

Physiology and Polygraph Components

Polygraph Components

- **Pneumograph assembly - respiration patterns and changes**
 - autonomic activity in thoracic/intercostal and abdominal muscles
 - also subject to voluntary activity (peripheral/somatic)
- **Blood pressure cuff - changes in blood pressure**
 - indicates adrenergic sympathetic activation
- **Electrodermal sensors - skin conductance (resistance)**
 - indicates cholinergic sympathetic activation
- **Movement sensor - movement / disruptive behavior**
 - peripheral/somatic muscle activity (behavioral efforts to disrupt the test outcome)

Cardiovascular Activity

- Regulated by both sympathetic and parasympathetic nervous systems
 - Sympathetic - norepinephrine - speeds the heart and increases contractility
 - Parasympathetic - acetylcholine - slows the heart and lowers blood pressure to baseline levels

Cardiovascular Activity

- Active coping tasks (e.g., mental arithmetic)
 - primarily beta adrenergic reactions
 - cardiac activation (vasoconstriction) and increased blood pressure
- Passive coping tasks (i.e., enduring)
 - primarily alpha adrenergic reactions
 - vasomotor activation (heart rate) and increased blood pressure

- Activated by Acetylcholine (not norepinephrine) in the sympathetic nervous system
- No parasympathetic neurons in the skin
- All activity represents sympathetic activation or resorption

Electrodermal Activity

Respiratory Activity

- Can be modified by autonomic or somatic nervous systems
- Chemoreceptors in brainstem (hypothalamus) monitor carbon dioxide
- Chemoreceptors in large vessels of heart monitor oxygen
- Stretch receptors in lungs monitor inflation

Respiratory Activity

- Easily brought under voluntary control
- Changes in respiration can produce changes in cardiovascular and electrodermal responses
- Must be monitored to determine whether to determine whether observed reaction are artifacts
- Very difficult to accurately mimic patterns of a truthful person while being deceptive

Somatic/Peripheral Activity

- Executed voluntarily in attempt to falsify or distort the recorded data pertaining to the sympathetic reactions
- Must be monitored to determine whether observed reactions are artifacts
- Absence of activity assures authenticity of sympathetic reactions
- Acetylcholine is activating neurotransmitter for peripheral nervous system (muscle) activity

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