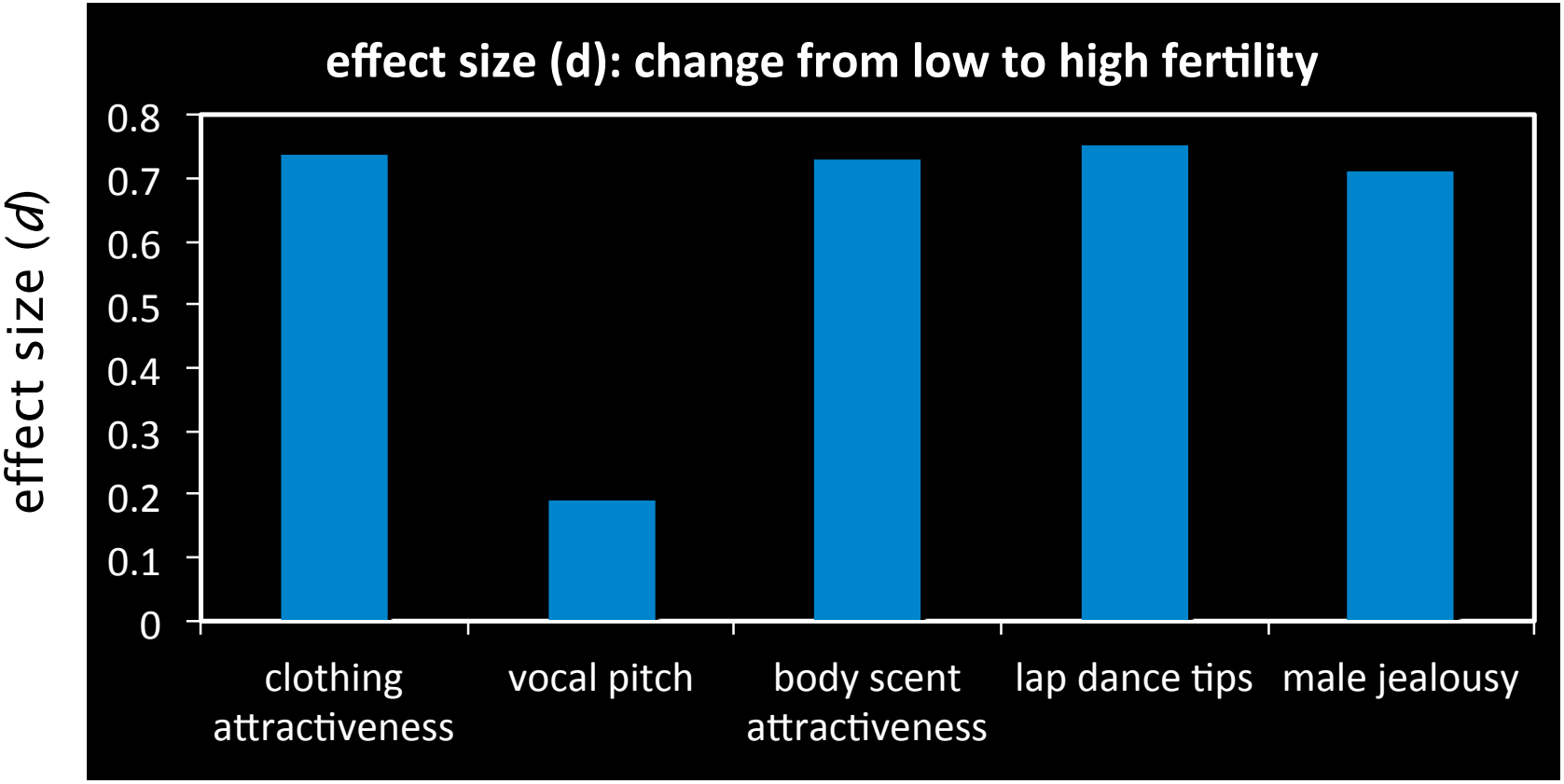

Subject B
Ovulation
High Fertility
Low Fertility
Fertility
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Day of the Cycle

F0 change is positively associated with proximity to ovulation in the high-fertility session



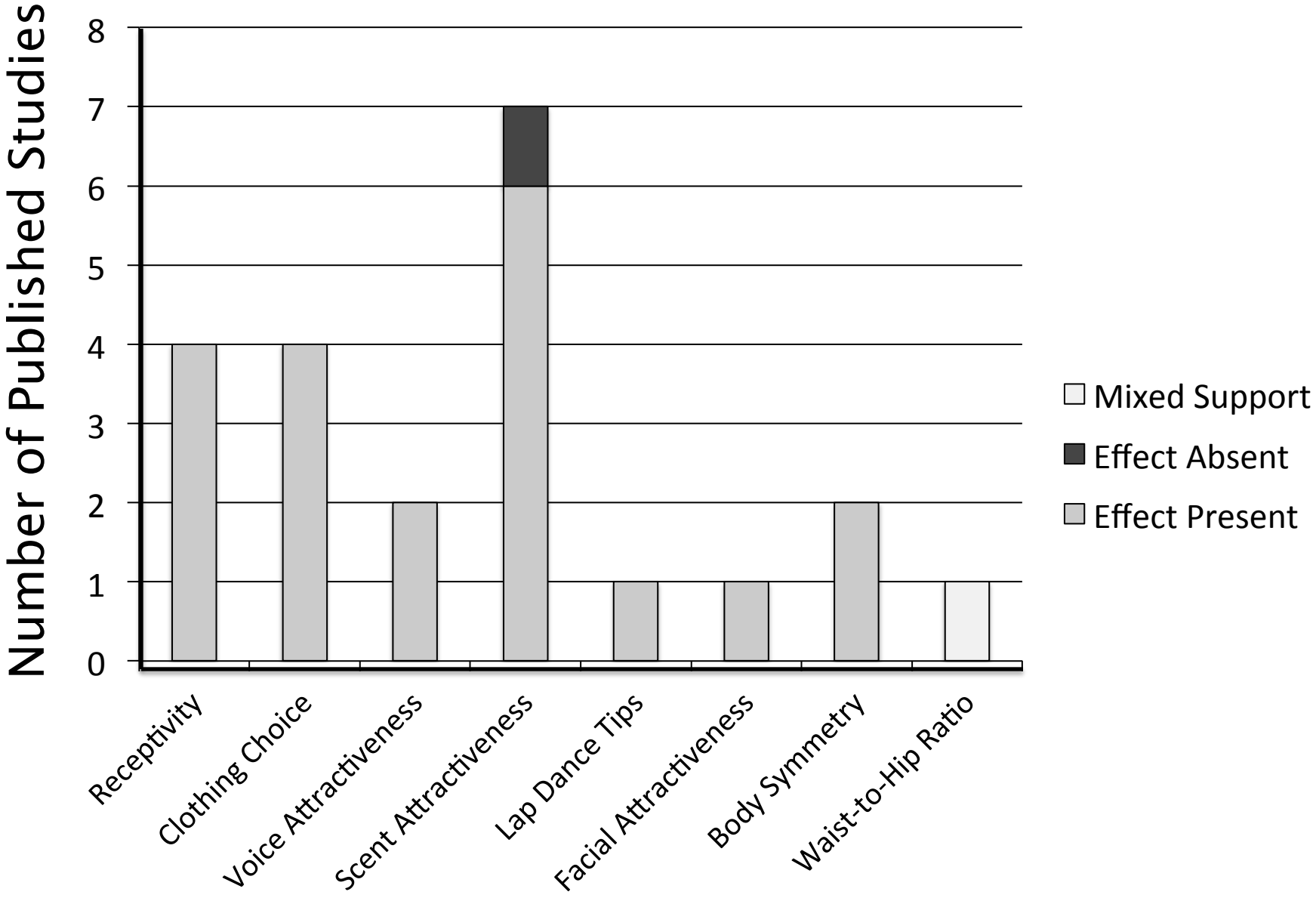
Analysis controls for proximity to menstrual onset and session order

Ovulation Cues: Representative Effect Sizes



Haselton & Gildersleeve (2011).
Current Directions in Psychological Science

Evidence for Ovulation Cues



Body Scent Cues of Ovulation

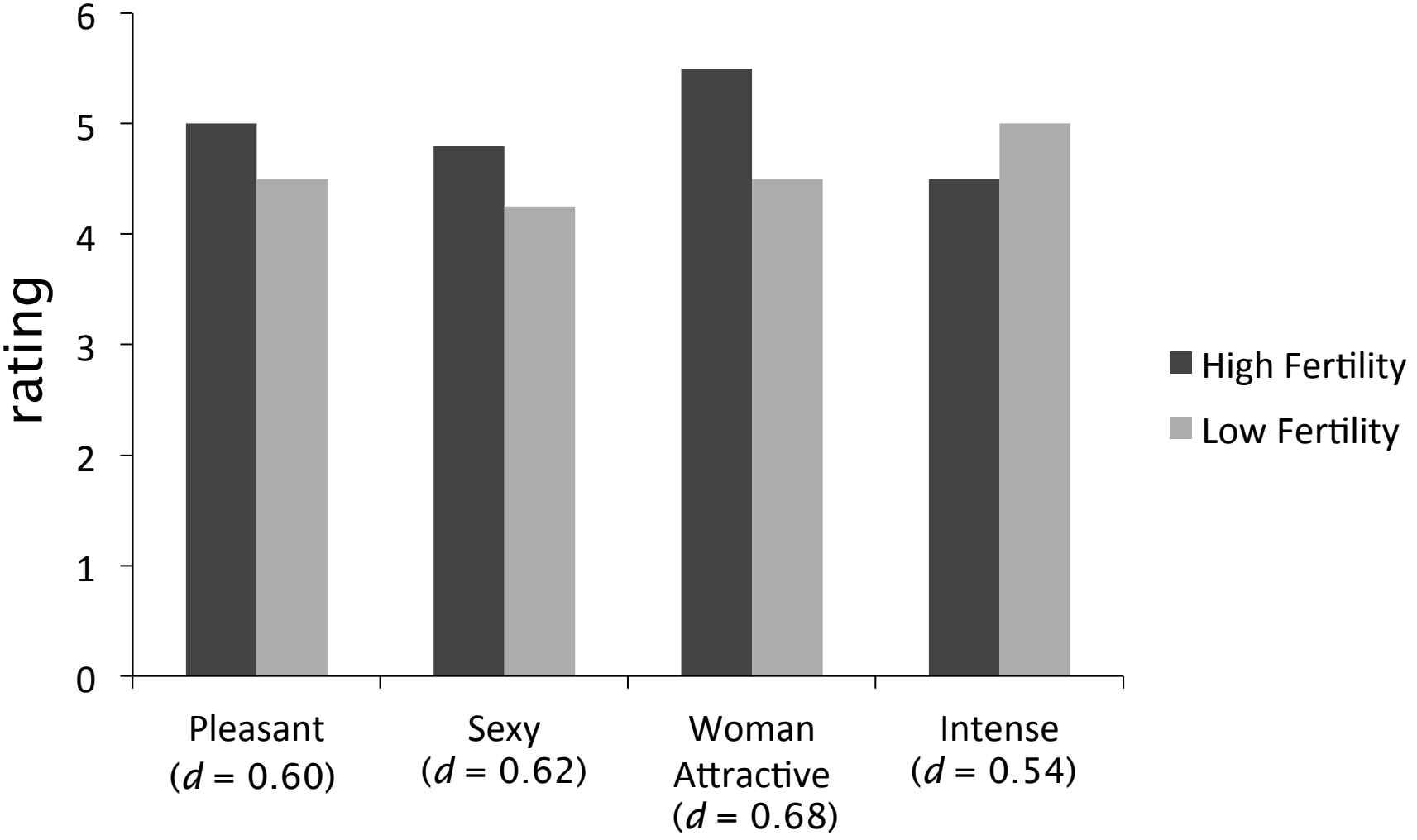
Scent Cues of Ovulation

(Gildersleeve, Haselton, Larson, & Pillsworth, 2011)

- Within-woman (N=41), hormone confirmation of ovulation
- Discrimination and preference measures

