Lecture 20: Fatness & the Female Body

• FAT — what is it for?
• Breasts
• Female Body Image
• Waist-Hip Ratio
• Eating Disorders

Fat: Where is it Stored?

“Facts” about Fat

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FAT: Where is it Stored?

Behavioral Biology of Women 2007

(Pond, 1997)

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- Fat is laid down at puberty and during pregnancy

Why are humans so fat?

- Energy depletion
- Reproduction
- Brain

(1) Fat as Protection against Energetic Depletion

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- Humans have a high propensity to store fat
  - Buffer against periods of low food availability
- Periods of low food availability may have been common during human evolution

Famines in Pre-Industrial Societies

Selection for Fatness in Samoans

![Graph showing percentage of women overweight in Western Samoa and Hawaii](McGarvey 1991)
Selection for Fatness in Samoans

- Selection for fat storage (‘Thrifty Genotype’)
  - Ocean voyages
  - Island famines
- Increased effect with modernization

(2) Fat and the Human Baby’s Brain

(3) Fat for Reproduction

- Reproduction is energetically expensive in females

Fat for Reproduction

- Reproduction is energetically expensive in females
- Fat is laid down in women at puberty and during pregnancy
- Fat is mobilized during pregnancy, but particularly during lactation.
Body weight at parturition and duration of postpartum amenorrhea in Bangladesh

- Duration of Lactational Amenorrhea (mo)
  - >44 kg
  - 38-43.9 kg
  - <38 kg

(Ford et al., 1989)

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Easier for women to put on weight and more difficult to lose.

Obesity: Men vs. Women

Sexual Dimorphism

!Kung Sexual Dimorphism

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Sexual Dimorphism

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Humans are unique in having breast development unassociated with pregnancy.

Breasts are the earliest sign of puberty, approximately two years before menarche.

Obtain full size before reach reproductive maturity.

Size not related to ability to lactate.

Explanations for Features of Human Breasts:
(1) Buttocks Mimicry

Humans mated dorso-ventrally before bipedalism. Thus, once bipedalism evolved, needed a mimic of buttocks to promote face-to-face intercourse (Morris, 1967).
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However...
- Fleshy buttocks didn’t evolve until bipedalism, thus couldn’t have been associated with copulation before bipedalism.
- The sexual attractiveness of the breast may not be a human universal.
- Do males really need a ‘buttock-mimic’ to promote arousal?

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Explanations for Features of Human Breasts:
(2) Infant Flotation
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  - We didn’t evolve in the water!
  - Why are large breasts seen in other apes after pregnancy then?

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  - How would it work?
Explanations for Features of Human Breasts:
(3) Indicator of Nutritional Status

• Breasts (and buttocks) as an indicator of nutritional status (Cant, 1981)

• HOWEVER...
  ➢ Breast size isn’t highly correlated with nutritional status
  ➢ No correlation between mother’s fat levels and milk quantity

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  ➢ Fat mostly mobilized from stores in groin (femoral) rather than in breast during lactation (Rebuffé Scrive, 1987)

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Explanations for Features of Human Breasts:
(4) Indicator of Ovulatory Status

• Breasts as an indicator of ovulatory status (Gallup, 1982)
Explanations for Features of Human Breasts:
(4) Indicator of Ovulatory Status

• Breasts as an indicator of ovulatory potential (Gallup, 1982)
• HOWEVER…
  ➢ Breasts develop before ovulation begins

Explanations for Features of Human Breasts:
(5) Indicator of Sexual Availability

• Signal of evolution of permanent estrus (Szalay and Costello, 1991): A sign of sexual availability instead of estrus
• HOWEVER…
  ➢ Breasts don’t indicate sexual availability in other primates.
  ➢ Other primates (orangutans) that have permanent estrus, don’t have early breast development

Explanations for Features of Human Breasts:
(6) The Nubility Hypothesis

• Enlarged breasts evolved in hominid females as an honest signal of age and, thus, residual reproductive value
Reproductive Value

• Enlarged breasts evolved in hominid females as an honest signal of age and, thus, residual reproductive value
• Large breasts are more prone to sagging with age — thus preferred by males because they are an honest signal of age

Breasts (in Hadza) stay firm through the years of peak fertility, even after 2-3 children.

