

Personality

What makes us who we are?

Psych 305A: Lecture 15

Biological Approach: Genetics

Updates to Syllabus

- Today: wrap up genetics; physiological approach
- Friday: FILM: “Body Doubles”
 - Will take full class, please arrive on time, movie will start at 2 pm sharp
 - Note syllabus change— Syllabus said we’ d watch the film next week

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

Broader Issue: Genetic Determinism vs. Free Will

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

Concordance Rates of Felony Convictions

| | |
|-----------------|-----|
| Identical twins | 42% |
| Fraternal twins | 13% |

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?

Gattica Clip



Physiological Approach

- How do we get from genes to personality?

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**

Which personality traits have the strongest biological basis?

Extraversion and neuroticism

Adult traits related to temperament -->
Sociability + activity level (extraversion) and
Excitability (neuroticism)



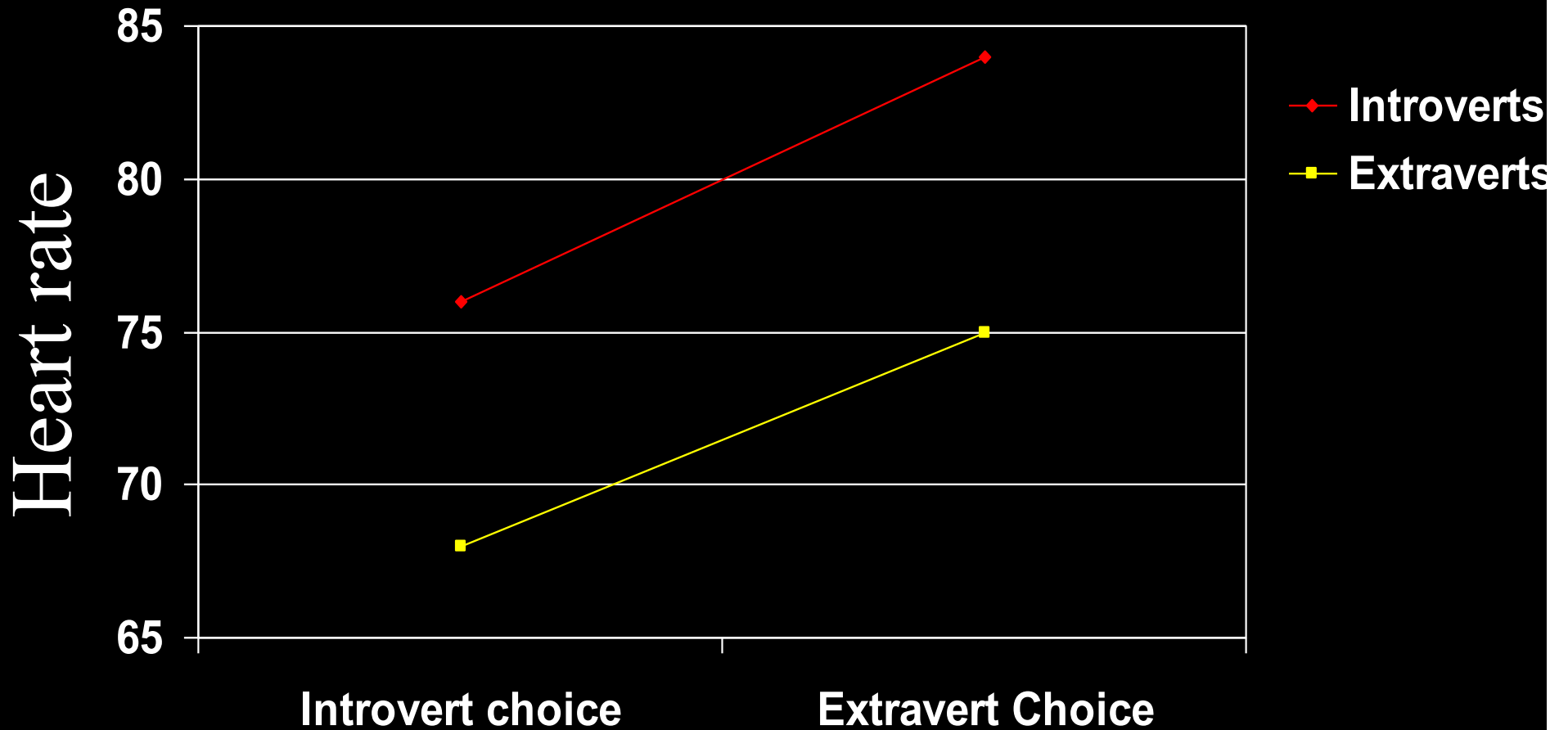
Eysenck's Theory of Personality

- 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?