Results: Scale Ratings

Ratings received at high vs. low fertility:
Women discriminated at above chance



all high vs. low differences, $p < .05$

Men's Testosterone in Response High-Fertility Body Odor Samples

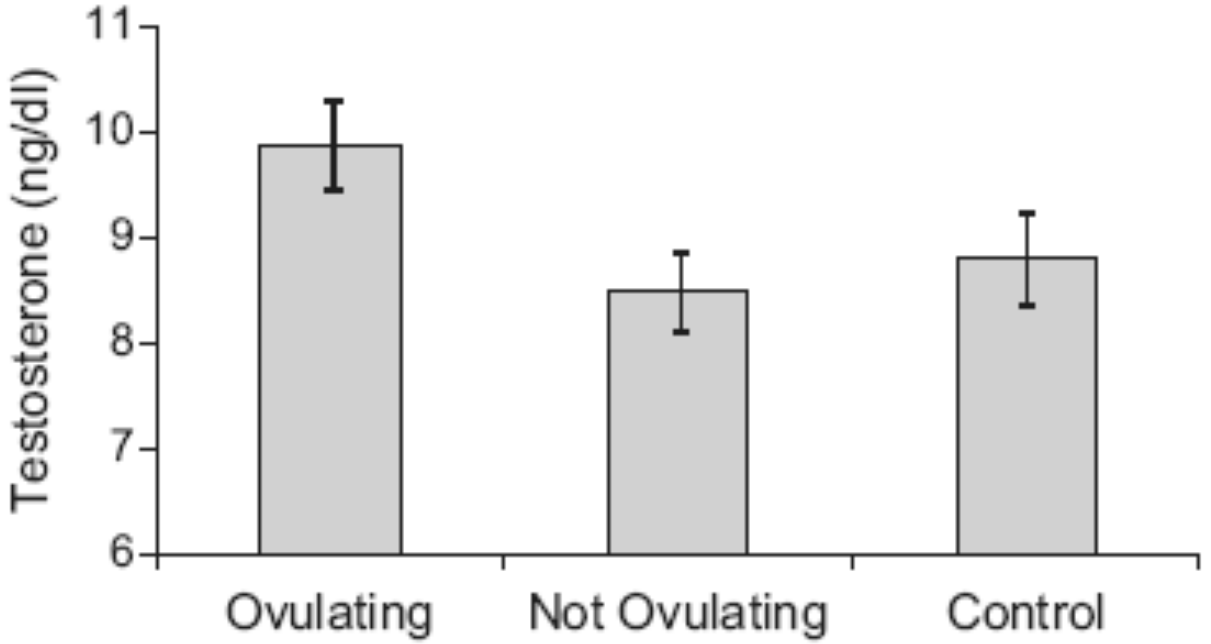


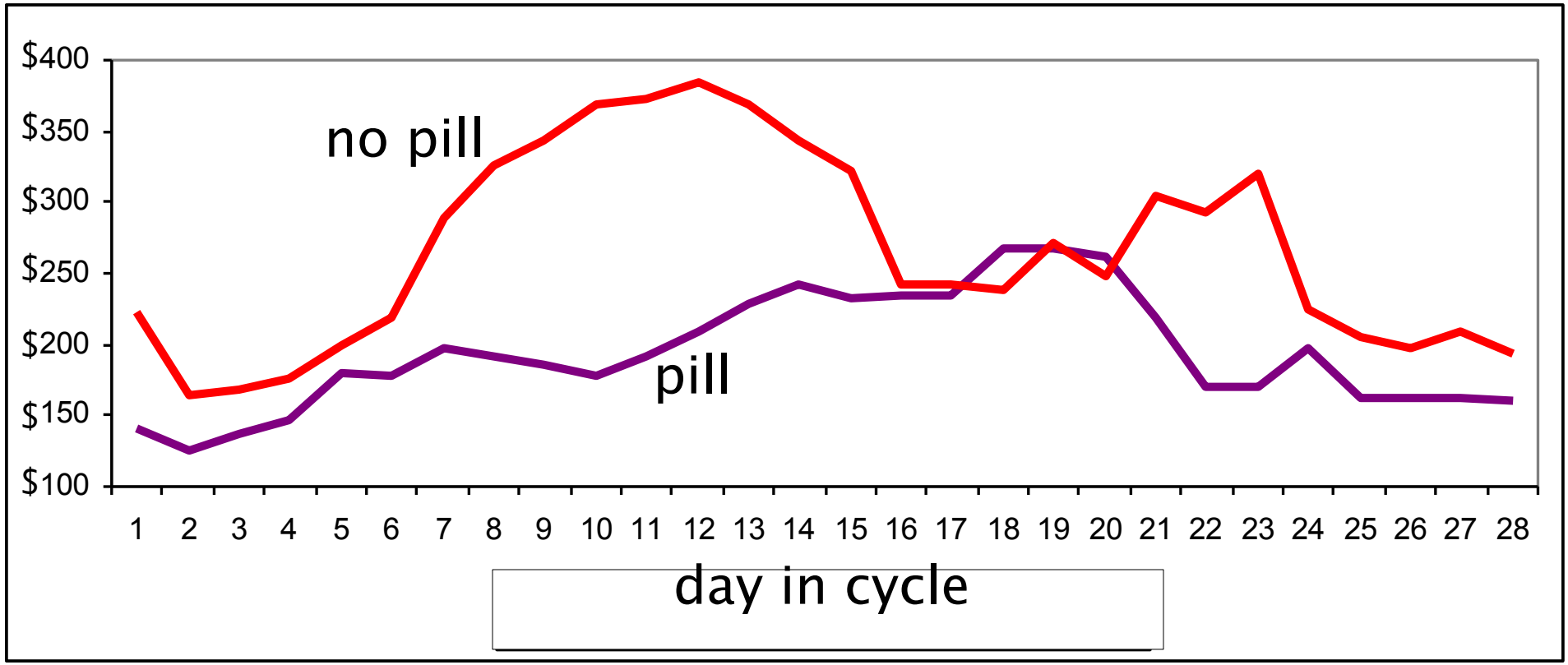
Fig. 1. Results from Study 2: postsmell testosterone levels (controlling for presmell testosterone levels) among men exposed to the odor of a woman close to ovulation, the odor of a woman far from ovulation, or a control odor. Error bars represent standard errors.

Miller & Maner (2009)

The “real” world

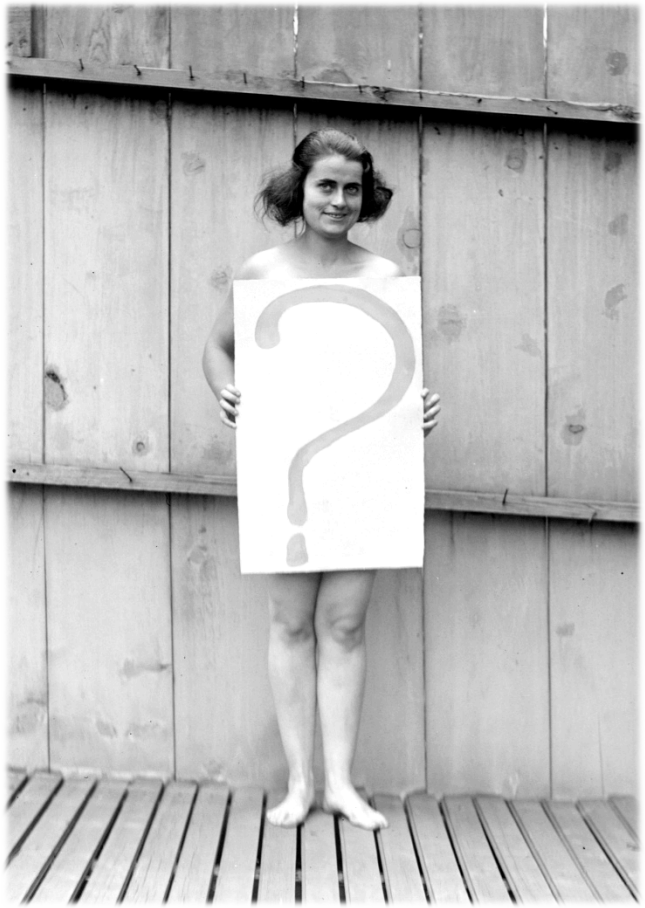
Tips Earnings by Lap Dancers Across the Cycle

(dollars per shift)



Miller et al. 2007,
Evolution and Human Behavior

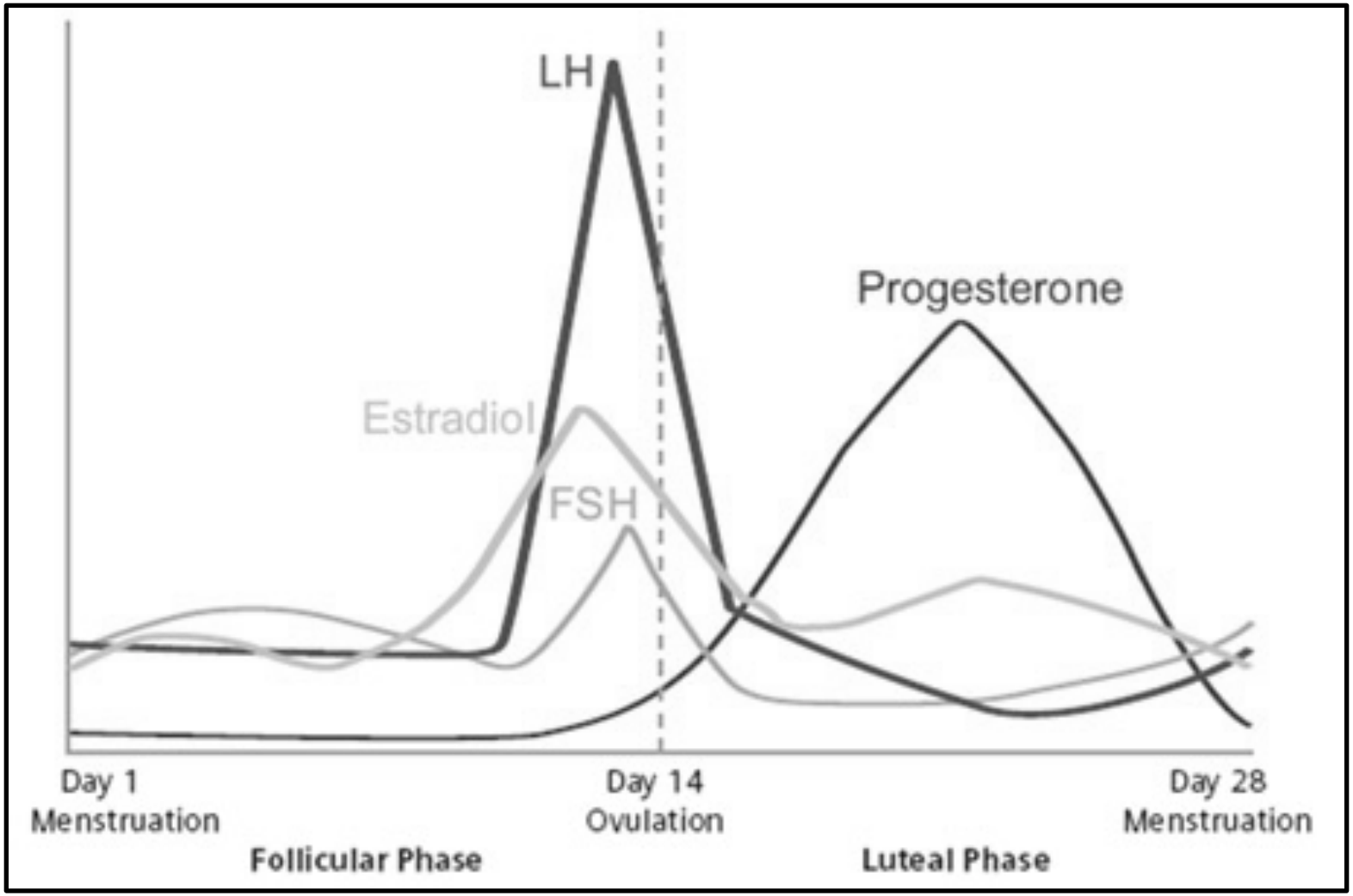
The “leaky cues” hypothesis



- Women are not signaling
- Detectable changes *leaky cues*
  - Advantage to women of shifting their behaviors, leading to detectable changes
  - A “hormonal stew” of changes; scent and appearance byproducts too costly to fully conceal
- Strong selection on men to detect subtle cues

Byproduct of Signaling General Fertility Hypothesis

- Females benefit from signaling overall mate value
- Possibly estrogen
  - baseline estrogen associated with general fertility
  - baseline estrogen associated with attractiveness

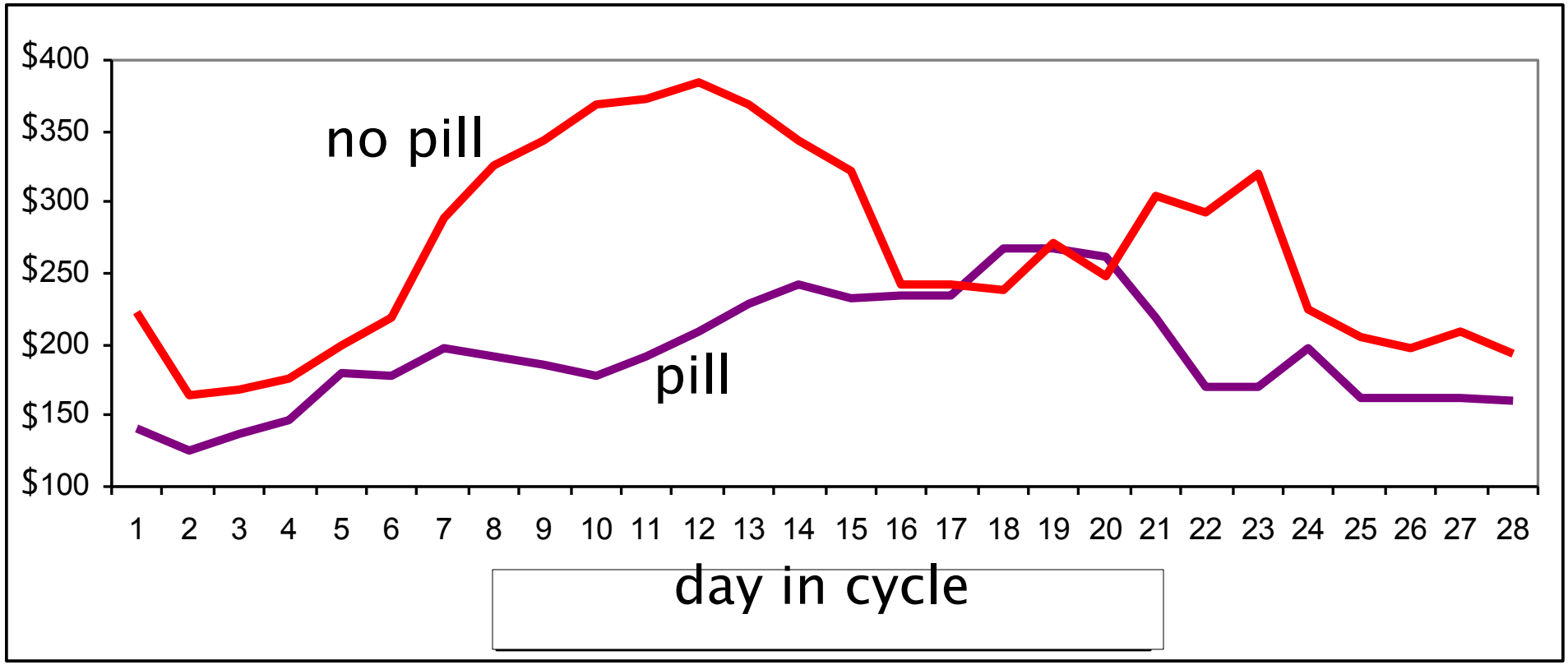

LH
Progesterone
Estradiol
FSH
Day 1
Menstruation
Day 14
Ovulation
Day 28
Menstruation
Follicular Phase
Luteal Phase

