

Physiology and Deception

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Physiology and Deception

- **Respiratory Activity**
 - Adrenergic (S/ANS) activation of the respiratory tract
 - Cholinergic (S/ANS) activation of thoracic/intercostal and abdominal muscles
 - Also subject to PNS (behavioral) activity
- **Cardiovascular activity**
 - Adrenergic (S/ANS) stimulation of cardiac functions
- **Electrodermal activity**
 - Cholinergic (S/ANS) activation of the sympathetic neurons in the skin

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Physiology

- **Peripheral (Nervous System** – behavioral
 - Major Muscle Activity
 - Discrete Muscle Activity
 - Voluntary Respiratory Activity
- **Autonomic Nervous System** - life maintaining
 - Sympathetic (autonomic) Nervous System
 - Cardiovascular activity
 - Electrodermal activity
 - Respiratory activity
 - Parasympathetic Nervous System

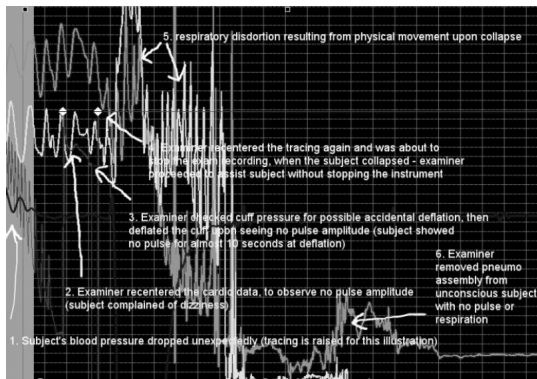
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Somatic/Peripheral Activity

- Faking – Acting
- Noncooperation and faking are correlated with lying
- Executed voluntarily in attempt to falsify or distort the recorded data pertaining to the sympathetic reactions
- Monitored to determine whether observed responses are ANS or ANS + PNS
- Absence of activity assures authenticity of ANS responses
- Acetylcholine is activating neurotransmitter for peripheral nervous system (muscle) activity

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Cardiac and Respiratory Failure



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Polygraph Theory

- Examinees will respond differently when trying to hide something (physiological arousal, emotional leakage, orienting responses)
- Pursuit of explanation to anomalous responses will lead to explanations and additional information regarding the target issues under investigation

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Cardiovascular Activity

- ***Sympathetic*** - norepinephrine - speeds the heart and increases contractility
 - Sympathetic demands are **workload** demands
 - Alpha Adrenergic (heart rate) – passive coping (enduring)
 - Beta Adrenergic (contractility) – active coping (mental math)
 - Delivers fuel to cells in brain, muscle, and organs
 - Oxygen
 - Adenosine Triphosphate (ATP)
 - Glycogen
 - Return CO₂ to lungs
 - Recycle/filter blood through Renal / hepatic system
- ***Parasympathetic*** - acetylcholine - slows the heart and lowers blood pressure to baseline levels

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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

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Respiratory Activity

- Normally regulated by Autonomic Nervous System (ANS)
 - Chemoreceptors in brainstem (hypothalamus) monitor carbon dioxide
 - Chemoreceptors in large vessels of heart monitor oxygen
 - Stretch receptors in lungs monitor inflation
- Thoracic/intercostal and Abdominal muscle groups are enervated by sympathetic Acetylcholine (not adrenaline)

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Respiratory Activity

- Can easily brought under voluntary control through attention Peripheral Nervous System (PNS) activity
- Voluntary changes in respiration can produce changes in cardiovascular and electrodermal responses
- Monitored to determine whether observed reaction are self-induced artifacts
- Impossible to accurately mimic the autonomic respiratory patterns of a truthful person

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Electrodermal Activity

- Monitored through eccrine (not apocrine) glands
 - Enervated by sympathetic Acetylcholine (not norepinephrine)
 - No parasympathetic neurons in the skin
 - All eccrine activity is sympathetic activity or resorbtion
- Thought to be a reflection of cholinergic activation of the sympathetic nervous system
 - Emotions – hypothalamus
 - Temperature
 - Reticular Activation System (RAS)
 - prefrontal cortex – enervated by acetylcholine

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Everything You Ever Wanted to Know About Sweating

- Eccrine glands located throughout the body
 - Denser concentrations in palms and feet
 - Enervated by Acetylcholine
 - Regulated in part by the Hypothalamus
- Apocrine glands located mainly in private areas
 - Cholinergic and hormonal (adrenergic) activation
 - Hair follicles
 - Foster production of bacteria (BO)
 - Thought to play a role in mating for some species
- Three main types of sweating
 - emotional sweating – fear and anxiety stimulate cholinergic activity in the hypothalamus
 - thermoregulatory sweating – hypothalamic acetylcholine signals
 - gustatory sweating – spicy food
- Sweating Disorder
 - Hyperhidrosis (Reynaud's)– excessive sweating (axillary or palmar)
 - Frey's syndrome – facial sweating in response to salivatory stim

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Physiology and Polygraph Components

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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)

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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

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Electrodermal Activity

- Measured through eccrine sweat glands
- Activated by Acetylcholine, not norepinephrine (adrenaline) in the sympathetic nervous system
- No parasympathetic neurons in the skin
- All activity represents sympathetic activation or resorption

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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

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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

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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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Thank You

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