

**Personality**  
What makes us who we are?

**Psychology 305A: Lecture 6**

**Biological Approach**

1

**UBC Psych Students!**

**Need an extra 2% for an **A+**?**

**The Human Subject Pool can help.**

- Visit [hsp.psych.ubc.ca](http://hsp.psych.ubc.ca)
- Complete the pre-screen survey for an extra ½ credit towards your course grade
- Browse studies to participate in
- Remember to allocate your credits to the courses before the system closes on December 4

Note: only those in classes registered for HSP can participate.

## Midterm 1 Recap

- Multiple Choice Mean = 65%
- Essay Mean = 67%
- Overall Exam Mean = 66%

TA Extra office hours to see your exams this week & next week:

Zak (Kenny 1002):

Thurs. 12:30 -1:30; Fri. 1:30 - 2:30

Cathy (Kenny 2029):

Wed. 11am -12pm; Fri. 2:30pm- 3:30<sub>3</sub>pm

## Problem MC Items

2. The reliability of a measure of personality refers to:

- a. the consistency of the measure over time
- b. the consistency of the measure across raters
- c. the consistency of the measure across test questions
- d. all of the above
- e. a and b only

4

### **Problem MC Items**

3. Which of the following were important factors leading to Mischel's 1968 critique of personality psychology?
- a. The Rolling Stones' "Street Fighting Man" just came out
  - b. Grand theories of social psychology began to emerge
  - c. Asch's and Milgram's research demonstrated the importance of situations
  - d. Lewin argued that  $B = f(S)$
  - e. C and D

5

27. All of the following characterize the differences between a grandiose and fragile narcissist, EXCEPT:
- a. A fragile narcissist is more likely to become depressed
  - b. A fragile narcissist experiences feelings of inadequacy
  - c. A grandiose narcissist is typically controlling and blames others for failures
  - d. A grandiose narcissist feels privileged and entitled
  - e. All of these are differences between the two

## **Problem Items**

28. The Strange Situation Procedure used by Ainsworth is a good example of:

- a. Self-report
- b. Observer report
- c. Test data
- d. B and C only
- e. All of the above

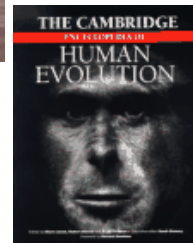
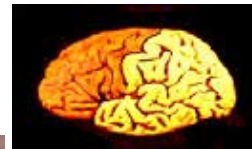
7

## **Biological Approach to Personality**

8

## Biological Perspective and Personality: Basic Assumptions

- Personality traits:
  - Reflect physiological differences
  - Are largely genetically determined
  - Are rooted in our evolutionary history

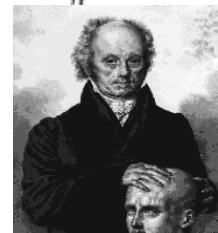
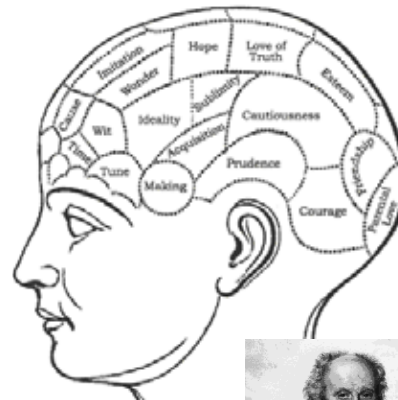


## Pre-Scientific Approach: Phrenology

Regions of the brain are associated with certain functions (e.g., sloping forehead = criminal prone)

Modern view:

- 1) it's in the brain, not the head
- 2) it's not that specific



## Galen's four humors

**GALEN:** Ancient Greek physician (C.130-200 A.D.)

Thought personality was a reflection of the four humors (fluids) that (he thought) make up our bodies.

**Yellow Bile** - bad temper, irritability (Choleric)

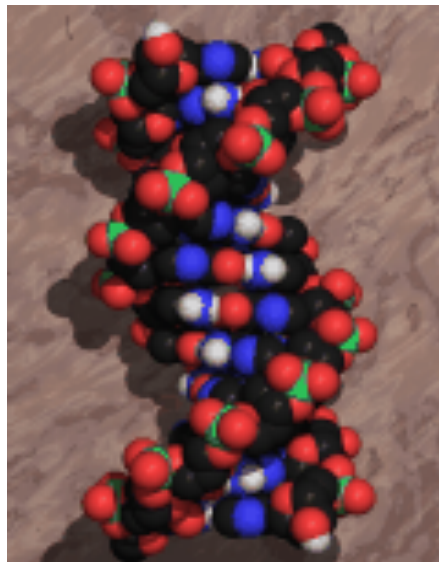
**Black Bile** - gloomy, pessimistic (Melancholic)

**Phlegm** - sluggish, non-excitabile (Phlegmatic)

**Blood** - cheerful, passionate (Sanguine)

If one of these fluids was dominant, the personality associated with that fluid would be observed 11

## Modern Biological Approach: Genes



12

## Genetic Approach to Personality

- Genes are the building blocks of personality
  - Inherited through evolutionary processes
  - Shape personality and behavior by shaping physiological responses
  - Behavioral genetics = the study of how genes shape behavior

13

## Assumptions of Behavioral Genetics

- Nature ~~vs.~~ Nurture
  - Behavior (i.e., personality) is shaped, in part, by genes we inherit
  - Behavior is also shaped by the environment
- NO traits are caused entirely by nature or nurture; it's always both

14

## Basic Assumptions of Genetic Approach

- *Genotypes* are genetic potentialities
  - E.g., genes for eye color, height
- *Phenotypes* are manifest characteristics.
  - E.g., actual eye color and height; influenced by mix of genes and environment
- *Genetic determination*
  - If gene, then phenotype, irrespective of environment
- *Gene-environment interaction*
  - If gene and a particular environment, then a particular phenotype

15

## Genetic Heritability

- Heritability is the extent to which individual differences in a trait, *within a group of people*, are due to differences in genes
  - Heritability can only apply to groups → based on individual differences
  - Does NOT mean how much of a trait within a single person is due to genetics

16



## Behavioral Genetics

- Used to identify genetic differences between individuals within a group
- Allows researchers to determine the extent to which individual differences in a trait are due to genetics and to the environment