Byproduct of Signaling General Fertility

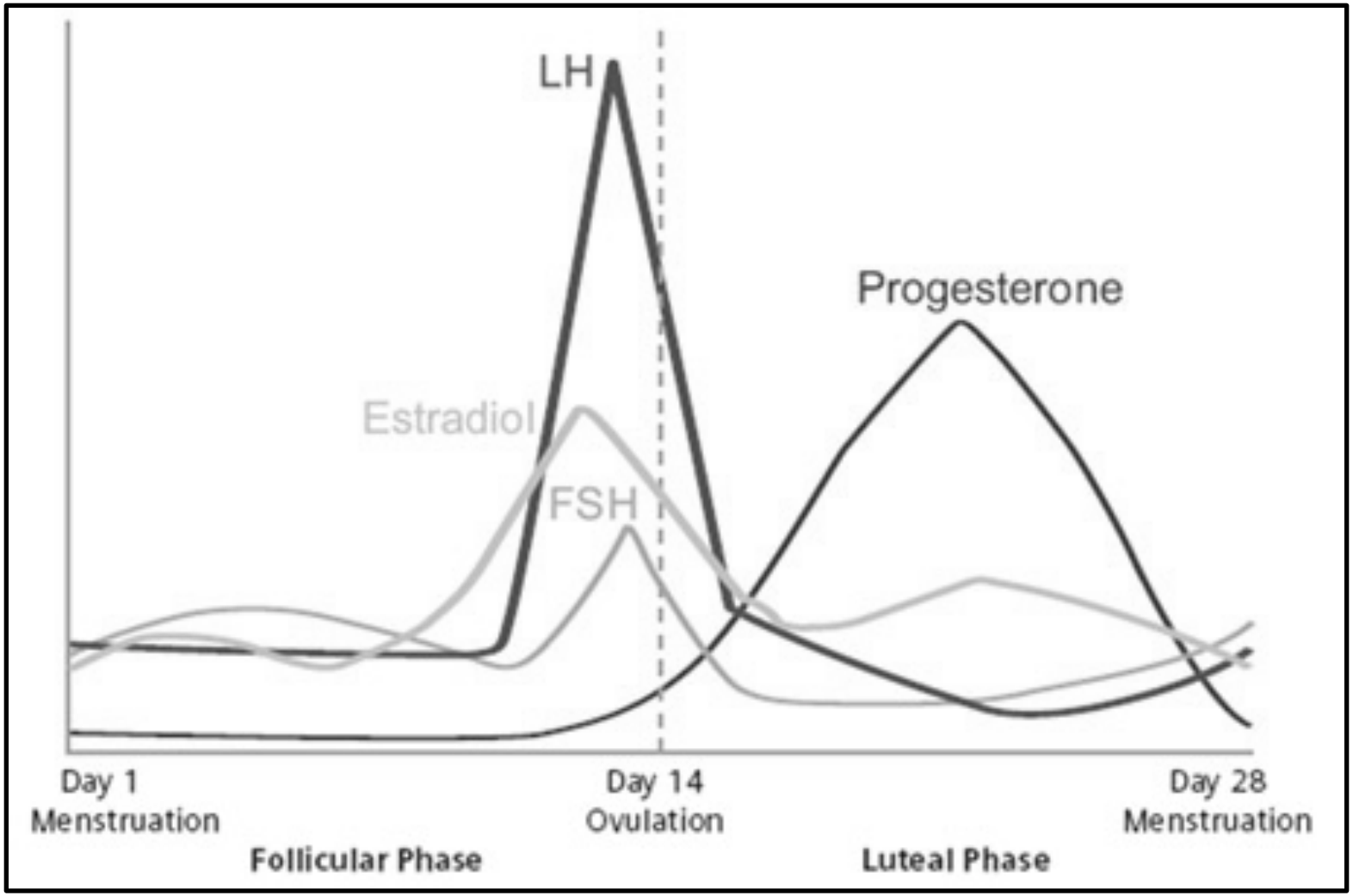
- Females benefit from signaling overall mate value
- Possibly estrogen
- As byproduct of estrogen cycling, there is cycling in attractiveness

Tips Earnings by Lap Dancers Across the Cycle

(dollars per shift)



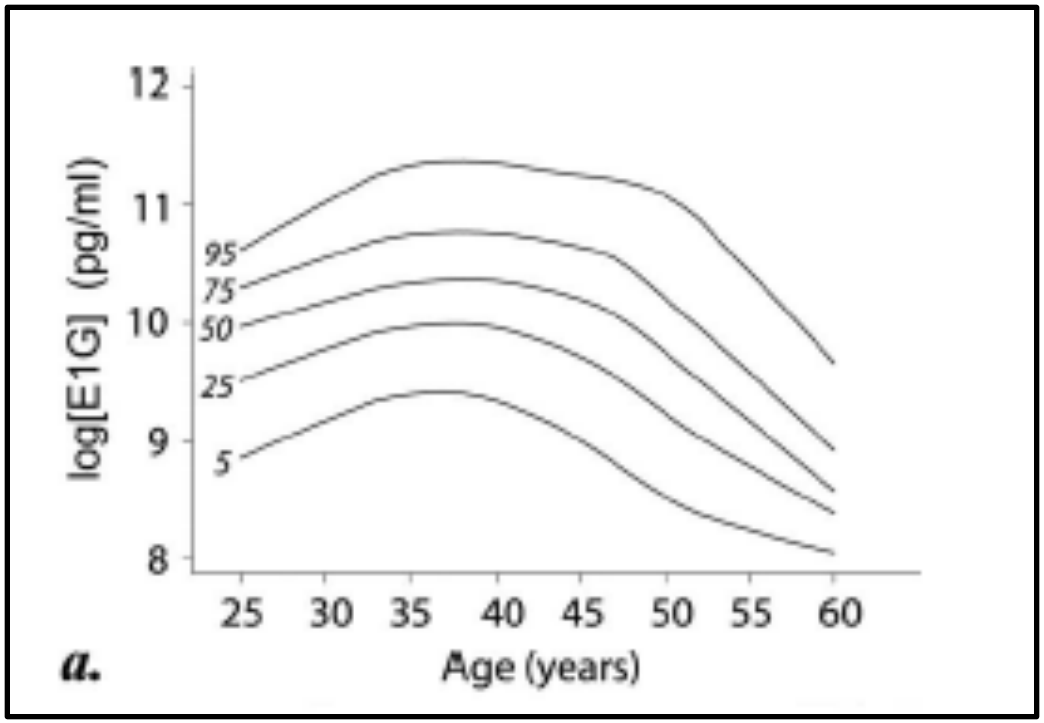
Miller et al. 2007,
Evolution and Human Behavior


LH
Progesterone
Estradiol
FSH
Day 1
Menstruation
Day 14
Ovulation
Day 28
Menstruation
Follicular Phase
Luteal Phase

Can Men Detect Ovulation?

- Probably romantic partners
- Probably not the guy on the street
  - much more between- vs. within-woman variation in estrogen (and attractiveness)
- Study in progress connects fertility cues to changes in partner testosterone

Ferrell et al. (1995)



Ferrell et al. (1995)

Summary

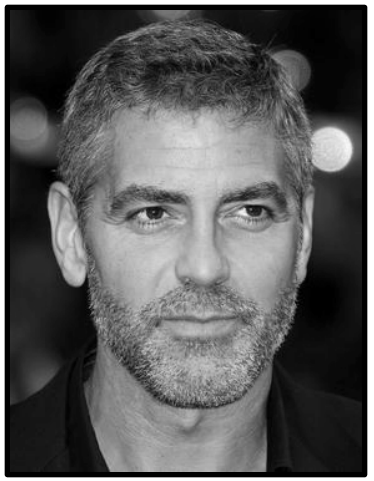
- Shifts in desires
- Shifts in attractiveness

Implications

- Trade-offs in somatic maintenance and reproduction
- Cyclic modulation of estrogen, testosterone

Estrogen

Testosterone



Implications

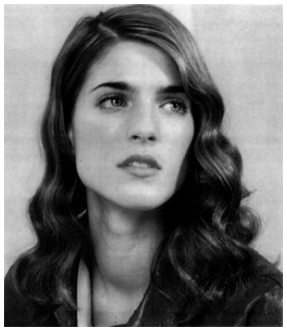
- Trade-offs in somatic maintenance and reproduction
- Cyclic modulation of estrogen, testosterone
- Variation also mediated socially due to reproductive opportunity presented by
  - High T partners
  - High E partners
- Variation in reproductive hormones, variation in cancer risk

The End

Interest in Infants

Haselton, Pillsworth, & Silk, in progress

- N = 100 women
- 20 randomized trials
- Choice between infant and adult
- Which do you prefer?
- Question: Does variation in hormones across cycle levels predict preference for infants?

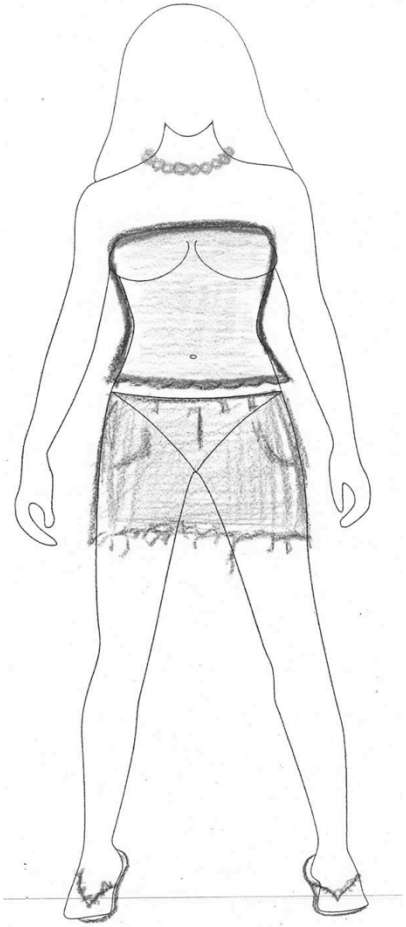

Preference for Infants Higher when Prolactin is High within the Menstrual Cycle

	All Infants ($\alpha = .76$) z (p)
Estrogen	-1.97 (.048)
Progesterone	1.04 (.299)
Testosterone	0.96 (.335)
E/P ratio	1.70 (.088)
Prolactin	2.25 (.024)
Session	2.06 (.040)

