

Measuring the Preconscious: Biometrics as a Measurement Tool

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Preconscious Neural Processing

- ▶ 350 milliseconds
 - ▶ Between the time you see something and the time you decide to react
- ▶ Another 150 milliseconds between the time you decide to react and the time you actually start moving to take action
- ▶ Often another 150 milliseconds or so before you become conscious that you are reacting
 - ▶ (Libet et al, 1983)

Biometric Measurement

- ▶ We start acting before we consciously decide to act
- ▶ Consciousness is the process of explaining to ourselves why we are doing what we already are doing
- ▶ Biometric Measurement is all about this 500-650 milliseconds between stimulus and conscious decisions and actions.

Why Biometrics Matter: Understanding Human Decision-Making

- ▶ 1950s: Cognitive Dissonance (Festinger, 1957)
 - ▶ Contrary to theory of marketplace of ideas, humans avoid information that clashes with existing beliefs
- ▶ 1960s-1980s: Tools developed that allowed neuroscientists to map the brain
 - ▶ Including areas of the brain used to process emotions and those used to reason

Why Biometrics Matter: Understanding Human Decision-Making

- ▶ Recent research shows most people begin processing complex dilemmas in emotional centers of the brain
 - ▶ A subset moves the decision-making to rational centers of the brain
 - ▶ Those who keep decision processes in the emotional centers of the brain tend to produce more “conservative” decisions

Why Biometrics Matter: Understanding Human Decision-Making

- ▶ Priming emotional responses affects moral decisions
 - ▶ Disgust, uncleanness, fear/anxiety lead to more politically conservative decisions
- ▶ Subliminal Priming is highly effective
 - ▶ Once an emotional association is established, it is hard to overturn (Zajonc)

Types of Biometric Measurement:

Observable Behavior Measures

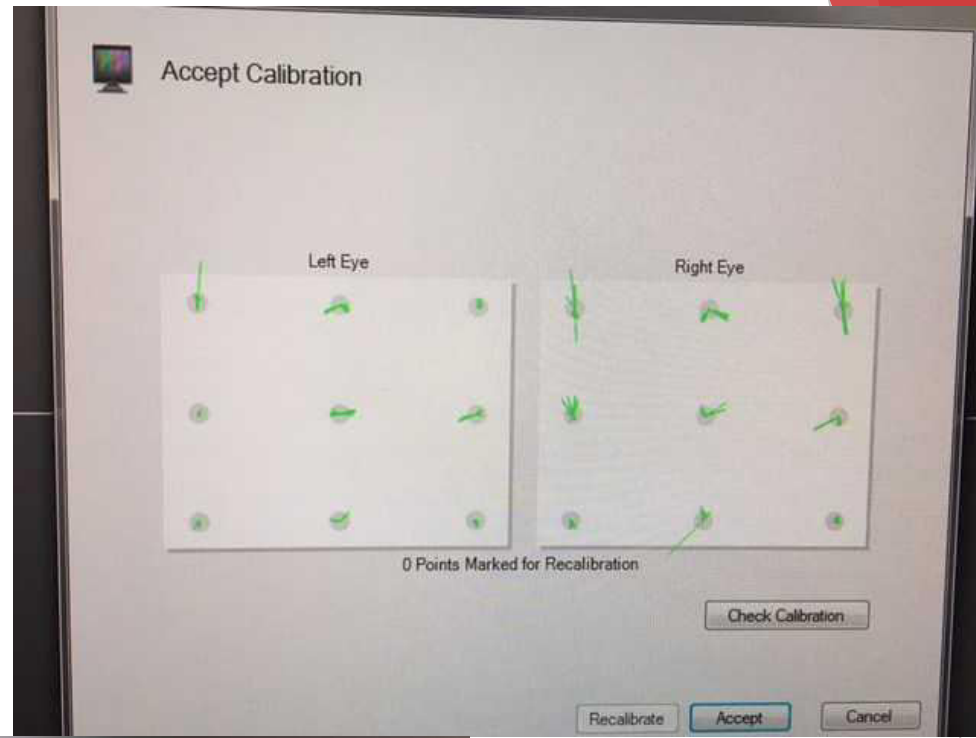
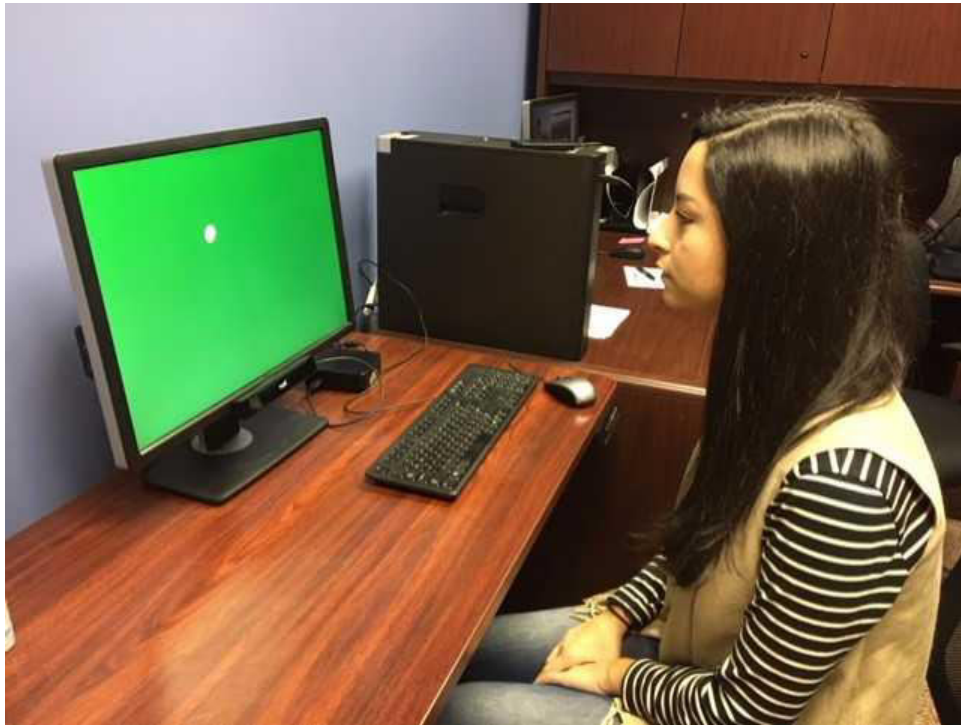
- ▶ Implicit Response Measurement
 - ▶ Showing people something such as a product or brand and asking them to press a button that links an emotion to that item
- ▶ Facial Coding
 - ▶ Using cameras and software to capture and code unconscious facial micro-expressions following a stimulus

Types of Biometric Measurement:

Observable Behavior Measures

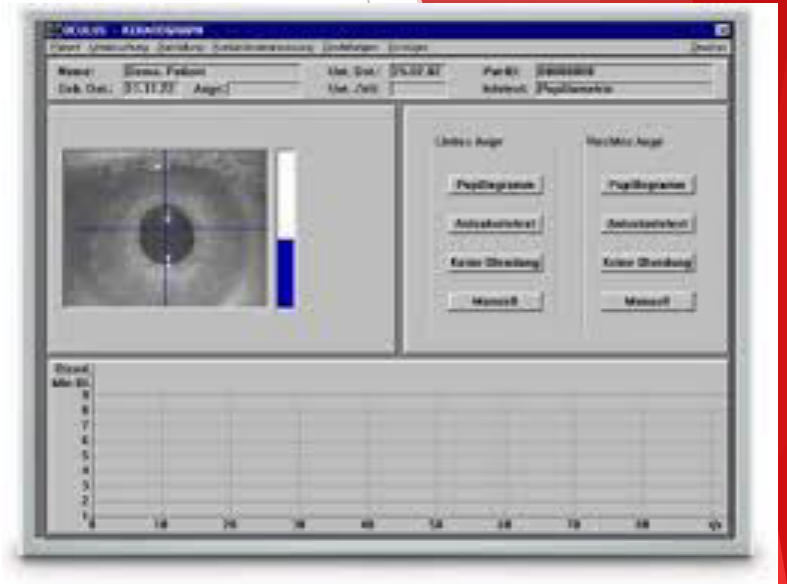
- ▶ Eye Tracking

- ▶ Use of cameras and software to track eye movement around content. Measures whether people are noticing things unconsciously