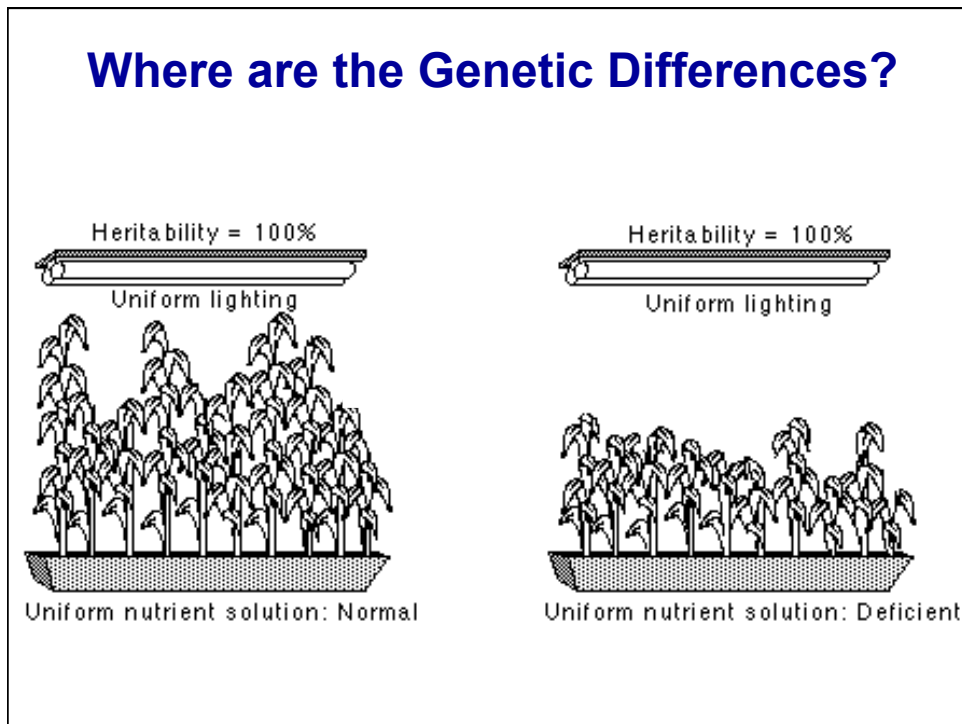
17

## Misconceptions about Heritability

- Group differences are (most typically) NOT explained by genetic differences
  - E.g., African-American vs. Caucasian IQ scores
  - Numerous studies have found that *average* IQ for U.S. African-Americans is 10 to 15 points lower than for U.S. Caucasians
  - This difference has been assumed, by some, to be due to genetics
  - What is wrong with this explanation?

18

## Where are the Genetic Differences?



## Group differences due to environmental differences between groups

- The difference in average racial IQs decreases when environments are matched on socioeconomic status
- Average IQ for U.S. African-Americans adopted into white middle-class households is 110
  - 25 points higher than average African-Americans, 10 points higher than average Caucasians

## **Group Differences Due to Different Environments**

- Race differences in IQ differ by age
  - No difference in infancy
  - 4 point difference at age 4
  - From ages 4-24 years African Americans lose 6/10<sup>th</sup> of a point per year

21

## **What's the environmental difference?**

- African American children more likely to be raised by single parent
  - Single parent homes less cognitively complex
- Attend schools with lower average IQ, so high achievers don't need to achieve as high

22

## Behavioral Genetics

23

### Research in Behavioral Genetics: Twin Studies



- Twin studies help us understand the importance of genetic and environmental influences on social development
  - Identical (MZ) vs. Fraternal (DZ) twins
  - Reared together vs. reared apart

24



## Shared Traits in Identical Twins

- Who has an identical twin?
- What personality dispositions do you and your twin share?
- Why do ID twins share traits?

## Twin Study Research Diagram

	Monozygotic (MZ) Twins	Dizygotic (DZ) Twins
Environment	same	same
Genetics	same	different

27

## Behavioral Genetics Methodology

- Twin Studies: compare concordance (similarity) of trait in MZ vs. DZ twins
- Adoption Studies: compare concordance of trait between parents and biological vs. adopted kids
- MZ Twins Raised Apart
  - Best Design: Simply look at the concordance of the trait → that's its heritability

28

*Table 10.3* Within-Pair Extraversion Correlations for MZ and DZ Twins

	<i>MZ Twins</i>	<i>DZ Twins</i>
Swedish sample	.47	.20
Finnish sample	.46	.15

Source: From Floderus-Myrhed et al. (1980) and Rose et al. (1988).

Is Extraversion more heritable in Swedes or Finns?

29

## Behavioral Genetics Methodological Issues

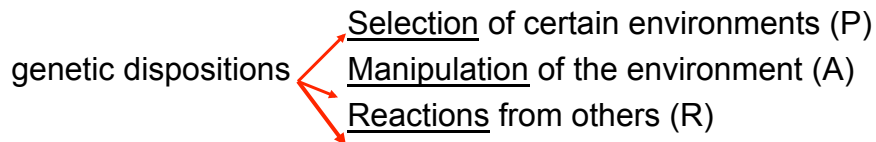
- Twin Studies
  - Equal Environments Assumption
    - Is amount of shared environment really the same for DZ vs. MZ twins?
- Adoption Studies
  - Representativeness
  - Selective placement

30

## More General Limitation

- Assumption that genes and environment are independent
- In fact, certain genotypes and environments may be associated with each other (genotype-environment correlation)

Passive, Active, Reactive



31

## Findings of Behavioral Genetic Research

- Twin studies have revealed 3 important influences on personality:
  - **Genetic influences:** Genes individuals inherit from their parents
  - **Shared Environment:** Environmental effects shared by family members (parenting style, family environment, schools, neighborhood, material resources)
  - **Non-shared Environment:** Environmental effects unique to the individual -- NOT shared by family members (illnesses, friends, teachers, being treated differently by your parents)

32



## Genetic and Environmental Effects

- Genetic effects
  - What parents pass on to their children
  - 100% shared in MZ twins, 50% in DZ twins
- Environmental effects
  - Shared: Family and environmental influences that affect MZ/DZ twins similarly
  - Non-shared: Family and environmental influences that affect MZ/DZ twins differently

33

## Heritability of Personality

	<i>Genetic</i>	<i>Shared</i>	<i>Non-shared</i>
Extraversion:	.49	.02	.49
Agreeableness:	.35	.11	.54
Conscientiousness:	.48	.07	.45
Neuroticism:	.41	.07	.52
Openness to Experience:	.45	.06	.49

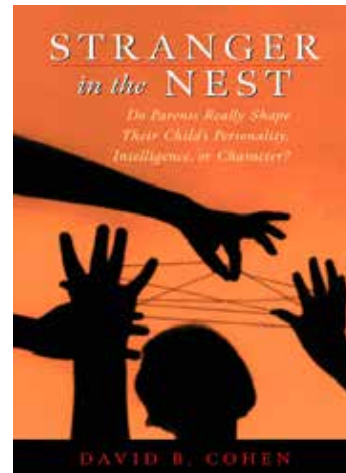
\*\*Genetics and non-shared environment important

\*\*Shared environment has little influence on personality

34

**CONCLUSION FROM TABLE:**

- Most personality traits have some genetic component
- Non-shared environmental experiences have a very strong impact on personality
- Shared environmental experiences have little impact on personality
  - Do parents matter??