What Explains Ovulation Cues

- Behavioral Effects: Mating Motivation

High-Fertility



Durante et al. (2011)
Retail Website Study

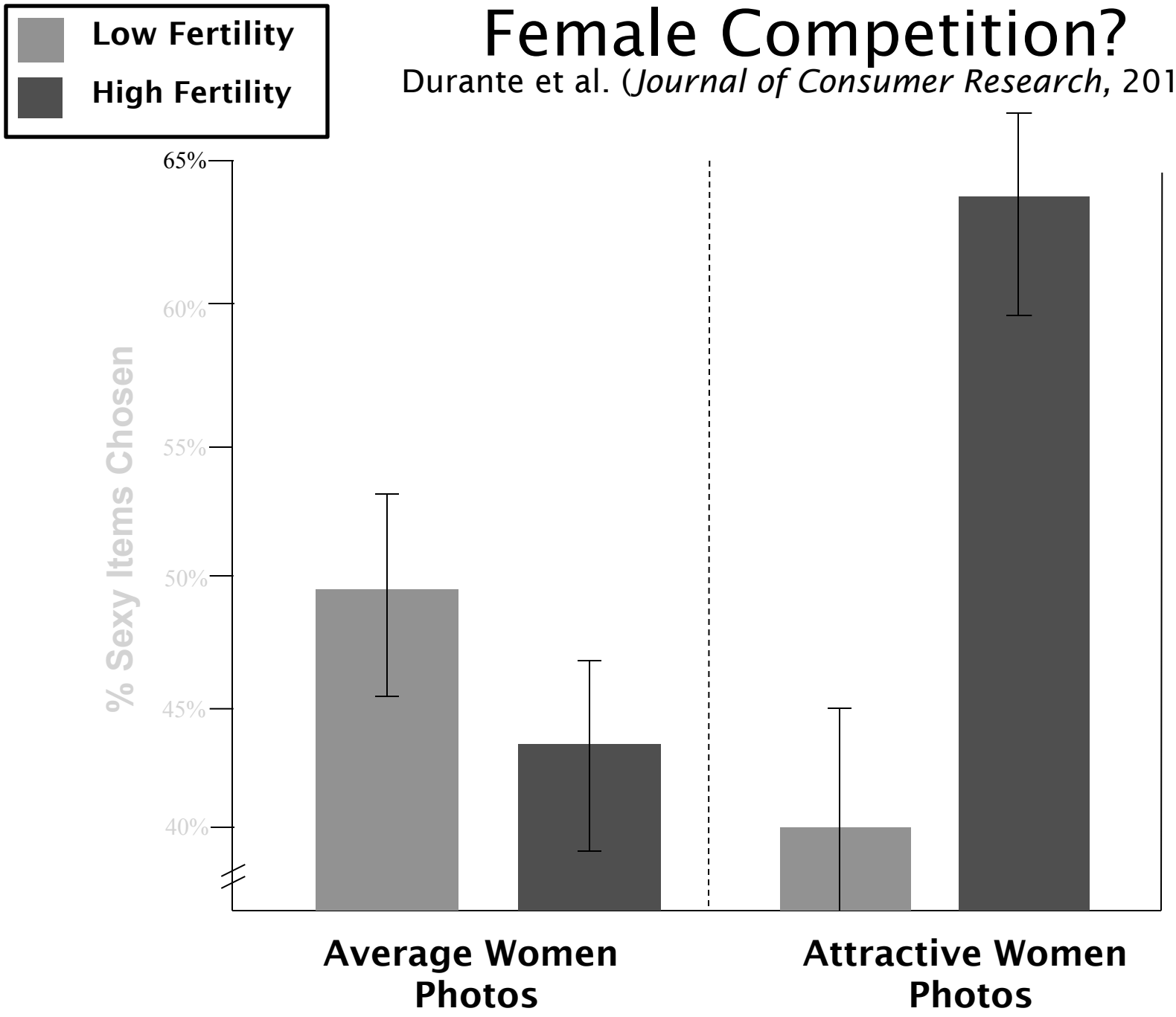






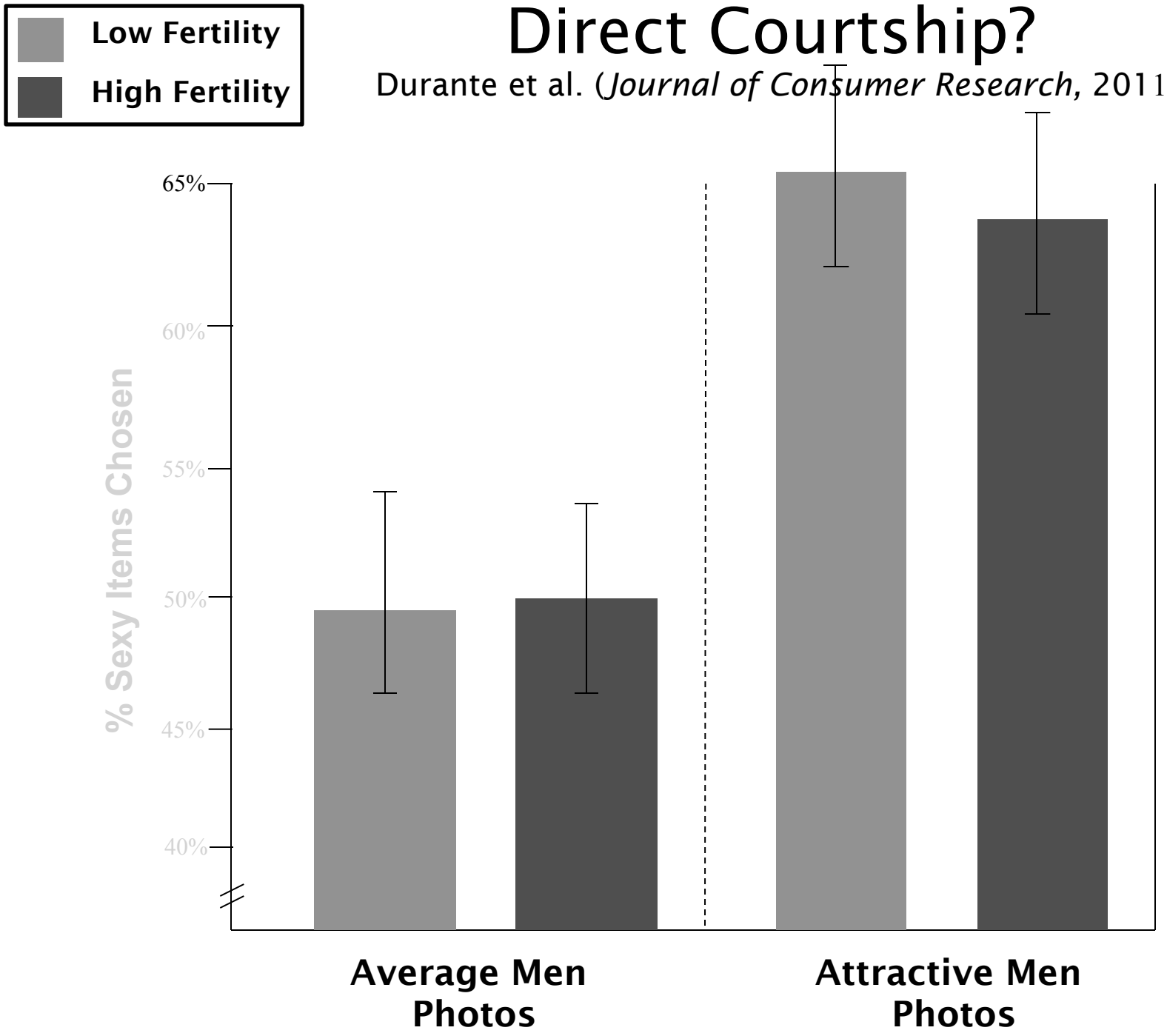

Female Competition?

Durante et al. (*Journal of Consumer Research*, 2011)



Direct Courtship?

Durante et al. (*Journal of Consumer Research*, 2011)



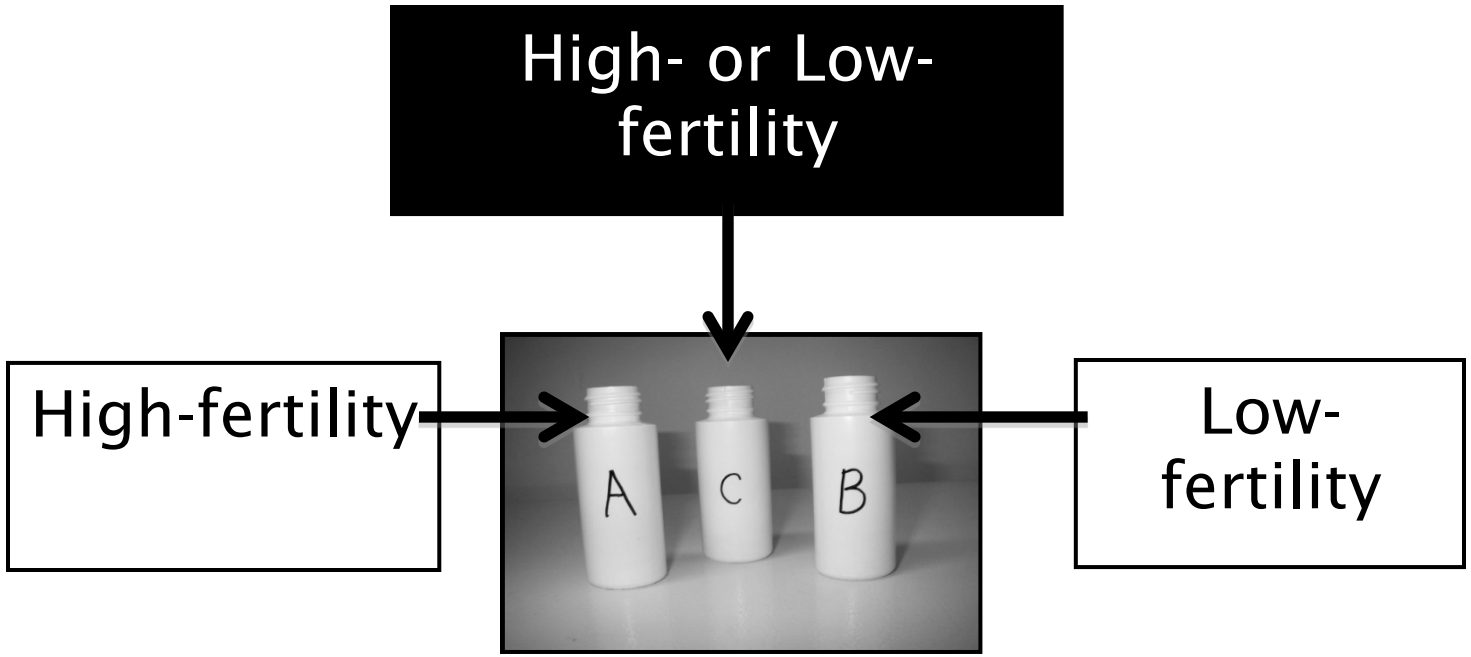
Conclusion:
Choosing sexier clothing due to *same-sex competition* with attractive female rivals.

What Explains Ovulation Cues

- Behavioral Effects: Mating Motivation
- Other Attractiveness Effects: ??

Scent Cues of Ovulation

(Gildersleeve, Haselton, Larson, & Pillsworth, 2011)



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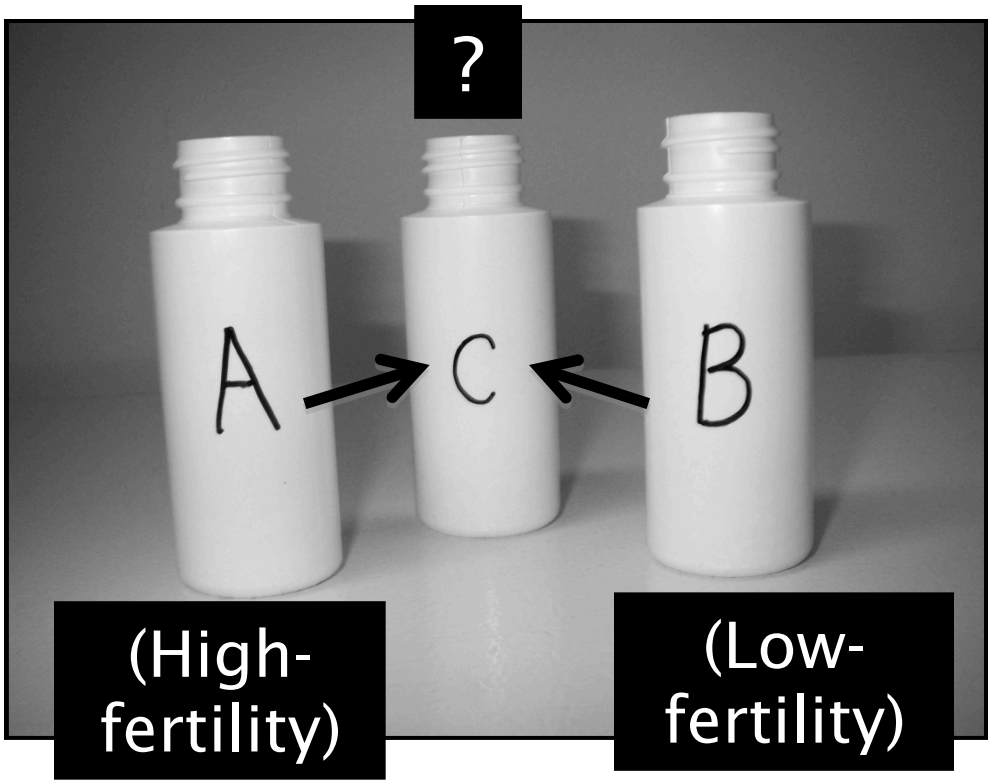