— HOWEVER…
  ➢ If unchanged .. Doesn’t this contradict that they’re a signal of age?

(Explanations for Features of Human Breasts: 6) The Nubility Hypothesis

• Breast development is the 1st sign of puberty ~ two years before menarche

• Importance of female reproductive value in human mate choice
  – Females usually chosen at peak reproductive value

• Breast adipose tissue has no relation to milk production

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• HOWEVER…
  ➢ Are large breasts preferred cross-culturally?
  ➢ Are breasts considered sexual cross-culturally?

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(Marlowe, 1998)
Human Breasts

- All humans have breast development at puberty, before pregnancy
- Universal human signal of sexual maturity
- Unclear if universally regarded as "sexual," but still may serve a signaling function

Corsets: Decreasing Waist to Hip Ratio (WHR)

"Satin jacquard corset. Romantic and timeless, the ultimate in hourglass shaping. Flowers bloom on satin finished in delicate lace trim. Flexible boning and a lace-up back cinch the waist."

Waist to Hip Ratio (WHR)

1. Measure the smallest part of your waist with a tape measure.
2. Measure the biggest part of your hips (the part where your buttocks stick out the most) with a tape measure.
3. Divide the waist measurement by your hip measurement.

Males use WHR to assess females because:
- Females have lower WHR than males
- Non-pregnant women have a lower WHR
- Lower WHR = fewer health problems

Studies of Waist to Hip Ratio

(Singh, 1993, 1994)
Studies of Waist to Hip Ratio

- Which figure do you find most attractive?
- Which figure would you choose for a long term mate?
- Which figure is healthiest?

(Singh, 1993, 1994)

Sculpture and WHR

Cross-Cultural Studies

- Hadza of Tanzania

US Men

(Marlowe & Wetsman, 2000)

Attractiveness Assessment

(Marlowe & Wetsman, 2000)
**Health Assessment**

**Preference for a Wife**

(From Marlowe & Wetsman, 2000)

- **However, another issue:**
  - “Does my bum look big in this?”

**Attractiveness of the buttocks**

The studies that have assessed men’s preferences for WHR have used pictures of women viewed from the front.

Frontal pictures show the waist and hips but NOT the buttocks.

**Some terms…**

- **Actual WHR** = as measured with a tape measure
- **Frontal WHR** = measurement of waist and hip in 2 dimensional form
- **Profile WHR** = measurement of waist & buttocks in 2 dimensional form
To get a fuller picture, we need to know men’s preferences for profile WHR

1. Test for profile WHR preferences in American and Hadza men

2. Investigate whether men’s preferences track the population mean for actual WHR of women.

Methods: stimuli

The five drawings were placed in a horizontal row in random order in front of the subject, who was then asked to choose the female they found most attractive. After they chose, the card was removed, and the subject asked to choose the most attractive among the four that remained.

This process was repeated until all five cards were ranked.

Subjects

American men: 18-72 yrs
(M=29, S.D.=13.52, n=108)

Hadza men: 15-75 yrs
(M=35, S.D.=14.23, n=110)

What is the “actual” preferred WHR for both Hadza and US men?

US Men:
- preferred frontal WHR = .70 (Marlowe & Westman, 2001)
- preferred profile WHR = .65

Hadza Men:
- preferred frontal WHR = .90 (Marlowe & Westman, 2001)
- preferred profile WHR = .60

Profile: Hadza prefer lower ratio = larger buttocks

Frontal: Hadza prefer higher ratio = larger waist

Calculated Theoretical Preference for Actual WHR for U.S. & Hadza Men

US Men: .68
Hadza: .78

Their theoretical preferences may not be as different as previously thought... however, they still differ considerably.
Some Hadza women may have been pregnant...

- WHR rises with parity- perhaps Hadza WHR is higher because Hadza women give birth to more children than American women. (TFR for Hadza is 6.2 births per lifetime compared to 2.1 in American women).

- Larger gut needed to hold the amount of bulky, fibrous tubers.

- Hadza women may need to be more physically active, which might favor higher androgen levels that could result in more fat being deposited in the abdominal area.