35

**Where do non-shared environmental effects come from?**

New Zealand Twin Study



36

## **Genetic and Environmental Effects Study**

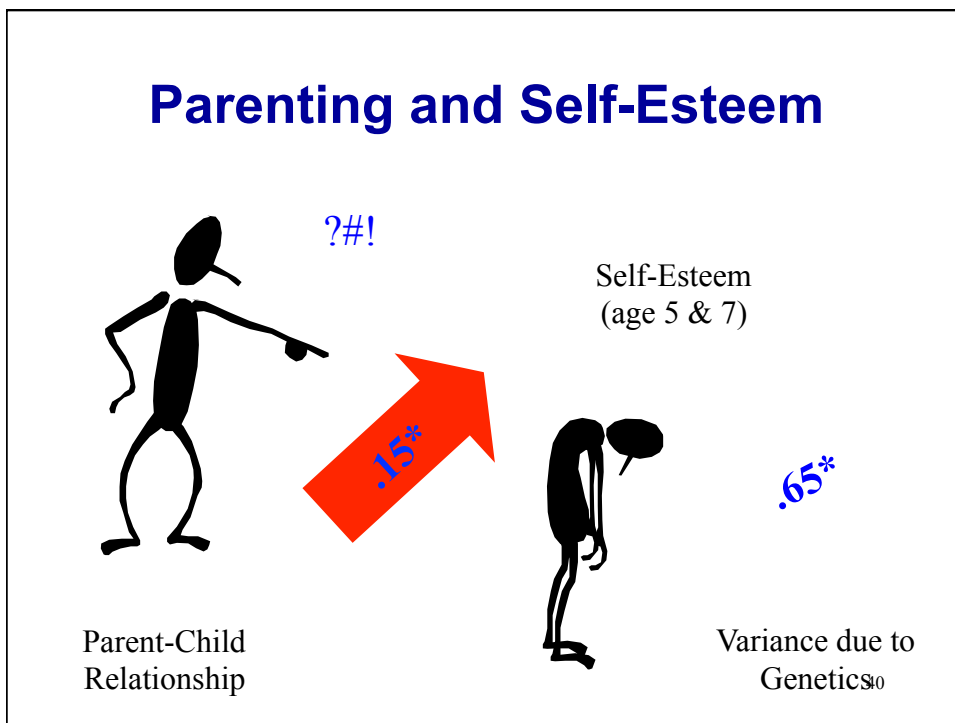
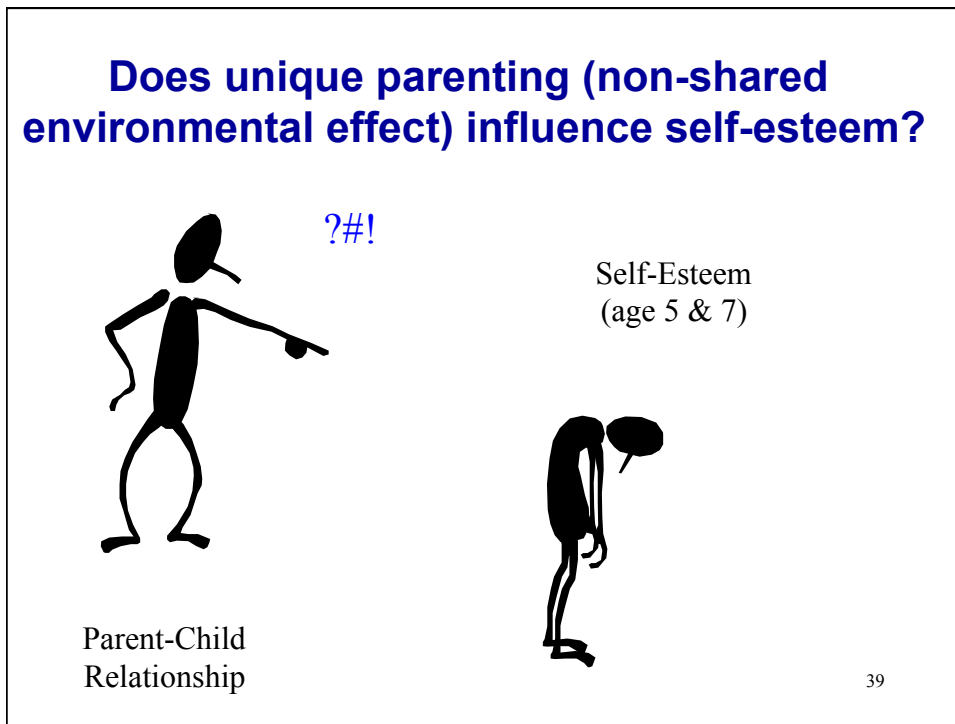
- Measured self-esteem: two teachers reported (age 5 & 7)
- Measured parent-child relationship
  - Mother's expressed emotion (child at age 5)
  - Mothers spoke about each twin for 5 minutes
  - Negative emotion expressed towards child coded from tapes

37

## **Negative Expressed Emotion**

“She always does it, I've never met such a clumsy child. We think 'oh here we go again, she's done it again.' It drives me mad! Why doesn't she look where she's going? I'm constantly having to look after her, she's constantly breaking things. Sometimes I think she's stupid. She never learns.”

38



## Parenting and Self-Esteem

- Do parents matter?
  - Yes
  - The unique relationship between the mother and each child predicts the unique self-esteem of each child
    - Non-shared environmental effect
  - This effect cannot be explained by genetic or shared environment influences

41

## Conclusions from Behavioral Genetic Research

- All personality traits are at least partially heritable
- The effect of being raised in the same family is smaller than the effect of genes
- Much of the variance in personality is not due to genes or shared family experiences
  - Personality differences are strongly influenced by unshared or idiosyncratic experiences, or unique parent-child relationship

42

## **Shared Family Environment**

- Does influence other aspects of a person
  - Attitudes
  - Religious beliefs
  - Political orientations
  - Health behaviors
    - Strong correlation between adopted siblings on smoking and drinking tendencies

43

## **Which traits are most heritable?**

- Which traits have strongest genetic component?