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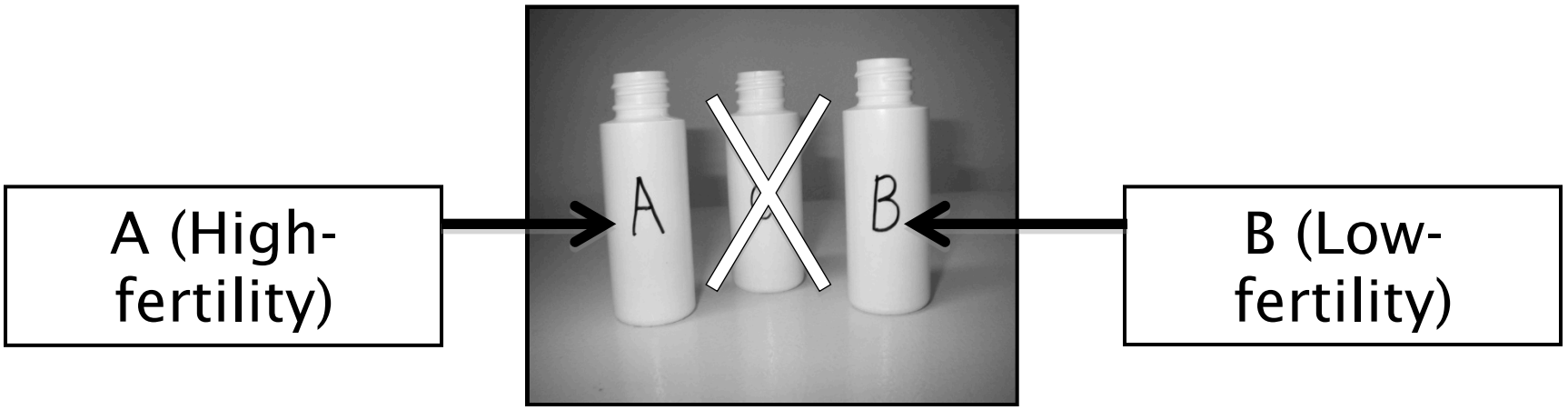
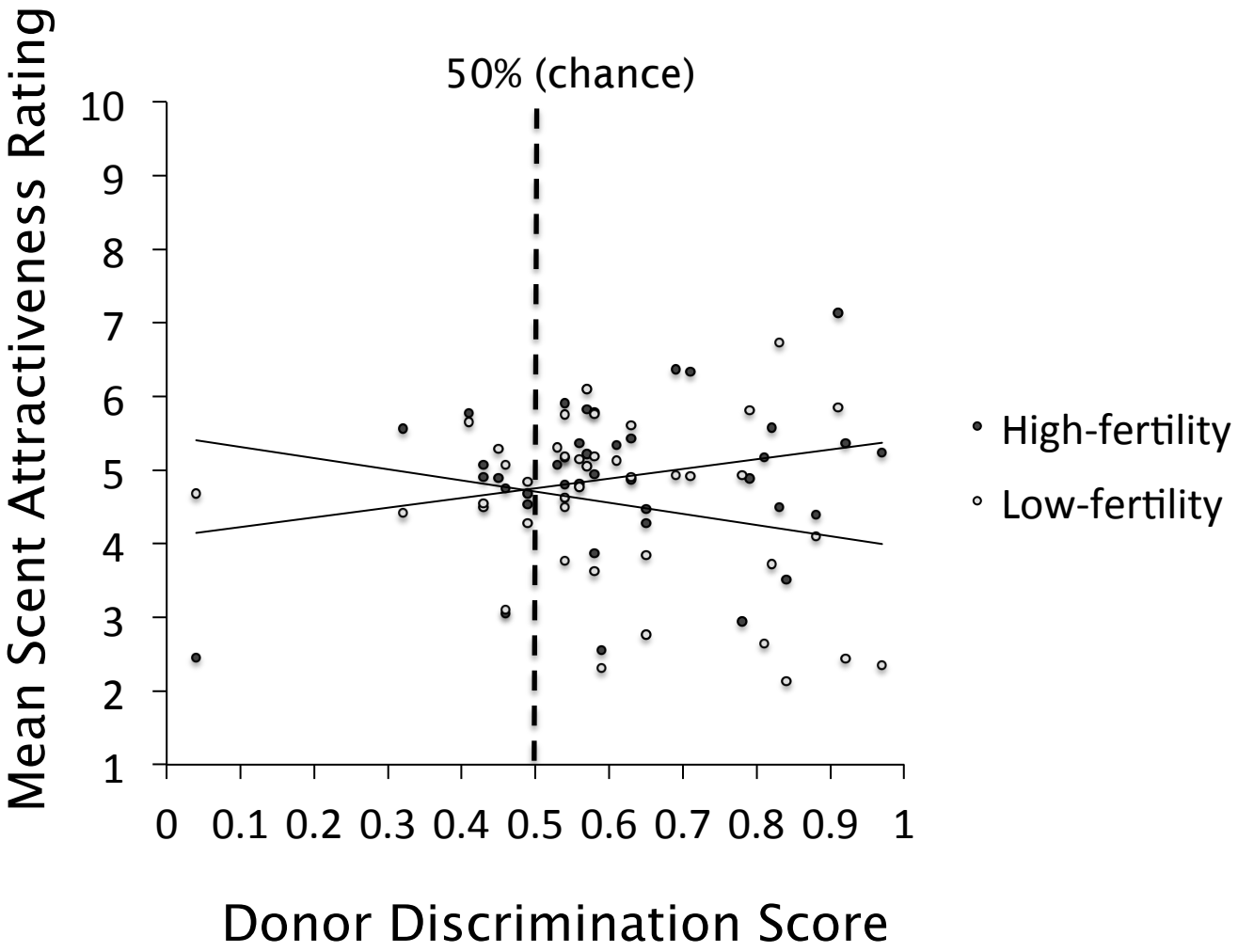
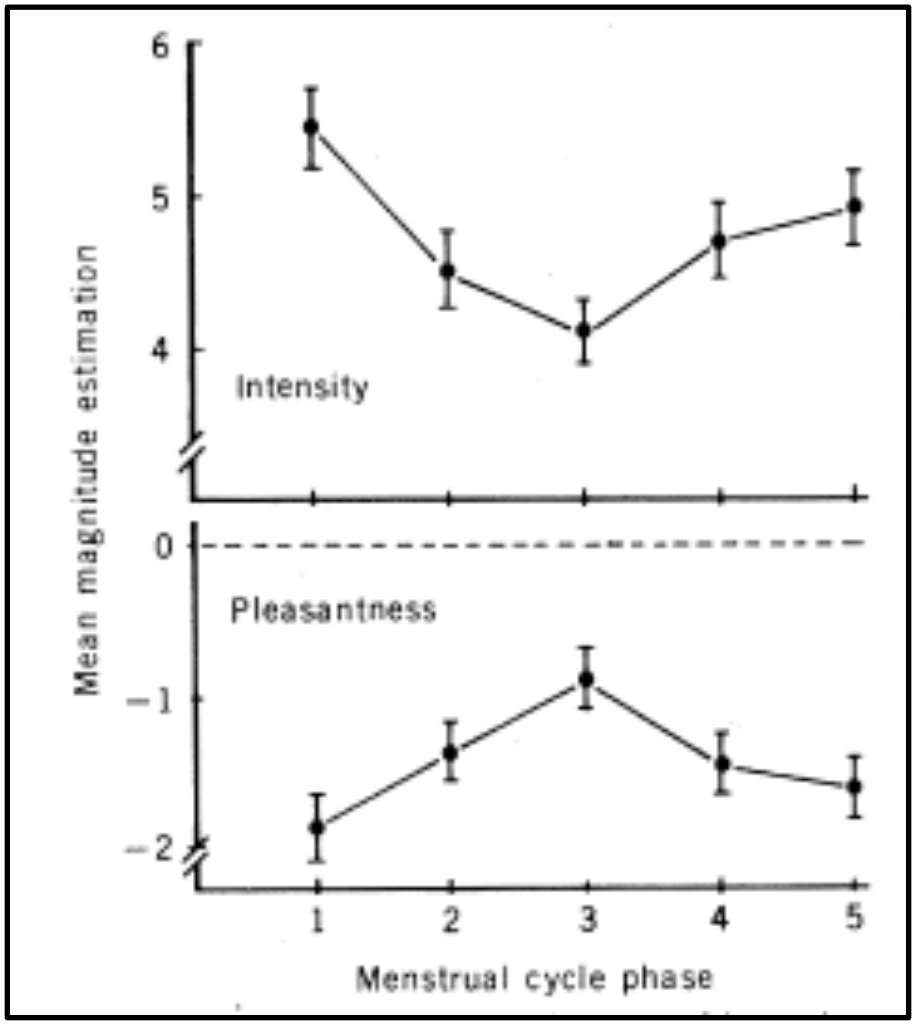


Scent Attractiveness at High vs. Low Fertility as a function of Donor Discrimination Score



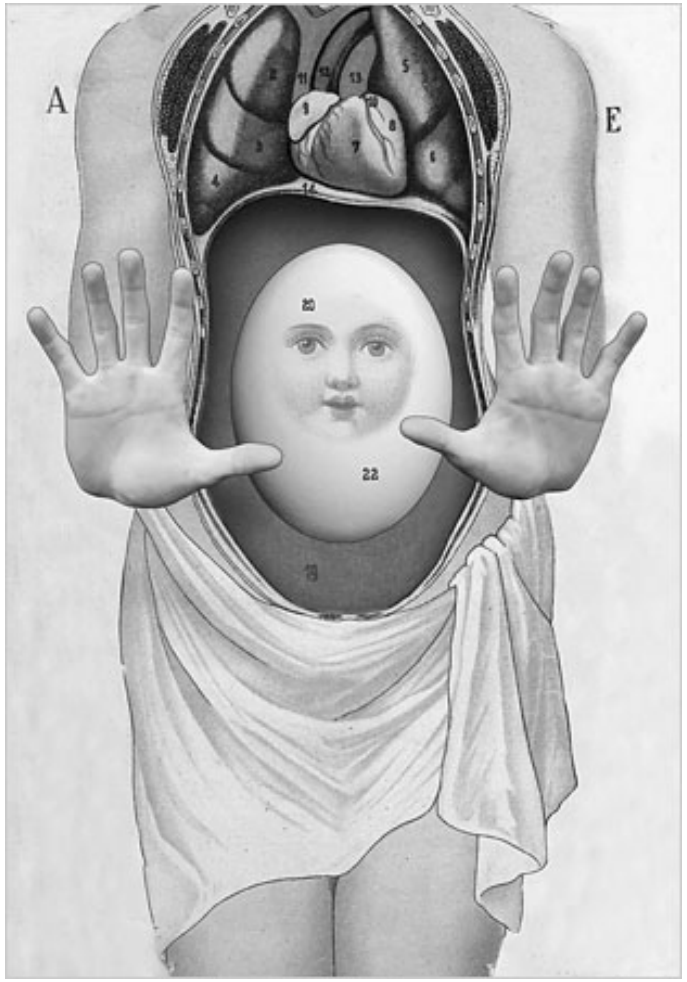
Ratings of Vaginal Odors

Doty et al. (1975). *Science.*



Concealed Ovulation

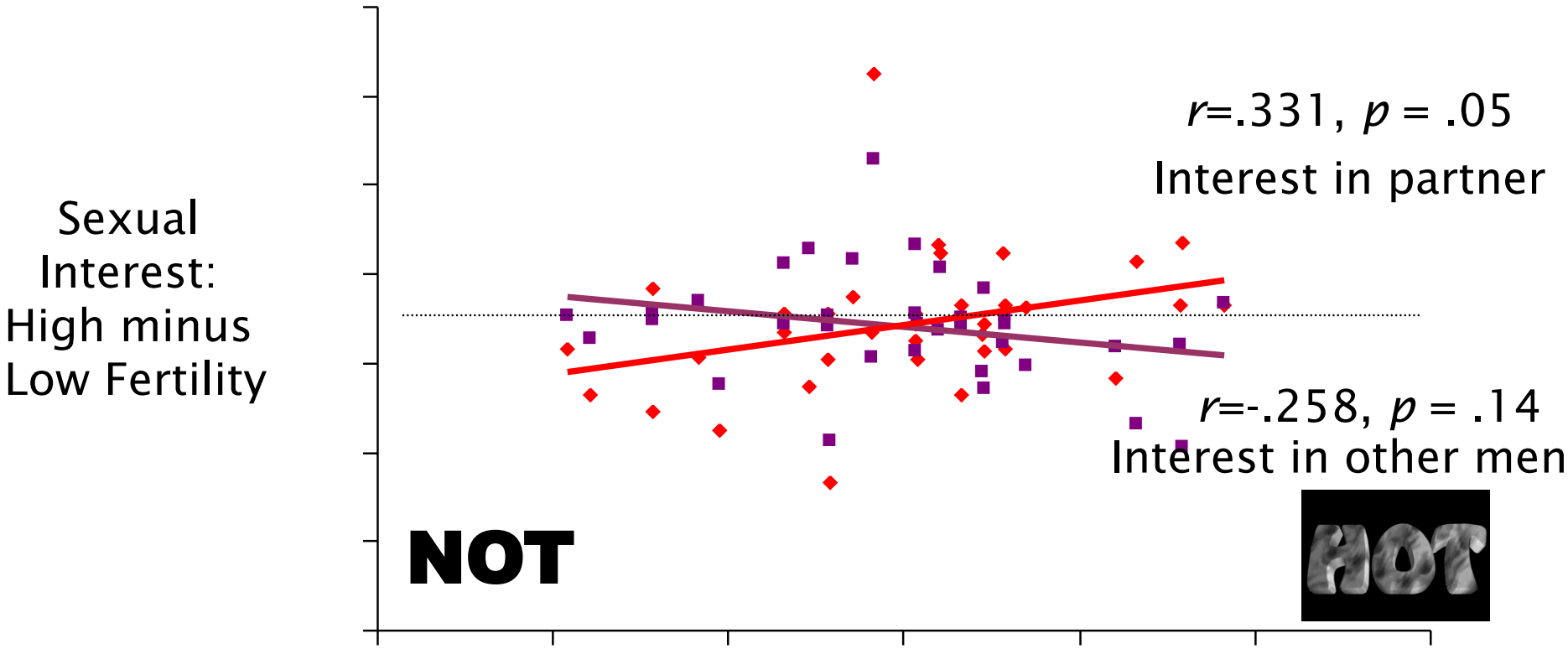
- Extends male investment throughout cycle
- Confuses paternity
- Enables female choice
- Prevents women from avoiding conception



Refs, e.g.: Benshoof & Thornhill, 1979; Burley, 1979; Gray & Wolfe, 1983; Hrdy, 1979; Powlowski, 1999; Symons, 1979

Interest in Own Partner Greater and Other Men Lower near Ovulation when Partner Objective Attractiveness High