- Women who walk more may have a more male-like pelvis trading off optimality in parturition for more efficient locomotion.

Do men’s preferences for actual WHR track the population mean WHR?

1. We measured actual WHR of Hadza women to compare to American Women:

*Hadza women 17- 81*

- Sample: American Nurses (n = 89)
  - Mean = 0.74
  - S.D. = 0.06
  - Range = 0.59 - 0.89

*Hadza women 17-24 years*

- Sample: American Students (n = 55)
  - Mean = 0.66
  - S.D. = 0.05
  - Range = 0.59 - 0.89

- Sample: Young American Students (n = 88)
  - Mean = 0.73
  - S.D. = 0.04
  - Range = 0.65 - 0.87

- Sample: American recruited for study with male photo stimuli (n = 92)
  - Mean = 0.72
  - S.D. = 0.04
  - Range = 0.69 - 0.87

- Sample: Hadza (n = 53)
  - Mean = 0.73
  - S.D. = 0.07
  - Range = 0.67 - 0.89

- Sample: Hadza (n = 10)
  - Mean = 0.70
  - S.D. = 0.06
  - Range = 0.61 - 0.77

Do men’s preferences for actual WHR track the population mean WHR?

2. We compared Hadza women mean WHR to American women mean WHR:

<table>
<thead>
<tr>
<th>Sample</th>
<th>Age</th>
<th>WHR</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Nurses (n = 89)</td>
<td>24 yr</td>
<td>0.74±0.06 (0.59–0.89)</td>
<td>Singh &amp; Zambrano (1997)</td>
</tr>
<tr>
<td>Young American Students (n = 88)</td>
<td>19.6±1.1 (18–25)</td>
<td>0.73±0.04 (0.65–0.85)</td>
<td>Chapman (2004)</td>
</tr>
<tr>
<td>American Students (n = 55)</td>
<td>19.0±1.0 (18–24)</td>
<td>0.77±0.04 (0.69–0.87)</td>
<td>Hughes Gallay &amp; Gordon (2003)</td>
</tr>
<tr>
<td>American recruited for study with male photo stimuli (n = 92)</td>
<td>18±3.9</td>
<td>0.72±0.04</td>
<td>Thornhill &amp;Grammar (1999)</td>
</tr>
<tr>
<td>Hadza (n = 53)</td>
<td>37.7±6.1 (17–82)</td>
<td>0.83±0.06 (0.69–0.94)</td>
<td></td>
</tr>
<tr>
<td>Hadza (n = 10)</td>
<td>37±2.2 (37–24)</td>
<td>0.79±0.04 (0.72–0.87)</td>
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</tbody>
</table>

**Men’s preferences MAY map onto geographic variation in the shape of females, some females having a wider pelvis and hips, and others narrower hips but perhaps more protruding buttocks.**
WHR, Breast Size and Estradiol

- Women with narrow waists and large breasts had 37% higher mean mid-cycle estradiol than other categories
  - This level of difference in estradiol associated with 3x greater probability of conception from Lipson & Ellison 1996 study.
- Women with larger breasts had higher estradiol independent of WHR
- Women with low WHR had higher estradiol and progesterone than women with high WHR.

Female Beauty Cross-Culturally

- More subsistence-oriented a society and the more energetically expensive women’s work — the more men will find ‘fatter’ women attractive.

Female Beauty Cross-Culturally

- 81% of cultures in the HRAF(ethnographic records) preferred plumpness as a female body characteristic

Venus of Wallendorf ~ 25,000 y.a.
Why has the “ideal” female body image changed in the West?

- Being thin associated with being higher status, control of eating in a food abundant society
- Preference of fashion designers?

The Ideal Female Body and the Workforce Image

- Changing role of women — entry into the professional “male” workforce
- Women often judged professionally according to body image
- Women with more ‘female’ bodies considered less competent.
The Ideal Female Body and the Workforce Image

- More “female” looking women (more curvaceous, bigger breasts) viewed as being less professional, less intelligent (Kleinke & Staneski 1980)

- Personnel consultants: more feminine the grooming - less likely to judge the woman as a potential manager, interested in work, independent.