44

## Twins Separated at Birth

Very Heritable	MZ Twins Raised Apart
Neuroticism	.70
Imagination	.74
Aggression	.67
<u>Moderately Heritable</u>	
Traditionalism	.59
Sense of Alienation	.59
Social Potency	.57
Sense of well-being	.49
Risk Taking	.45
<u>Somewhat Heritable</u>	
Achievement Orientation	.38
Social closeness	.15

45

## How Can We Explain Heritability of Personality?

- How can self-esteem, personality, IQ, sexual orientation, political & religious orientation, even divorce, be heritable??
- Genes → Neurotransmitters, hormones, physiological arousal → Thoughts and Feelings → Personality → Divorce
- Current genetics research on personality
  - Molecular genetics (genetic markers of traits)
  - Neurotransmitters (dopamine) and hormones (testosterone)
  - Neuro-anatomy

46

## Broader Issue: Genetic Determinism vs. Free Will

Do we have any conscious control over our actions, thoughts, and personality?

	<u>Concordance Rates of Felony Convictions</u>
Identical twins	42%
Fraternal twins	13%

47

## What if we could choose our genes?

If scientists can find the genes associated with certain “good” and “bad” traits, could we manufacture “perfect” humans? Should we?



48



## ***Gattica***



49

## **Physiological Approach**

- How do we get from genes to personality?

50

## Physiological Approach

- How do we get from genes to personality?

51

## TEMPERAMENT

Biologically based traits present at birth

*Excitability*  
*Sociability*  
*Activity level*



INFANT  
TEMPERAMENT



ADULT  
PERSONALITY

some adult traits are strongly related to temperament and others are not –i.e. some are mostly biological and others are mostly environmental



OBJECTIVE AND SUBJECTIVE  
ENVIRONMENT

52

## Which personality traits have the strongest biological basis?

Extraversion and neuroticism

Adult traits related to temperament -->

Sociability + activity level (extraversion) and  
Excitability (neuroticism)



53

## Eysenck's Theory of Personality

- Extraversion and introversion represent different levels of physiological arousal
- Extraverts: Below optimal level (under-aroused)
  - Seek out social interactions for stimulation
- Introverts: Above optimal level (over-aroused)
  - Avoid excessive stimulation (e.g., social interaction)
  - But, this does not mean that introverts are *shy*
    - What is the difference?

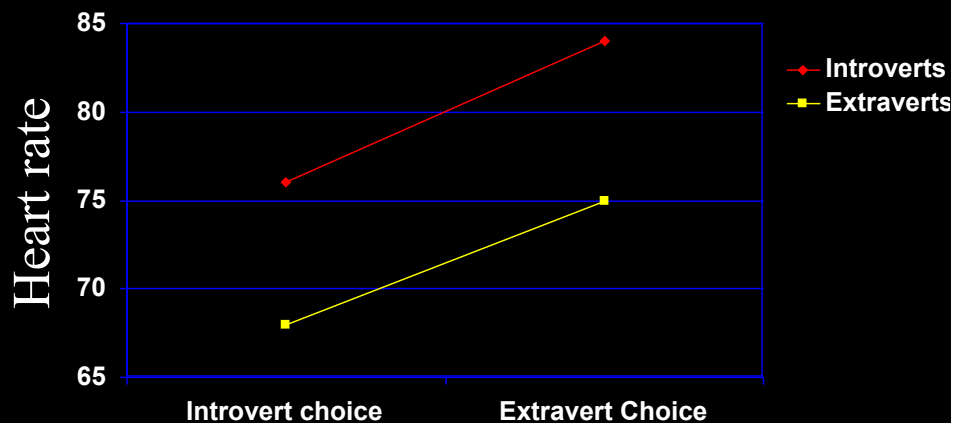
54

## Eysenck's Theory: Evidence

- Preference for quiet environment (e.g., library)
  - Introverts prefer and perform better in quiet environments
- Loud music
  - Extraverts set volume higher than introverts

55

## Heart Rate in Response to Music Volume



## **Eysenck's Theory: Evidence**

- Bedtime
  - Introverts may be morning people and extraverts night people
- Recreational drug use
  - Extraverts tend to use stimulants (e.g., cocaine, caffeine)
  - Introverts tend to use sedatives (e.g., heroin, marijuana)

57

## **Alternate Theory: Jeffrey Gray**

- Reinforcement Sensitivity
  - How sensitive are you to rewards and punishments?
- Two systems
  - Behavioral Activation System (BAS)
    - Sensitivity to reward
  - Behavioral Inhibition System (BIS)
    - Sensitivity to punishment

58

## Alternate Theory: Jeffrey Gray

- Reinforcement Sensitivity
  - How sensitive are you to rewards and punishments?
- Two systems
  - Behavioral Activation System (BAS)
    - Sensitivity to reward
  - Behavioral Inhibition System (BIS)
    - Sensitivity to punishment

59

## BIS AND BAS THEORY

### Behavioral Activation System (BAS) ENGINE or 'ON' SWITCH SYSTEM

- Individual differences in *sensitivity to reward*
- BAS activation => release of *dopamine*
- People with very strong BAS: highly impulsive, low gratification-delay, extreme novelty-seekers
- Linked to Positive Emotionality

### Behavioral Inhibition System (BIS) BREAKS or 'OFF' SWITCH SYSTEM

- Individual differences in *sensitivity to novelty and punishment*
- BIS activation => lower levels of *serotonin*
- People with very strong BIS: very fearful, insecure, hyper-cautious
- Linked to Negative Emotionality

## Measures of BIS and BAS

- Rate yourself on the following scale:  
 1-----2-----3-----4-----5  
 Not true of me                      Very true of me
- BIS (inhibition/avoidance)**  
 \_\_\_ Criticism or scolding hurts me quite a bit.  
 \_\_\_ I worry about making mistakes.  
 \_\_\_ If I think something unpleasant is going to happen I usually get pretty "worked up" about it.
- BAS (activation/approach)**  
 \_\_\_ When I get something I want, I feel excited and energized  
 \_\_\_ When I want something, I usually go all-out to get it.  
 \_\_\_ I often act on the spur of the moment.