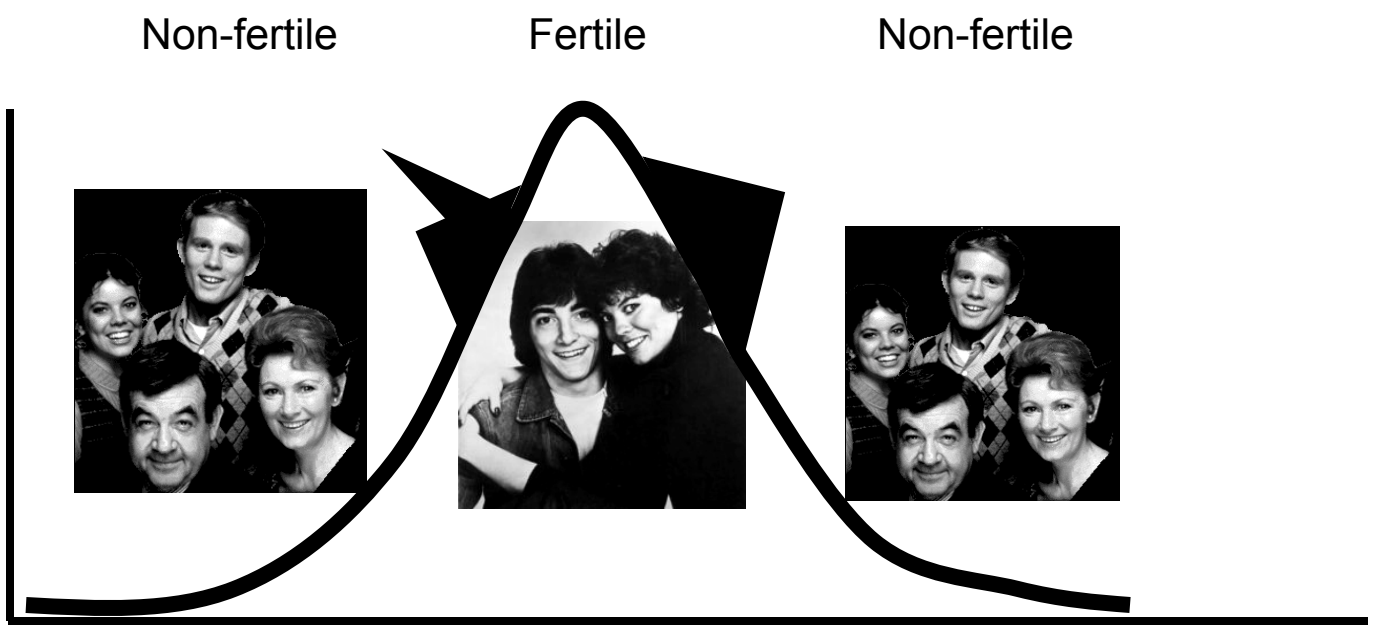
(Haselton, Larson, & Pillsworth, in progress)



Primary Partner: Rated Body Attractiveness

Fertility X Partner X Body Attractiveness : F=12.259 p=.001

Patterns of association across the menstrual cycle

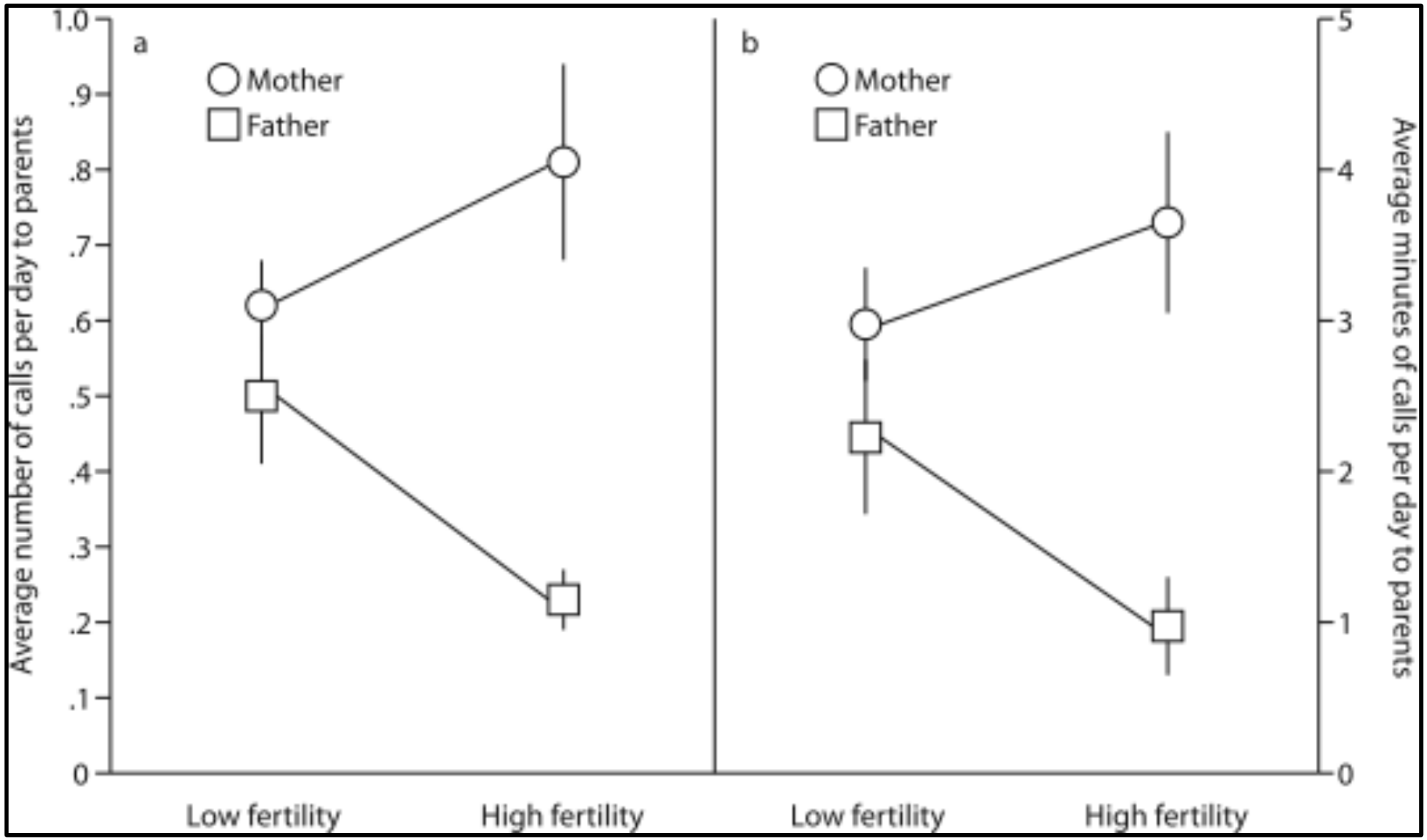


Cell Phone Study

Lieberman, Pillsworth, & Haselton (2010) *Psych Science*

- Changes in affiliation across the ovulatory cycle (kin affiliation)
- Cell phone records provide objective measures

Lieberman, Pillsworth, & Haselton, 2010, *Psychological Science*



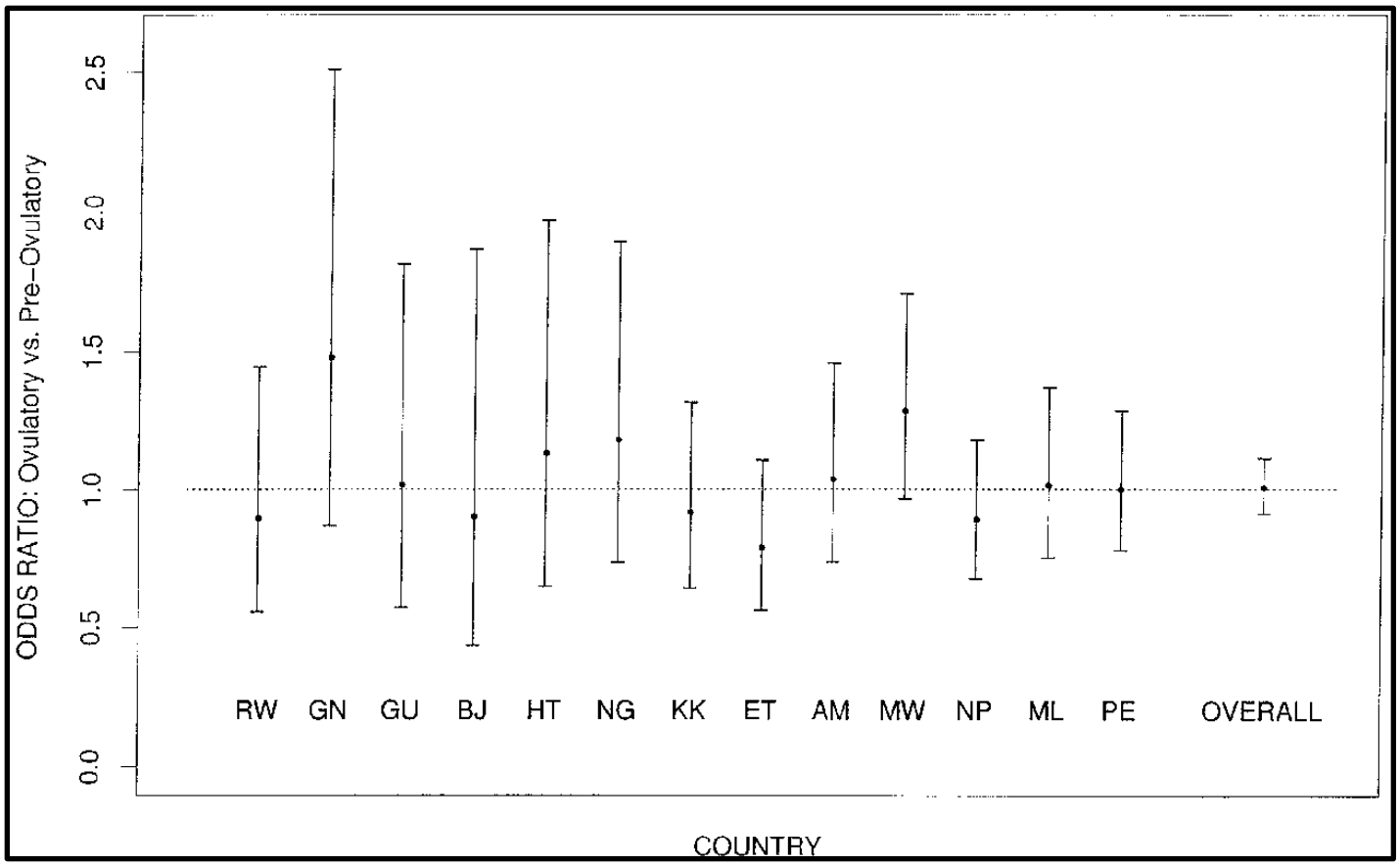
Rates of Copulation in Large Samples

- Brewis & Meyer, 2005
- Analysis of DHS (Demographic and Health Surveys data, examining developing countries)
- Inclusion criteria:

  women (*a*) who were married, (*b*) whose spouse was currently in residence, (*c*) who were not pregnant, (*d*) who had menstruated within the preceding six weeks, (*e*) who reported having had sex within the previous 12 months and were not currently practicing postpartum or permanent abstinence, (*f*) who were not using either the rhythm method or a chemical contraceptive method (pill, injectable, Norplant), and (*g*) who were between the ages of 18 and 40 years.
- Sample sizes per country between n = 770 and n = 3202
- Cross-sectional design based on last reported menstrual onset

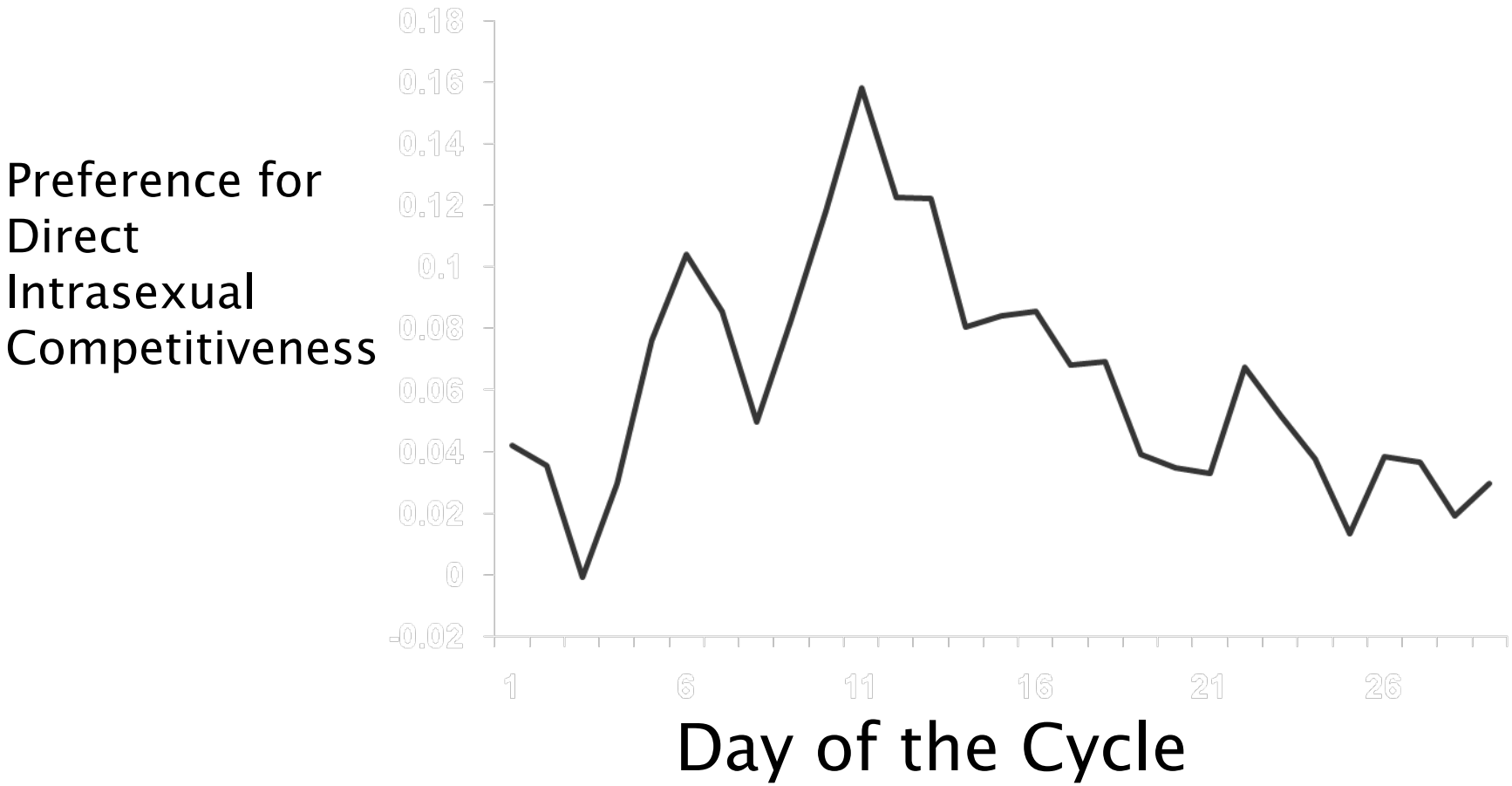
"Ovulation is undetectable (at least in human pair-bonds)"