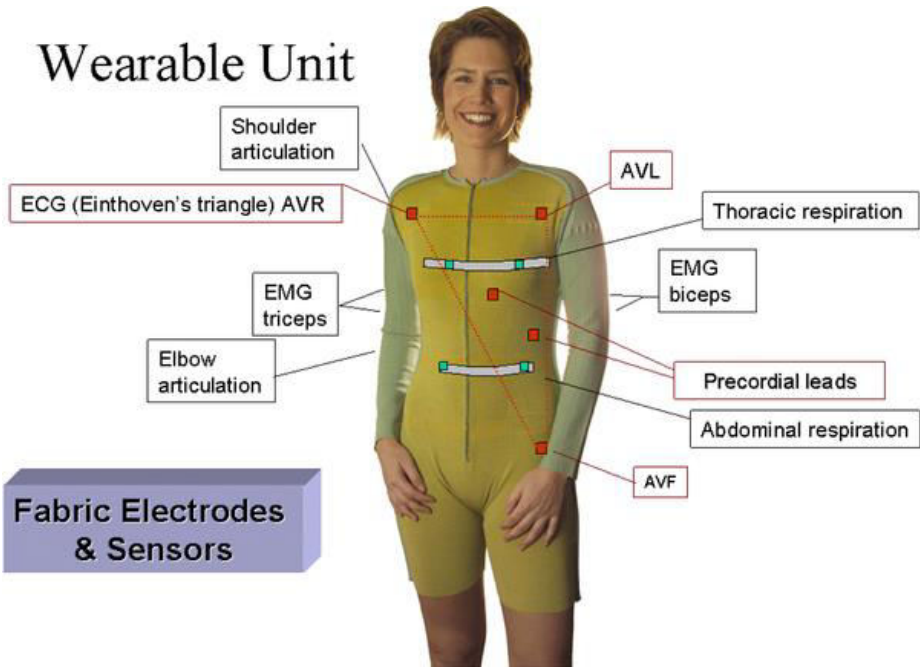


Types of Biometric Measurement: Autonomic Nervous System Measures

- ▶ Pupilometry
 - ▶ Measuring changes in the size of the pupil in response to emotionally charged or cognitively loaded stimuli
- ▶ Skin Conductance
 - ▶ Measures electrodermal changes or “galvanic skin response”
 - ▶ Effective measure of arousal, stress, and emotional engagement
- ▶ Heart Rate/Respiration
 - ▶ Measures changes in the frequency and variability of the heart rate
 - ▶ Provides robust measure of variations in arousal or engagement