61

### How can we integrate GRAY & EYSENCK?

Gray's dimensions are a rotation of Eysenck's dimensions (i.e., both sets of dimensions refer to the same phenomenon, they just cut the pie differently)

high BAS =  
Impulsivity = E+ N+

high BIS =  
Inhibition = E- N+

## Neurotransmitters, Hormones (Brain Chemistry) and Personality

- Dopamine
- Serotonin
- Testosterone

63

## Dopamine and Mice

- Mice will keep pushing a lever (for hours and hours) that releases dopamine
- Genetically engineered mice
  - High dopamine mice very active, explored their cage
  - Low dopamine mice (dopamine circuits don't work) lethargic, don't eat or drink much





## DOPAMINE

- Linked to Behavioral Activation System (BAS)
  - Increased levels in humans after sex, cocaine, a good meal
- Genetic Basis for Sensation Seeking
  - Long version of dopamine receptor gene (D4DR) = increased brain response to dopamine
    - High sensation seekers
  - Short version of D4DR = decreased brain response to dopamine
    - Low sensation seeking
  - Sensation Seeking is highly heritable (genetic influence = 50%)

65

## SEROTONIN

- (Negatively) Related to Behavioral Inhibition System (BIS)
- Low Serotonin related to depression and anxiety
- Ecstasy (the recreational drug) increases serotonin
  - Removes inhibition
- Prozac (the medical drug) also increases serotonin
  - reduces depression and anxiety

66

## TESTOSTERONE

- Linked to aggression (Eysenk' s Psychoticism)
  - Men are higher in Testosterone; also more aggressive in all cultures
- Higher testosterone at birth → increased aggression in boys (but not girls)
- Men convicted of violent crimes have higher testosterone levels than men convicted of non-violent crimes
  - Testosterone linked to crime for low but not high income men

67

## Neuro-anatomical Approach to Personality

There are regions in the brain associated with particular aspects of personality, emotion, and behavior



68

## Patterns of brain activity associated with personality

- **Right Prefrontal Cortex:**
  - Withdrawal (BIS)
- **Left Prefrontal Cortex:**
  - Approach (BAS)
- **Orbitofrontal Cortex:**
  - Anticipation of reward & punishment (BIS and BAS)
- **Medial Prefrontal Cortex:**
  - Self-referential judgments (“the self”)
- **Amygdala**
  - Fear, emotion recognition

69

## How can we connect brain, physiology, and genes?

- Genes → different neuro-anatomy
  - Or, different levels of activity in different brain regions
- Brain activity in different regions → neurotransmitters & hormones
- Neurochemicals → personality (e.g., BIS/BAS, Extraversion/Introversion)

70

## **Application of the Biological Approach: Sensation-Seeking**

- High sensation seekers tend to scuba dive, sky dive, ride motorcycles, and have lots of sex partners
- “I sometimes like to do things that are a little frightening”
- “I like to have new and exciting experiences and sensations even if they are frightening, unconventional, or illegal”
- “Almost everything enjoyable is illegal or immoral.”
- “I get bored seeing the same old faces.”

71

## **Sensation Seeking**

- Neuroscience/ Physiological approach:
- High sensation seekers have different brains than low sensation seekers
  - Different anatomically
  - Different neural activation patterns
  - Different levels of neurotransmitters
    - high levels of dopamine

72

## Sensation Seeking

- Genetic approach:
- The degree to which you are a high vs. low sensation seeker is partially due to your genetic make-up
  - Sensation seeking is highly heritable
  - Linked to specific genes (e.g., long version of D4DR)

73

## Evolutionary Perspective

74

## Evolutionary Perspective

- How do heritable traits get passed on?
- Why do humans have some of the traits we have?
- Why are men and women different?
- Why do humans have individual differences in social behavior and personality?
  - Weakest point of evolutionary perspective

75

## Evolutionary Perspective

- We are *biologically programmed* to engage in behaviors that facilitate survival and reproduction
  - e.g. eating, sex, fighting enemies, cooperating with friends
- These behaviors maximize the likelihood that our genes will be passed down to the next generation
- Natural selection is the process by which adaptive behaviors are selected
  - People with genes for adaptive behaviors live to pass these genes on
- The result is a human nature that reflects behaviors that have been adaptive throughout evolutionary history

76

## Evolutionary Perspective

- To study personality from an evolutionary perspective, think about how personality traits might be adaptive
  - Does a particular trait increase your likelihood of survival? (*Natural Selection*)
  - Does a particular trait increase your likelihood of finding a mate and reproducing? (*Sexual Selection*)
  - Does a trait influence the likelihood that your relatives will survive (*Inclusive Fitness*)

77

## Inclusive Fitness

- Explains behaviors that seem maladaptive
  - Altruism, self-sacrifice
    - Prediction: more altruism toward kin than non-kin
    - Evidence supports this, at least in self-report
  - Inclusive fitness has been used to explain “gay gene”

78

## Evidence for the Evolutionary Perspective on Personality

- Humans across cultures and non-human primates show similar social behaviors
  - Attachment (parent-child & pair bonding)
  - Affiliation, need to belong
  - Coalitions
  - Status hierarchies
  - Competition for resources
  - Emotion expressions
  - Sexual jealousy
- All of these behaviors promote survival and reproduction

79

## Evidence for the Evolutionary Perspective on Personality

- Humans across cultures and non-human primates show similar social behaviors
  - Attachment (parent-child & pair bonding)
  - Affiliation, need to belong
  - Coalitions
  - Status hierarchies
  - Competition for resources
  - Emotion expressions
  - Sexual jealousy
- All of these behaviors promote survival and reproduction

80



## Evidence for Evolutionary Perspective: Universal Emotions



**Surprise**



**Anger**



**Disgust**



**Fear**



**Happiness**



**Sadness**

81

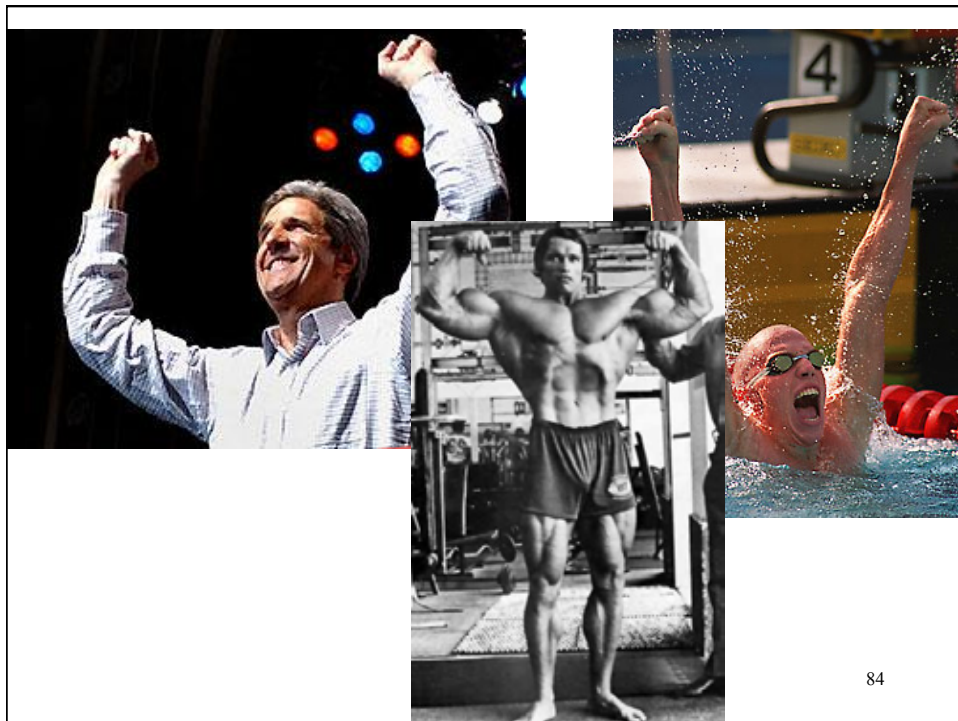
## Why are emotion expressions adaptive?