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

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)

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

Alternate Theory: Jeffrey Gray

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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.

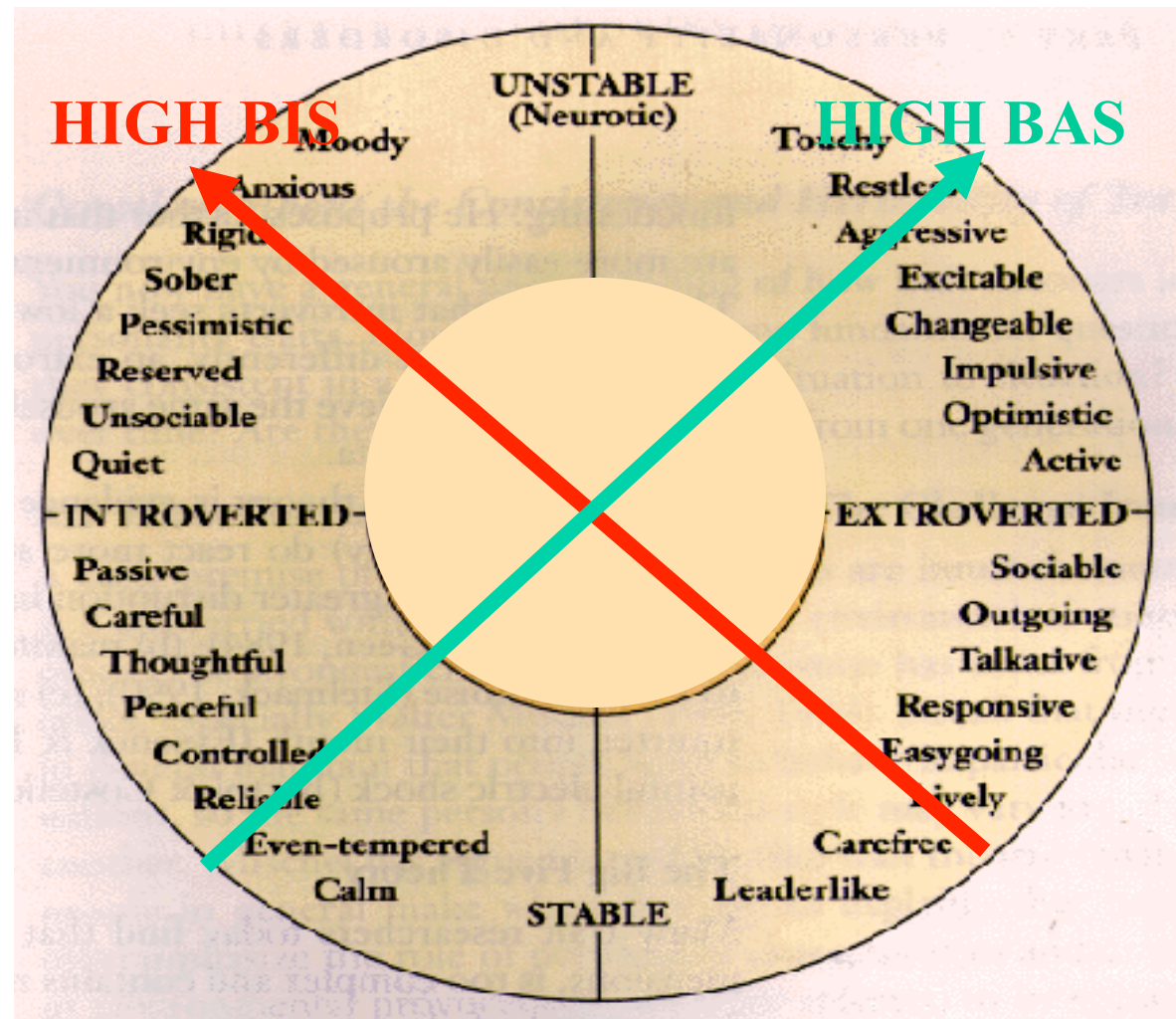
___ I often act on the spur of the moment.