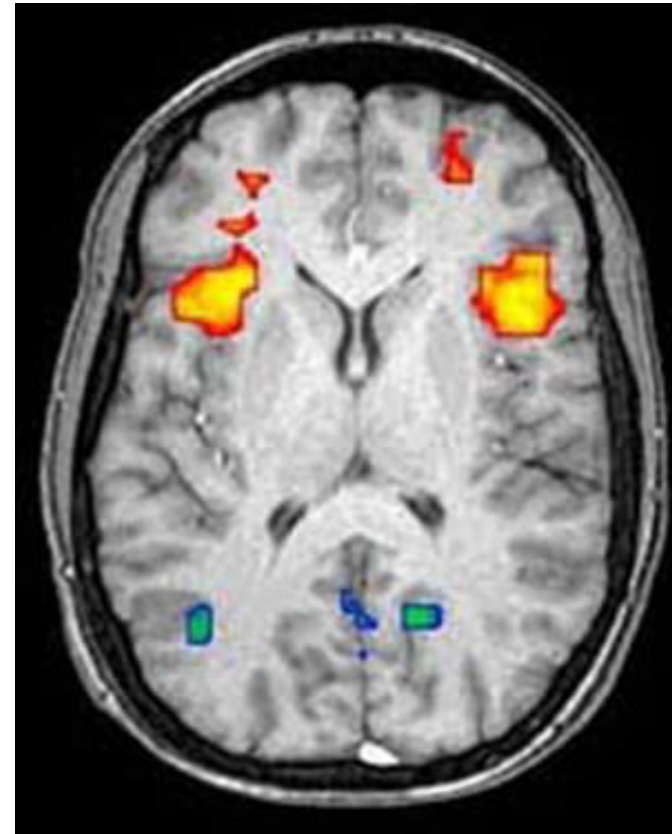
Wearable Unit



Types of Biometric Measurement: Brain Physiology

- ▶ Functional Magnetic Resonance Imaging (fMRI)
 - ▶ Identifies levels of oxygenation in different regions of the brain, linked to activity
 - ▶ Limitations: time, expense of use; limitation of activities that can be measured; lag time before brain activity rises to fMRI measurable level; lack of temporal ability to measure scene by scene response

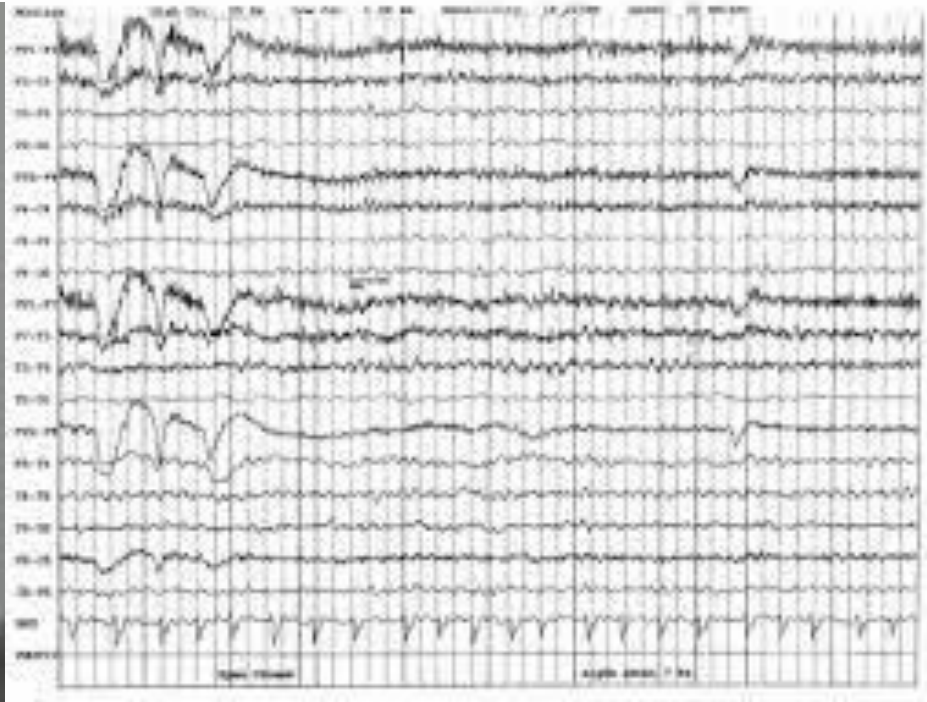
fMRI



Types of Biometric Measurement: Brain Physiology

- ▶ Electroencephalography (EEG)
 - ▶ Measures brain waves flowing between cells
 - ▶ Samples at a rate of hundreds of times per second so permits scene-level response measurement
 - ▶ Task-related changes occur on a sub-second time scale
 - ▶ Limitations: cannot pinpoint the sources of the signals to particular brain structures
 - ▶ Cheaper than fMRI but must be done in lab with highly experienced staff

EEG



Summary

- ▶ Neural imagery of brain activity have been found to be more closely associated with:
 - ▶ Higher than average sales-lift
 - ▶ Higher numbers of call-center responses
 - ▶ Increased television ratings
 - ▶ Increased program-related Twitter activity
- ▶ Correlations with brain activity measures higher than with post-exposure subjective response ratings of content
- ▶ Neuroscience and biometric measurements make increased communication effectiveness - and subliminal manipulation for marketing and other purpose plausible

The background features a white central area with red geometric shapes on the left and right sides. The shapes are composed of overlapping triangles and polygons in various shades of red, creating a modern, abstract design.

Thank you!

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