Personality and Physiology

What is the relationship between personality and our physiology?

It appears to be a complex interaction between the brain, our bodies, and the environment.
The case of Phineas Gage

• Frontal Lobes help to inhibit the limbic system and appear to be implicated in what we call our “personality.”

• Galen & Hippocrates – Fluid Theory (phlegm, blood, yellow bile, & black bile)
• Early Greek philosophers had a profound impact on important western philosophers such as Immanuel Kant and Wilhelm Wundt.

• Physiological systems are relatively easy to measure and appear to be associated with some personality characteristics.
Sheldon’s Physiological Approach to Personality (1940)

- Ectomorph – skinny (thoughtful and introverted)
- Mesomorph – muscular (assertive and bold)
- Endomorph – fat (sociable and fun loving)

Research had significant bias issues!

The most significant issue in this area of research is building a theoretical bridge between physiology and personality.
There are different types of physiological parameters.

- Most use surface **electrodes** to detect activity
- Some use **telemetry** to transmit this activity
- The **autonomic nervous system**
  - Electrodermal activity/skin conductivity
  - Appears to be a relationship between skin conductivity and neuroticism/anxiety
– Heart rate/blood pressure
  • Inconvenience of measurement
  • **Type A Personality** (impatient, competitive, & hostile)

– Brain activity
  • EEG, evoked potential
  • fMRI (2003)
  • PET scans
– EMG
  • Relationship between muscle activity and personality

– Hormones (often measured by saliva analysis)
  • Testosterone
  • Cortisol (byproduct of adrenaline)
  • MAO (thrill seeking)
Physiologically based dimensions of Personality

• Extraversion –Introversion
  – Optimal level of arousal
  – Are there basic differences?
    • There are differences in arousability
    • I > E in terms of arousability
    • E > I in terms of need for a stimulating environment
      – E will seek out stimulation for themselves
    • E = I in the level of stimulation if given the opportunity to choose stimulation
• Sensitivity to Reward/Punishment
  – *Behavior Activating System* (BAS) – is responsive to incentives like cues for rewards and regulates *approach* behavior. They are vulnerable to unpleasant emotions including anxiety, fear and sadness. BIS is responsible for the personality dimension of *anxiety*.
  – *Behavior Inhibiting System* (BIS) – is responsive to cues for punishment, frustration and uncertainty. It increases inhibitory behavior or brings about *avoidance*. They are vulnerable to positive emotions and the ability of individuals with a reactive BAS to inhibit behavior decreases as he approaches a goal. BAS is responsible for the personality dimension of *impulsivity*, the inability to inhibit responses.
– Persons who are a bit introverted and highly neurotic are most prone to anxiety while persons at the other end of this continuum are seen as extraverted and emotionally stable.

– Persons who are highly extraverted and a bit neurotic are seen as the most impulsive while people at the other end of this continuum are introverted and emotionally stable.
• Persons with highly susceptible BIS tend to have anxiety attacks, fears, worry, depression, phobias, obsessions, and compulsion.

• Persons with highly susceptible BAS seek out interactions with others and more susceptible to positive emotions.

– Highly BAS individuals appear to work faster and are more accurate when rewards are used while BIS individuals appear to work faster and improve performance under punishment conditions.
• Sensation Seeking
  – The tendency to seek out thrilling and exciting activities, to take risks, and avoid boredom.
  – The study of *sensory deprivation* reveals individual differences related to personality characteristics.
    • Most appear motivated to acquire any sensory input, even if ordinarily such an input would be perceived as boring.

• Hebb’s *Theory of Optimal Level of Arousal* suggests that people are motivated to reach an optimal level of arousal. If they are underaroused, relative to this level, an increase in arousal is rewarding; conversely, if they are overaroused, a decrease in arousal is rewarding.
• Zuckerman identified *sensation seekers* as individuals who require a lot of stimulation to reach their optimal level of arousal, are the least tolerant of sensory deprivation, and find sensory deprivation to be particularly unpleasant.
  – Low sensation seekers were able to tolerate sensory deprivation better and for longer periods of time.
  – High sensation seekers have a need for high levels of stimulation in their daily lives.
  – There appears to be a relationship between sensation seeking and the individual’s neurotransmitters.
• Neurotransmitters and Personality
  – Monoamine Oxidase (degrades neurotransmitters)
    • Too much MAO and the individual has too little NT and nervous transmissions would diminish (lethargic). Low sensation seekers & too much inhibition.
    • Too little MAO and the individual has too much NT and nervous transmissions would increase (shaky). High sensation seekers & too little inhibition.
• What about the other neurotransmitters?
  – **Dopamine** (associated with pleasure, functions in the reward system, and is called the “feel good” chemical)
  – **Serotonin** (associated with depression, anxiety, & irritability) (SSRI’s allow serotonin to stay in synapse longer allowing individuals to feel less depressed, even in non-depressed individuals)
  – **Norepinephrine** (associated with activation of the autonomic nervous system and the fight or flight response)
Tridimensional Personality Model is a model that suggests that there is a complex interplay of these neurotransmitters.

- Novelty seeking – dopamine
- Harm avoidance – serotonin
- Reward dependence – norepinephrine

A good example of the complex interplay of neurotransmitters is alcoholism.

Some drink to seek novelty, some for pleasure boosting, some to relieve stress, some for harm avoidance, some for relief, and some because it is rewarding.
• All of the approaches with regard to genes and personality have common underlying basis in the biology of the nervous system.

• Morningness and eveningness
  – Tends to be stable over a lifetime
  – Is based on an individual’s circadian rhythms
  – While it is stable there is a gradual shift towards Morningness
    • Affects who can live together
    • Cognitive performance
    • Preferences

• Brain asymmetry and affective style
  – Studies suggest that the left hemisphere is more active than the right when an individual is experiencing unpleasant emotions and visa versa
  – May reflect an underlying biological disposition or trait
  – May also be related to the release of hormones like Cortisol.