--Brewis & Meyer



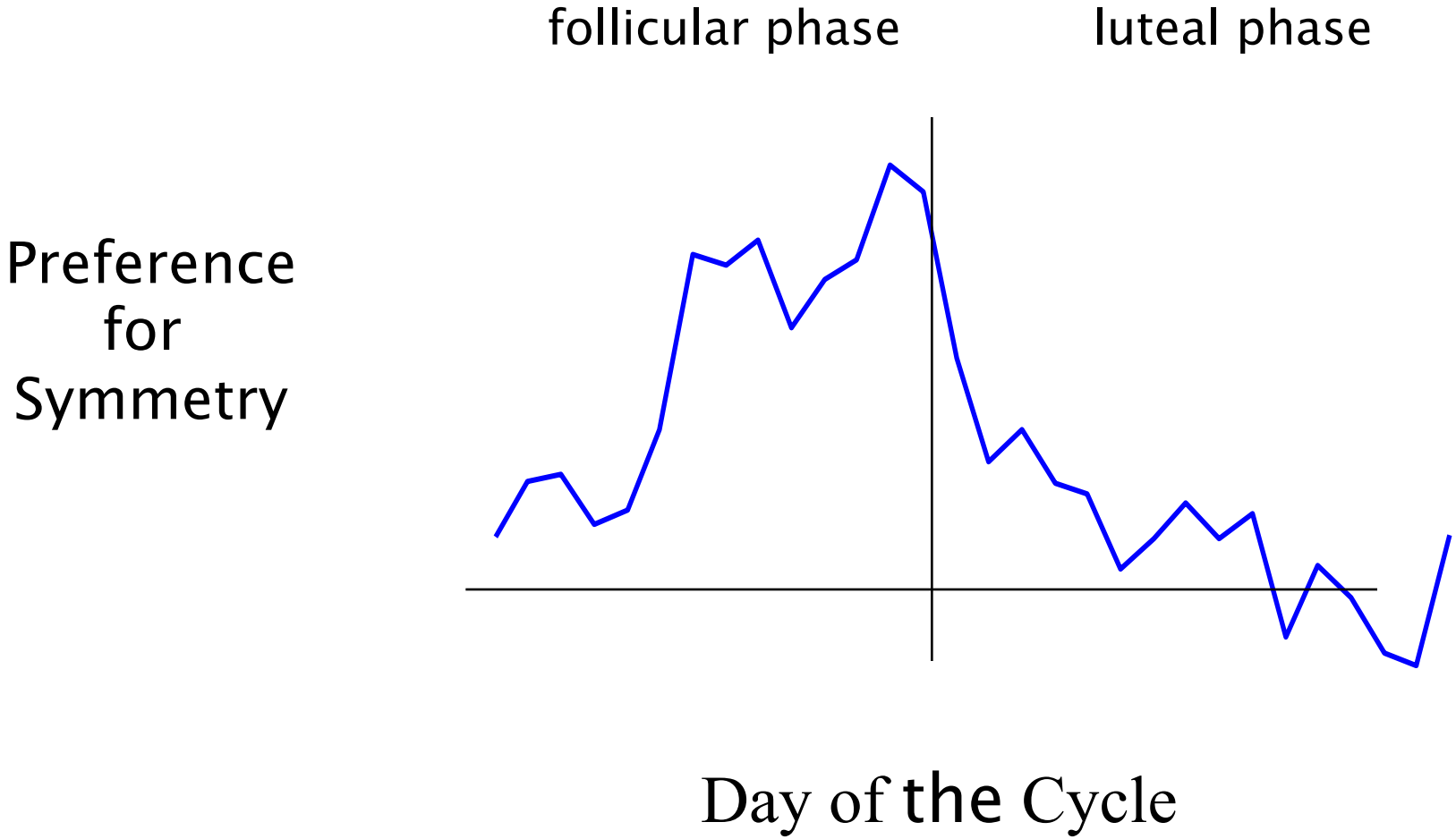
Rates of copulation in married couples. Brewis & Meyer (2005) Analysis of DHS Data (Total *N* = 20,304).

Women's preferences for men's behavioral displays as a function of day of the cycle



From Gangestad et al., (2004). *Psychological Science.*

Women's preference for the scent of symmetry as a function of day in cycle

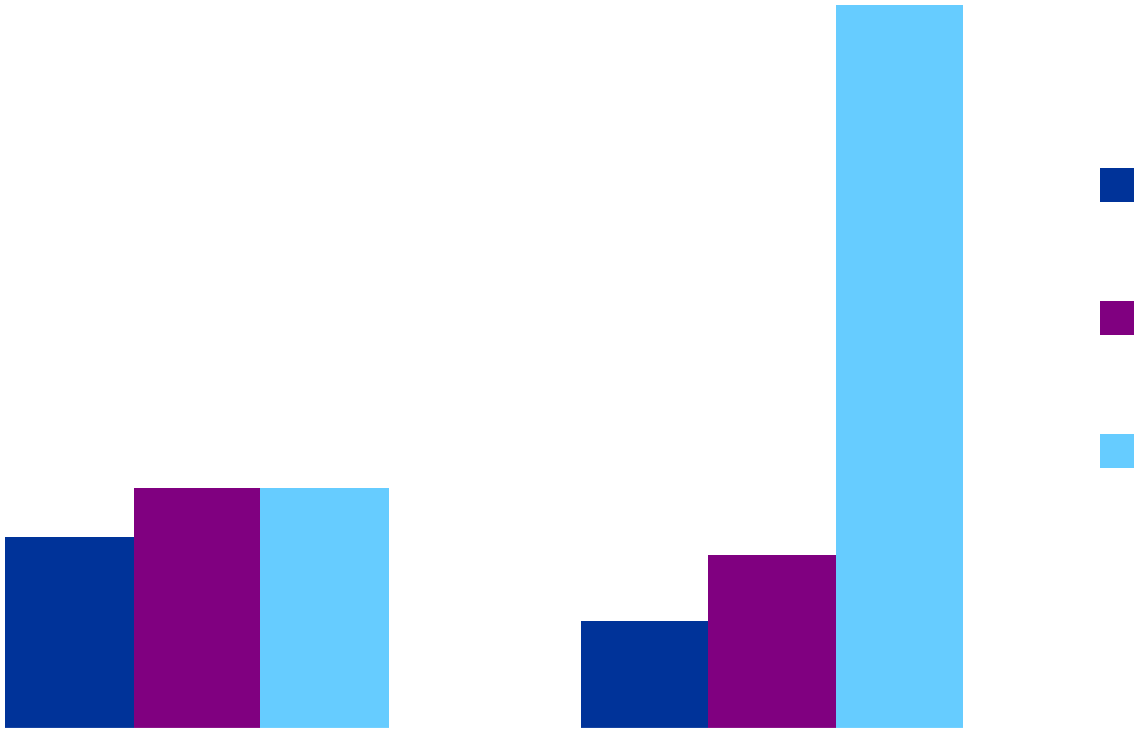


Notes: Total *N* = 141 women.

Evidence of Selection for Joint Parental Care: Increase in Maternal Caloric Needs

Dufour & Sauther (2002)

Evidence of Selection for Joint Parental Care



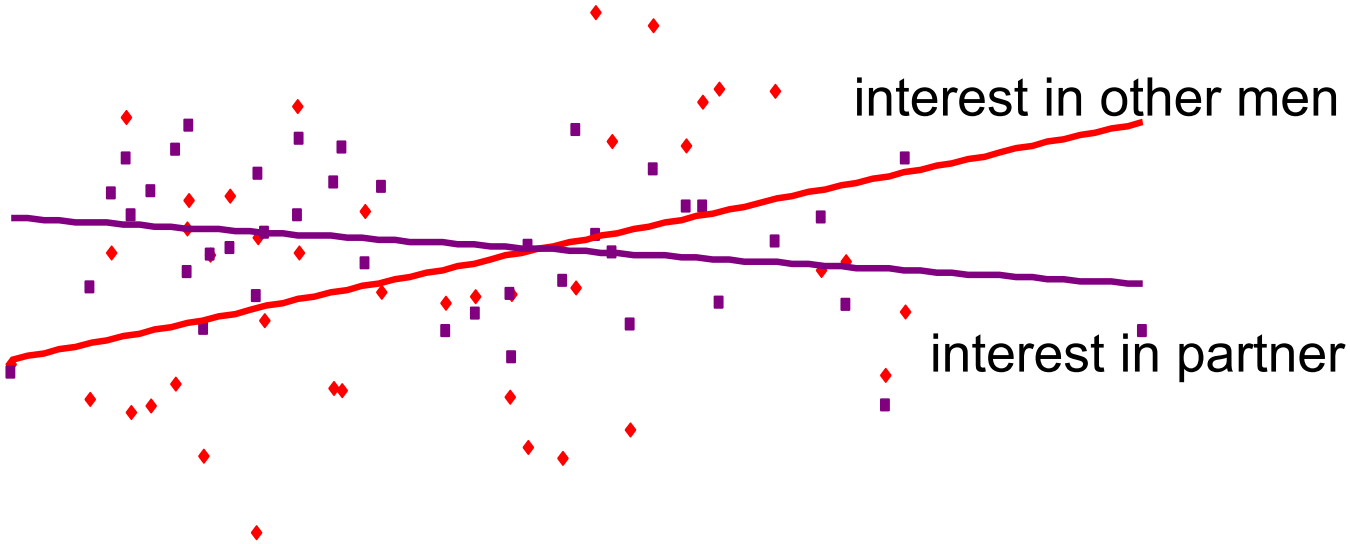
Lancaster et al. (2000); Hill & Hurtado (1996)

Women's attraction to primary partners and extra-pair men during fertile phase

other men: r = .40, p = .007

own partner: r = -.22, *ns*

Sexual Attraction and Fantasy



MHC matches (proportion)

Interaction $F(1,36) = 11.10$, $p = .002$.
(Age and rel. length controlled.) From Garver-Apgar et al. (2006)

Does "The Pill" Affect Mate Choice?

Trait	Non-pill users	Pill users	Sample size
Symmetry	Increased preferences for scents of symmetrical men at mid-cycle	No preference for either symmetrical or asymmetrical men's scent	17 NPU-35 PU
	Increased preferences for scents of symmetrical men at mid-cycle	No preference for either symmetrical or asymmetrical men's scent	16 NPU-66 PU
Masculinity	Increased preferences for facial and vocal masculinity at mid-cycle	Weaker change across the cycle	307 NPU-112 PU
	Increased preferences for facial masculinity when paired or when seeking short- term relationship	No change according to the relationship status	214 NPU-102 PU
MHC scents	Preferences for MHC-dissimilar men	Preferences for MHC-similar men	31 NPU-18 PU
	Preferences for MHC-dissimilar men	Preferences for MHC-similar men	32 NPU-26 PU
	No preferences for either MHC-similar or dissimilar men during fertile phase	Increased preference for MHC-similar men	60 NPU-40 PU
Voice	Attractiveness ratings by men are increased for women at mid-cycle	No variation in attractiveness ratings by men	17 NPU-21 PU
General	Attractiveness ratings by men are increased for women at mid-cycle	No variation in attractiveness ratings by men	11 NPU-7 PU
Body scent	Attractiveness ratings by men are increased for women at mid-cycle	No variation in attractiveness ratings by men	42 NPU-39 PU

Mate Preferences

Effects on Attractiveness

Why Study This?