Changes in Bust:Hip Ratios

- Question: If curvaceous/bigger breasted women are perceived as less competent and intelligent, then did the standard of bodily attractiveness for women become less curvaceous/bigger breasted during periods when competence and intelligence was most highly valued?

Changes in Bust:Hip Ratios

- Peak in female professionals
- Peak in female college graduates

Eating Disorders

- 64% of women but only 23% of men who had never been overweight reported a history of dieting to lose weight (Jeffrey et al. 1984)

Body Image & Dieting

- In Silverstein’s study the proportion of articles dealing with obesity peaked the following year after each of the low points (1925) and (1970’s).
Body Image & Dieting

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- In Silverstein’s study the proportion of articles dealing with obesity peaked the following year after each of the low points (1925) and (1970’s).
- When standard of female “curvaceousness” reached it’s lowest point, so did the proportion of very thin college women.

Body Image & Dieting in ‘Normal’ Women

- A large majority of women report feeling fat, despite being normal weight
- One survey - 75% of female respondents felt ‘too fat’
- Studies of non-eating disordered patients reveal that many psychological traits thought to be representative of patients with eating disorders are broadly spread across all women
- Garner: Women who were weight preoccupied similar to anorexics in terms of degree of body dissatisfaction.

Eating Disorders

- “Anorexia and bulimia strike one million American women every year (Wolf, 1991)”
- Up to 19% of anorexic women die of their affliction (Hsu, 1980)”

Who suffers from Eating Disorders?

- 95-99% of clinical cases of eating disorders occur in women, particularly upper middle class white women
- Particularly prevalent in women who stress academic achievements and professional careers
  ➢ “In one college population, 78% of women had engaged in binge eating (Hawkins & Clement, 1980)”
  ➢ On college campuses one in five women may suffer from anorexia (Brumberg, 1988)

Is it Cross-Cultural?

- Where observed, occurs in women of high status
- Malaysia: quite low, but where observed 67% among Chinese subpopulation which are:
  – Most Educated
  – Wealthiest
  – Highest # of professional women

Body Perceptions

(Thompson)
Why are eating disorders predominantly found in women?

• Psychological studies indicate that eating disorders have emerged because women seek approval through their body image (Bardwick, 1971)

But, these studies do not address *WHY* female bodies should be such a focal point of attention

Body Image and Eating Disorders: An Evolutionary Hypothesis

• Women in all societies have larger subcutaneous fat deposits than do men

Body Image and Eating Disorders: An Evolutionary Hypothesis

• Women in all societies have larger subcutaneous fat deposits than do men
• Reproduction is limited by energy availability in women
• Women have been selected over evolutionary time to put on fat deposits

How does this effect female psychology?

• During the EEA there may have been a selective advantage to maximizing food intake when possible

Fat and Female Adaptation

• Thus, women have physiological and possibly psychological adaptations to enable them to store excess food as fat
Female Body Image

- Female bodies are evaluated in most (all?) societies
- Up until the 20th century in the west, and still in other human societies, men prefer women who are above average in body weight:
- Fat in women was/is viewed as denoting:
  - Health
  - Reproductive ability
  - Associated with higher status (more access to resources)

The Consequence

- Thus, throughout evolutionary history women have been selected to maximize food intake and store fat reserves.
- This has been in accordance with the desired female body
- But, with overabundance of food in our society and changing standards of ideal female body image, these no longer go together
Thus, throughout evolutionary history women have been selected to maximize food intake and store fat reserves. This has been in accordance with the desired female body. But, with overabundance of food in our society and changing standards of ideal female body image, these no longer go together. However, female physiology and psychology have NOT changed. Still adapted to maximize calories.

Thus, our physiological and psychological adaptations to put on fat reserves are now in conflict with the current "ideal" body image. This causes psychological problems and behaviors such as
- Fixation on food, but not eating
- Binging and then purging

Next Time...
- Control of Female Fertility
  - Abortion
  - Infanticide
  - Neglect
- Film: China’s Only Child

Subsistence Transitions, Women’s Status and Biology
- Subsistence Transitions
  - Hunting & Gathering
  - Horticulture
  - Agriculture
- Industrialization
- The Demographic Transition
- Population Growth
- Limiting fertility
- Post-Industrialism