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+

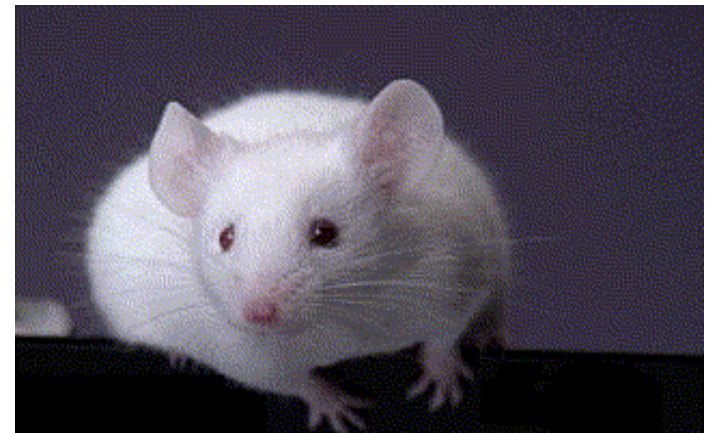


Neurotransmitters, Hormones (Brain Chemistry) and Personality

- Dopamine
- Serotonin
- Testosterone

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%)

SEROTONIN

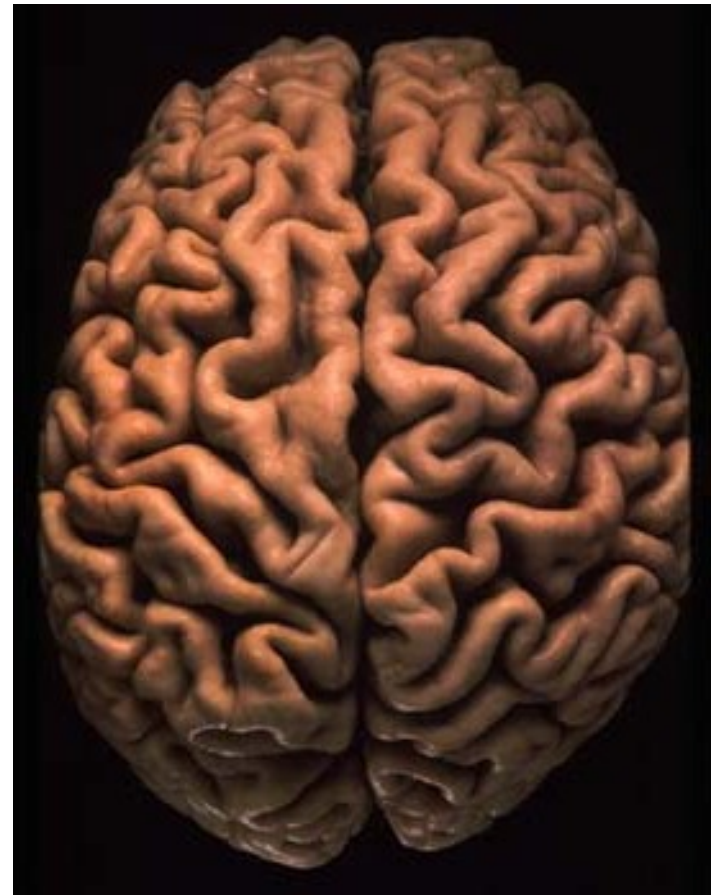
- (Negatively) Related to Behavioral Inhibition System (BIS)
- Low Serotonin related to depression and anxiety
- Ecstasy (the recreational drug) increases serotonin
 - Removes inhibition
- Prozac (the medical drug) also increases serotonin
 - reduces depression and anxiety

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

Neuro-anatomical Approach to Personality

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



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

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)

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.”

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

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)

Next Class

- Film: Body Doubles