- Send messages that can save lives of sender and receiver (natural selection and inclusive fitness)
- Fear
  - “Don’t attack!”
- Happy
  - “I’m friendly”
- Sad:
  - “I need comfort”
- Disgust:
  - “This food will make you sick”
- Anger:
  - “I’m going to attack!”
- Surprise
  - “Look over there!”

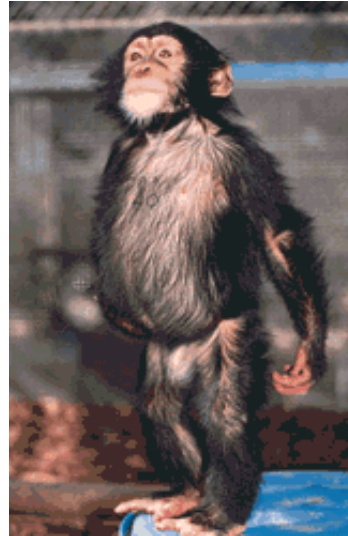
82

## Are there other universal emotion expressions?

83



84



85

## Why would a pride expression be adaptive?

- Occurs after success, so may communicate success to others
  - “I’m a successful person who deserves high status”

86

## Pride Recognition Forced-Choice Test



“Circle the emotion that best matches the emotion expressed by the person in the photo”:

*Surprise*    *Pride*    *Happiness*    *No emotion*

## Pride Recognition Open-Ended Test



“Which emotion is being expressed in this photo?” \_\_\_\_\_

## Manipulating Components of the Expression



89

## The Pride Expression



**89% Pride  
Recognition**

90

## Why is it adaptive for pride to look like this?

- Head and neck tilted slightly back
  - Look above others
  - Approach oriented
- Expanded posture
  - Dominance
  - Draws attention
- Slight smile
  - Social cohesion
  - Individual remains within the group



91

## But, is pride universal?



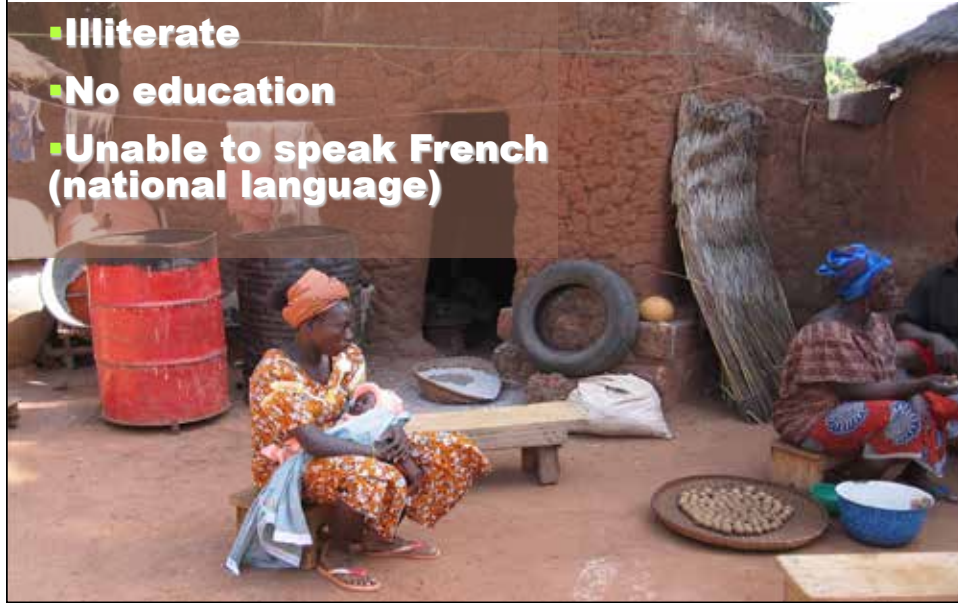
- Ekman and colleagues (1969)
  - Studied isolated Fore tribe in Papua New Guinea
- Need to study pride in isolated culture

92



## Burkina Faso Study

- **Illiterate**
- **No education**
- **Unable to speak French (national language)**