- Physical attractiveness judgments
- Relationship dynamics
- Conflict between the sexes
- Coevolution of sexual strategies
  - e.g., do women conceal and men coevolved to detect any available cue?
- Evolution of sexual signaling in humans

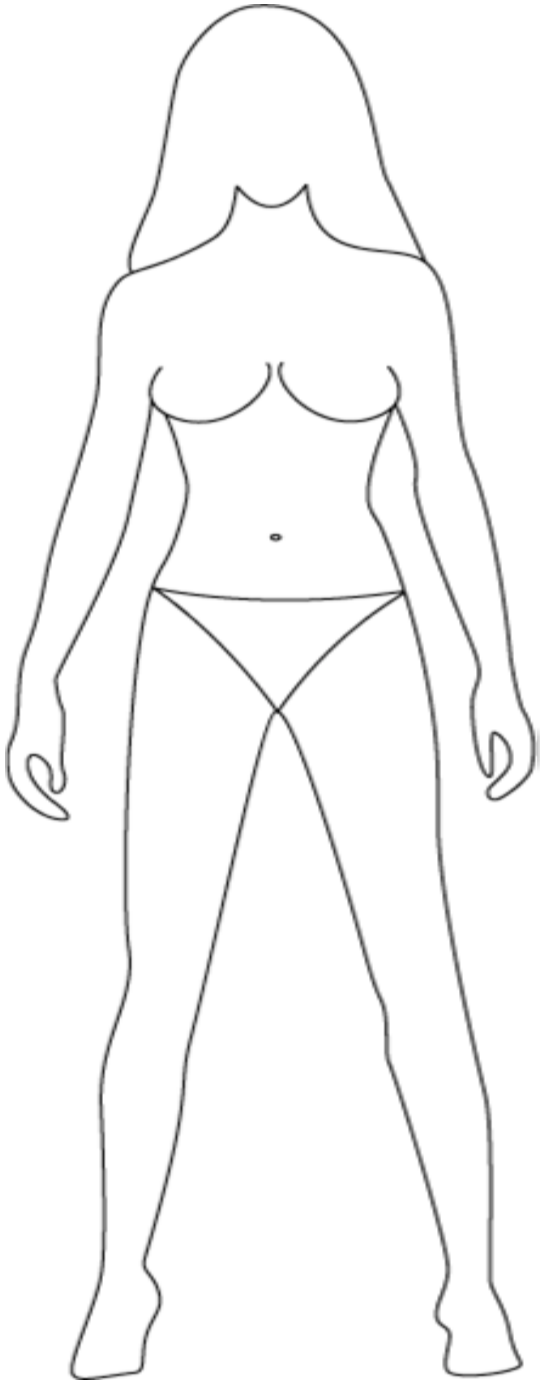
Women Dress to Impress

- A readily-observed cue of ovulation that male partners (and others) could attend to

- Not explicitly sexy – *but what if women were going out for the evening rather than going to the lab…*

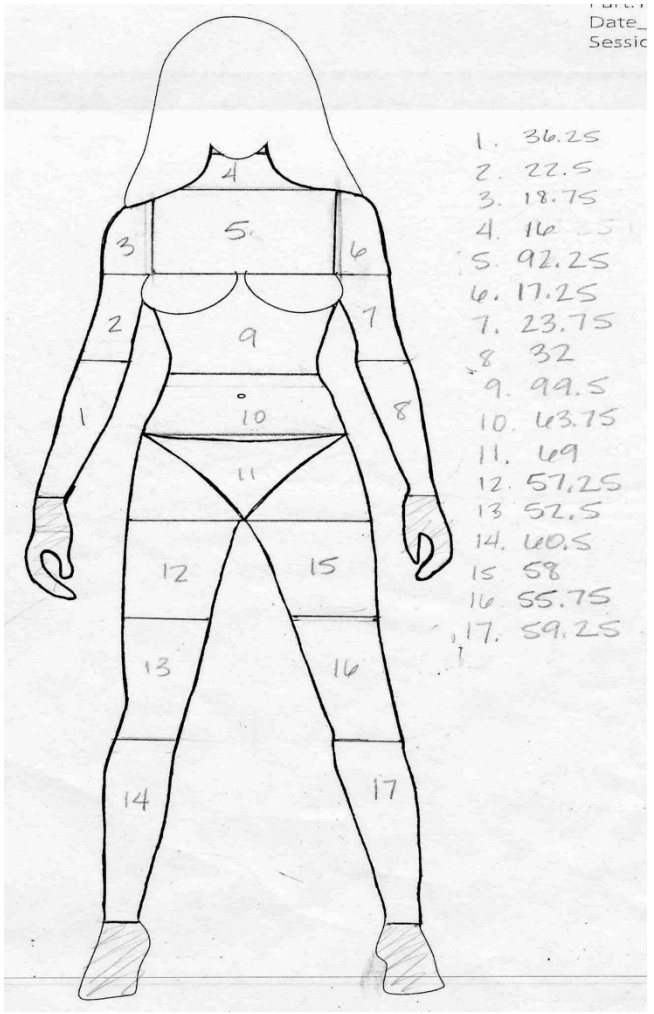
Durante, Li, & Haselton (2008)

Imagine you are attending a big party at a friend's house this evening.

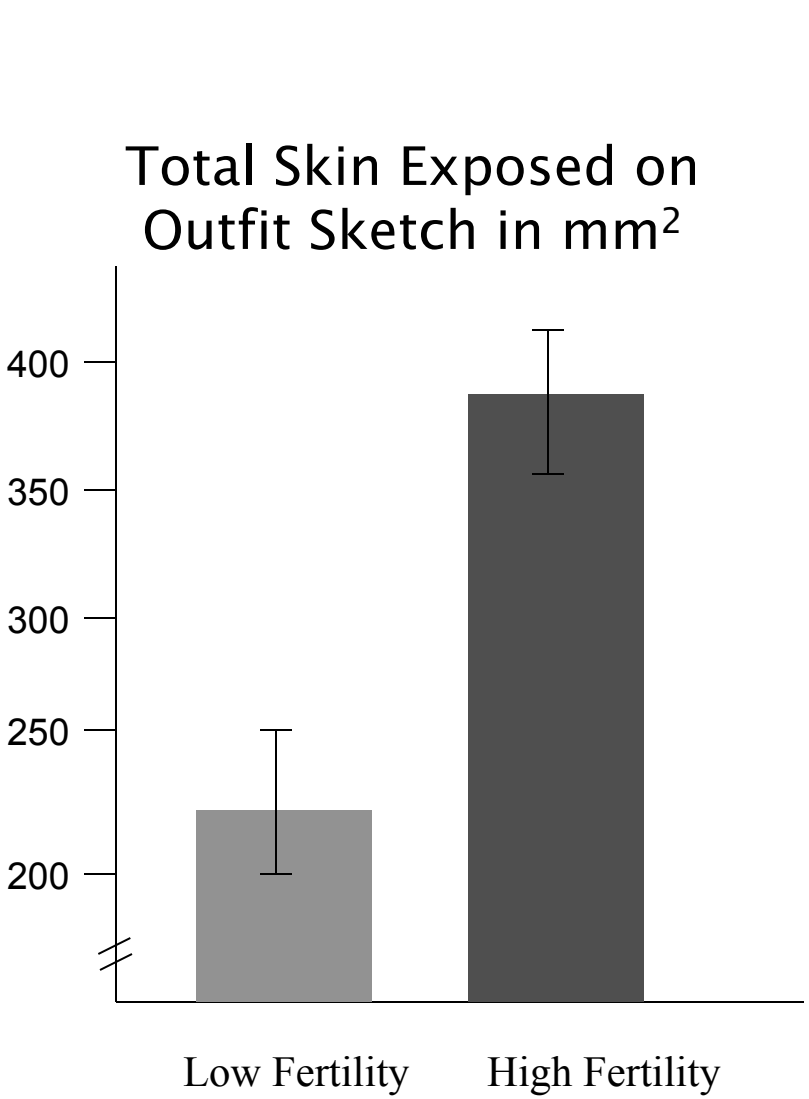


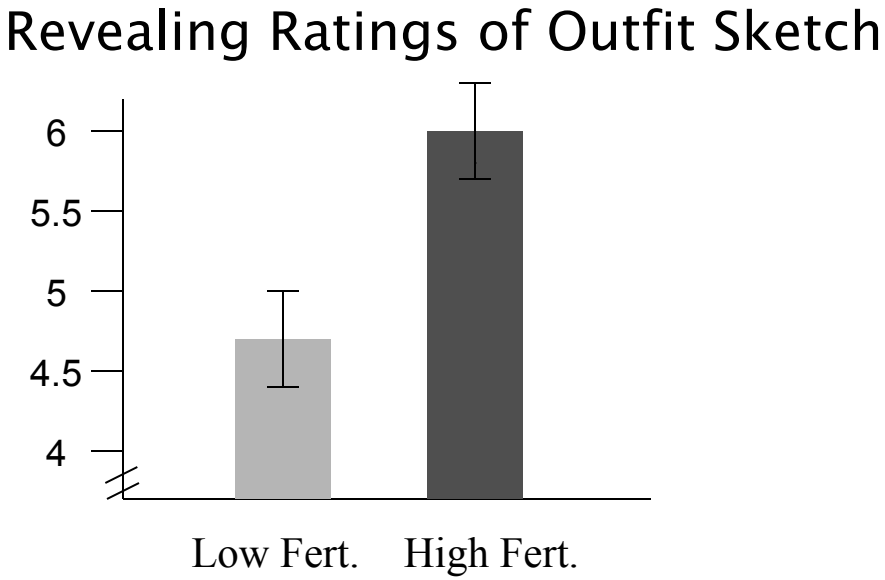
Three Measures

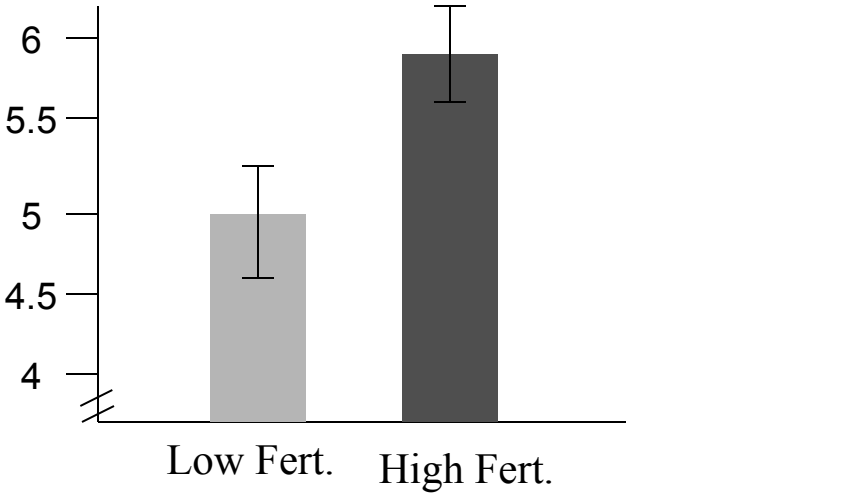
1. Skin in mm²
2. How *revealing* is the outfit?
3. How *sexy* is the outfit?



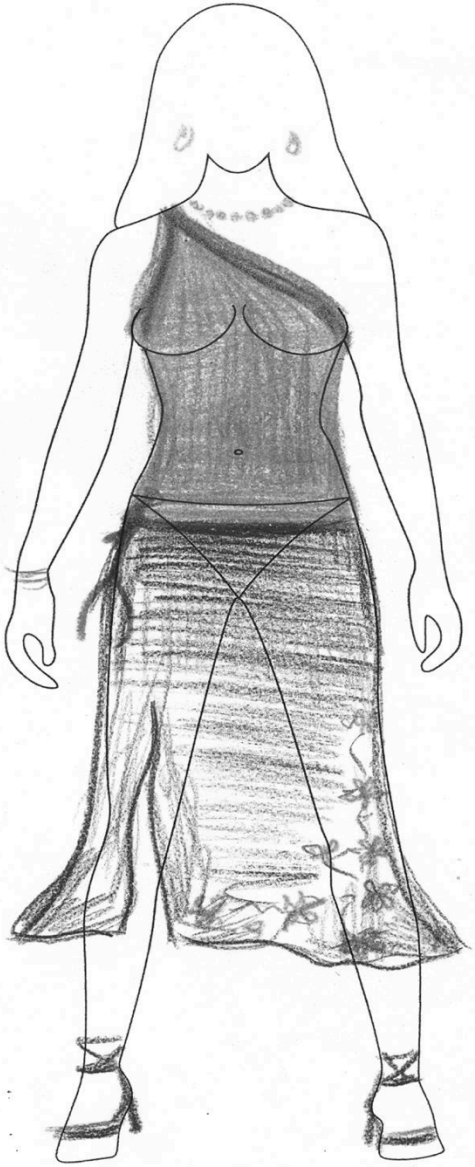
Results

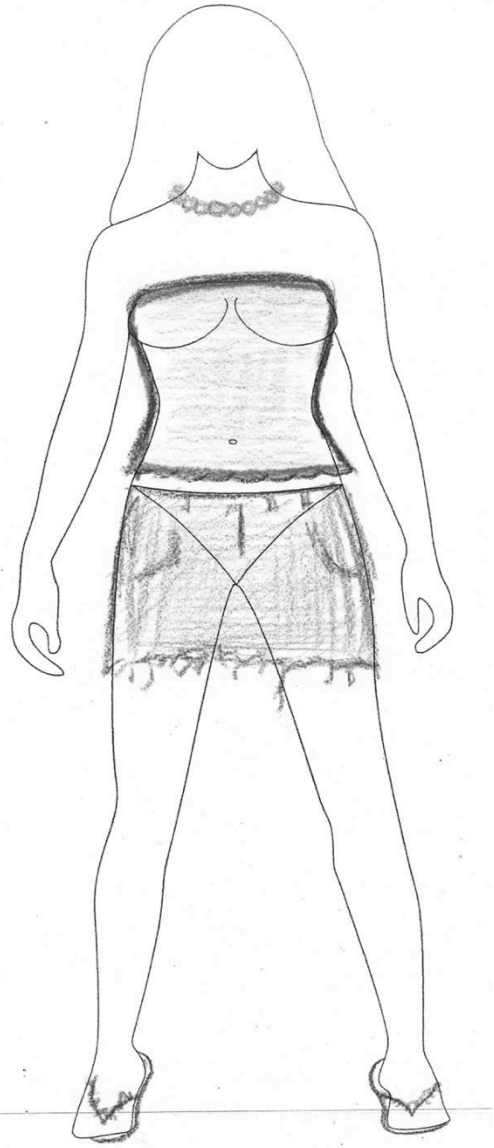

Total Skin Exposed on Outfit Sketch in mm²
400
350
300
250
200
Low Fertility
High Fertility


Revealing Ratings of Outfit Sketch
6
5.5
5
4.5
4
Low Fert.
High Fert.


Sexy Ratings of Outfit Sketch
6
5.5
5
4.5
4
Low Fert.
High Fert.

Low Fertility





High Fertility

Conclusion: At high-fertility women desire to wear sexier outfits to a social event

Proximity to ovulation in fertile photo predicts judges' choices