		
George W. Bush: 0%	Tom Cruise: 0%	Tony Blair: 0%
		
Michael Jordan: 0%	David Beckham: 0%	

105

	
<b>President Campore: 69%</b>	<b>Thomas Sankara: 51%</b>

106

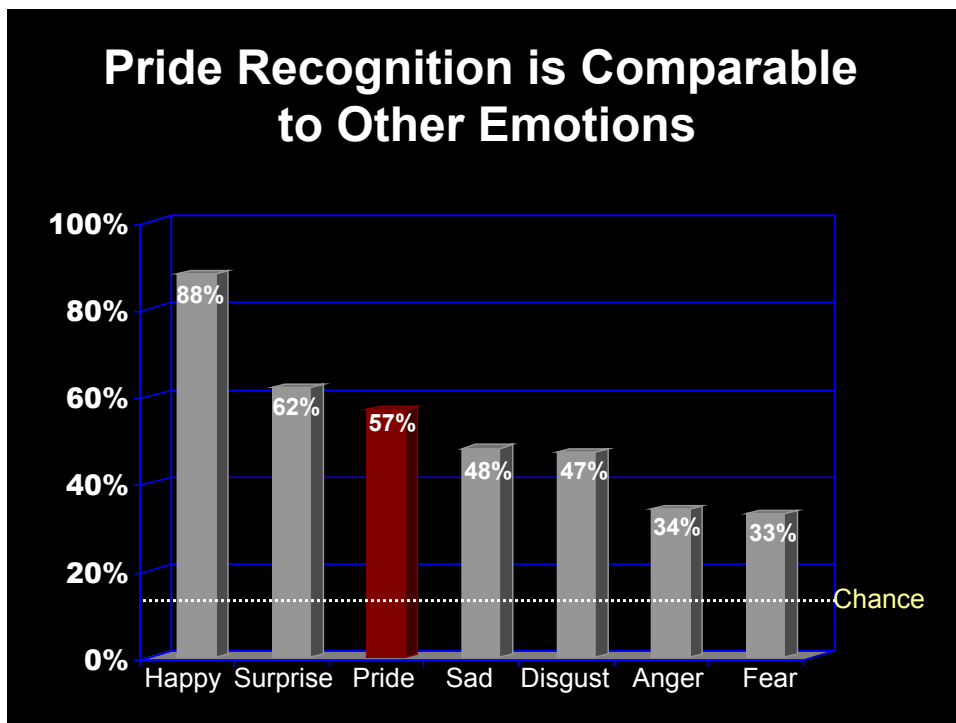
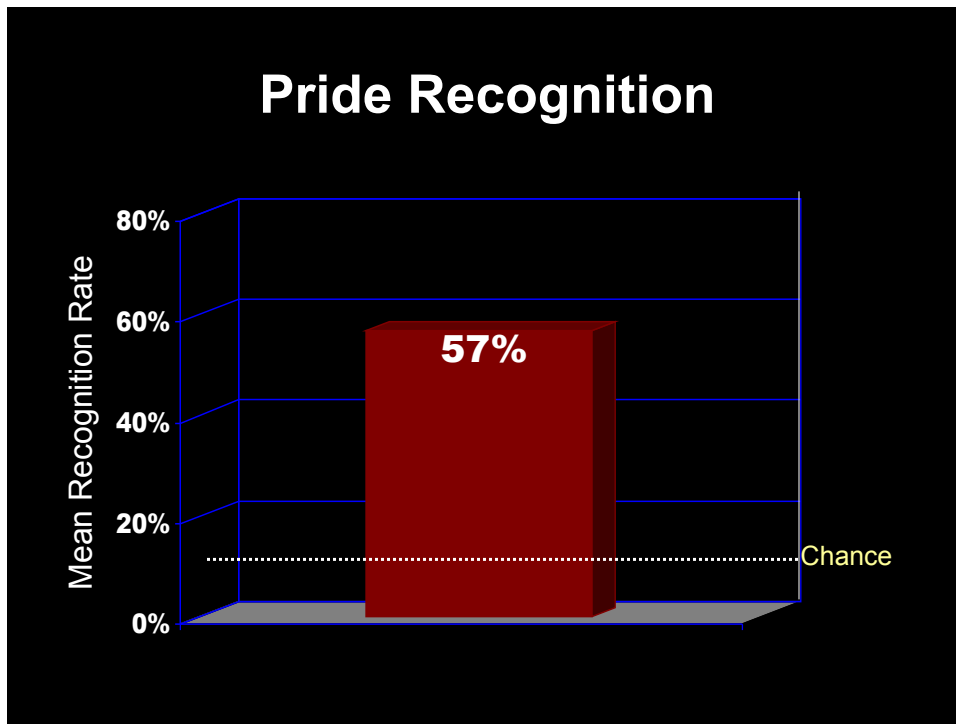
## Burkina Faso Study



Selon vous, laquelle des émotions la personne avait quand la photo a été prise? Choisissez une émotion seulement. *[cocher une réponse]*

Colère    Dégoût    Peur    Content    Fier    Triste  
Surpris    Avoir Honte    Autre emotion: \_\_\_\_\_    Je ne sais pas

**Could they recognize pride?**



## **But, recognition was lower than in Western cultures**

- Complicated procedure
  - Difficulty of translation
  - Illiterate participants must remember response options
  - Novelty of task
- Previous research on preliterate cultures
  - Very low recognition rates: 30-50% in some samples

111

## **Do people actually show the pride expression after a success?**

- Is it just a recognizable stereotype, or is it an actual behavioral display
- If evolved to promote status
  - Must communicate success and increased status to others
  - Should occur after success

112

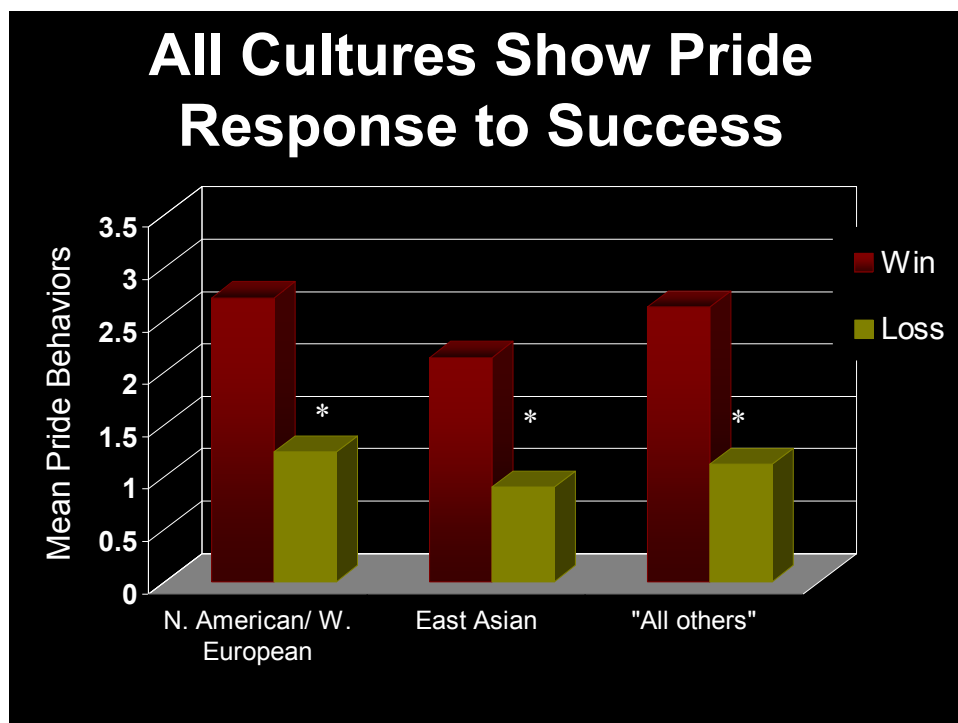
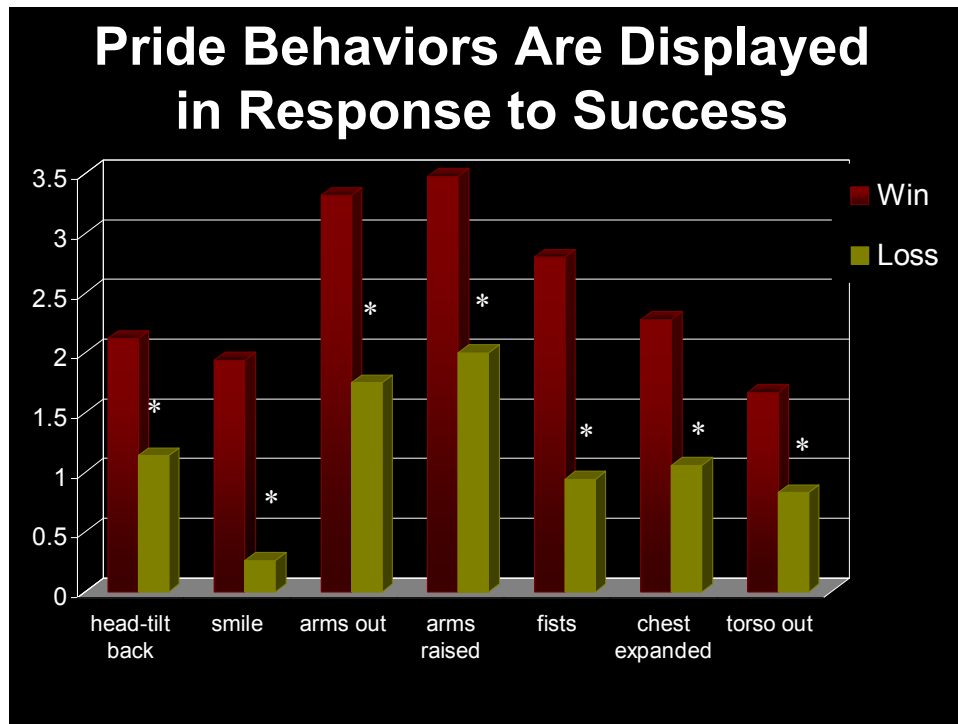


## 2004 Olympics: Judo Competition



### Olympic Judo Study

- Official photos by Judo Federation photographer
- 48% winners
- 46% women
- 36 nations
  - North American/Western European
  - East Asian
  - Eastern Europe/ South/Central American, Australian

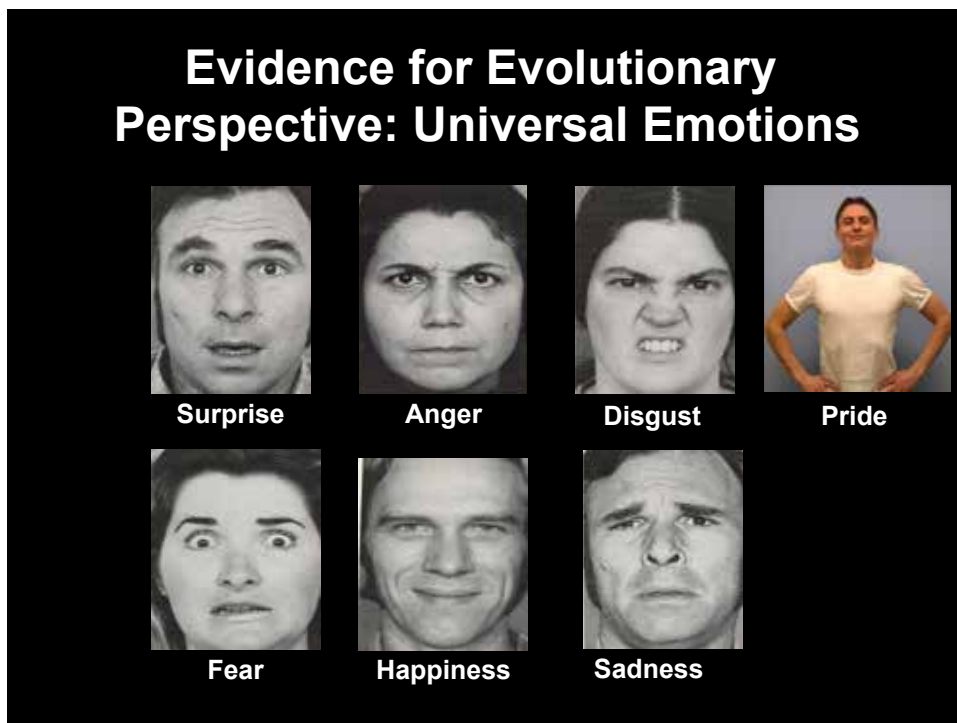
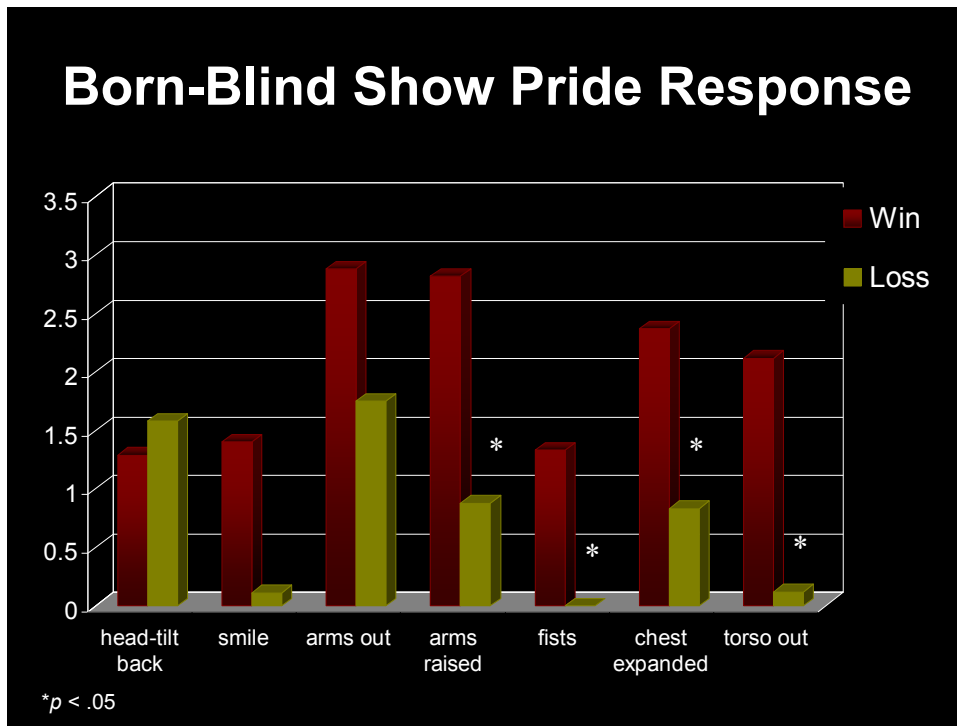


## The Pride Expression

- Cross-cultural behavioral response to success
- Universally recognized
- May be an evolved signal of success
- But, is the pride expression *innate*?
  - Could the expression be a learned display?

## Paralympics Judo Study: Blind Athletes







121

## Next Class

- Film: Body Doubles
- Discuss Film; Finish Evolutionary Approach
- Begin Cognitive Approach
  - Read Larsen & Buss, Chs 6 & 7 if you haven't, and Ch. 8

122