Emotional Sequelae

what happens during emotions

Experience, Communication, and Measurement

We can measure discrete or valence

Self-Report Measures

- In essence, the participant reports their internal feelings
- Here, we are interested in emotions
  - Shorter duration (seconds to, at most, minutes)
  - Generally more intense
  - Usually linked to a specific event
- Not moods
  - Longer duration
  - In normal range, less intense
  - Moods do not have the “aboutness” of emotions

Early research looked at discrete emotions

- For example, the
  - Multiple Affect Adjective Checklist (MAACL)
    - 132 adjectives that people rate on a 4-point Likert scale
  - Profile of Moods States (POMS)
    - 65 adjectives rated on a 5-point Likert scale
- The specific affect scales were found to be largely inter-related!
  - People reporting happiness also reported amusement
  - People reporting sadness also reported anxiety and anger

inversely related
↑+ ↓−

같이느끼는 감정들이 많다

Helped lead to 2-factor theory of emotion – remember?

Russell, 1980

Label relevant axes:

= monopolar

= bipolar

Watson & Tellegen, 1985

Starting in 1980s

- Watson & Tellegen model became relatively dominant (well, see who wrote the chapter!)
- Negative and positive affect are WEAKLY correlated with eachother, when using the Positive and Negative Affect Schedule (PANAS) questionnaire

The PANAS

Positive and Negative Affect Scale (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

___ interested
___ distressed
___ excited
___ upset
___ strong
___ guilty
___ scared
___ hostile
___ enthusiastic
___ proud

___ irritable
___ alert
___ ashamed
___ inspired
___ nervous
___ determined
___ attentive
___ jittery
___ active
___ afraid

What the article reviews

(we will not cover everything)

- The major and most widely used measures – those with best reliability and validity
  - Mood Adjective Checklist (MACL)
  - Multiple Affect Adjective Checklist (MAACL & MAACL-R)
  - Profile of Mood States (POMS)
  - Positive and Negative Affect Schedule (PANAS & PANAS-X) larger scale
  - Differential Emotions Scale (DES; not reviewed in lecture – poor reliabilities)
  - Self-Assessment Manikin (SAM; amazingly not included in chapter)
- A few additional, more recent measures with certain advantages
  - Affect Grid
  - UWIST Multiple Adjective Checklist (UMACL)
  - Current Mood Questionnaire (not reviewed in lecture; some concerning reliabilities)

PANAS-X

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ cheerful	_____ sad	_____ active	_____ angry at self
_____ disgusted	_____ calm	_____ guilty	_____ enthusiastic
_____ attentive	_____ afraid	_____ joyful	_____ downhearted
_____ bashful	_____ tired	_____ nervous	_____ sheepish
_____ sluggish	_____ amazed	_____ lonely	_____ distressed
_____ daring	_____ shaky	_____ sleepy	_____ blameworthy
_____ surprised	_____ happy	_____ excited	_____ determined
_____ strong	_____ timid	_____ hostile	_____ frightened
_____ scornful	_____ alone	_____ proud	_____ astonished
_____ relaxed	_____ alert	_____ jittery	_____ interested
_____ irritable	_____ upset	_____ lively	_____ loathing
_____ delighted	_____ angry	_____ ashamed	_____ confident
_____ inspired	_____ bold	_____ at ease	_____ energetic
_____ fearless	_____ blue	_____ scared	_____ concentrating
_____ disgusted with self	_____ shy	_____ drowsy	_____ dissatisfied with self

PANAS-X Scoring

Table 2 *Item Composition of the* PANAS-X *Scales*

General Dimension Scales	
Negative Affect (10)	afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, distressed
Positive Affect (10)	active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, strong
Basic Negative Emotion Scales	
Fear (6)	afraid, scared, frightened, nervous, jittery, shaky
Hostility (6)	angry, hostile, irritable, scornful, disgusted, loathing
Guilt (6)	guilty, ashamed, blameworthy, angry at self, disgusted with self, dissatisfied with self
Sadness (5)	sad, blue, downhearted, alone, lonely
Basic Positive Emotion Scales	
Joviality (8)	happy, joyful, delighted, cheerful, excited, enthusiastic, lively, energetic
Self-Assurance (6)	proud, strong, confident, bold, daring, fearless
Attentiveness (4)	alert, attentive, concentrating, determined
Other Affective States	
Shyness (4)	shy, bashful, sheepish, timid
Fatigue (4)	sleepy, tired, sluggish, drowsy
Serenity (3)	calm, relaxed, at ease
Surprise (3)	amazed, surprised, astonished

Note. The number of terms comprising each scale is shown in parentheses.

See book for alpha-reliabilities, but all quite good (especially those with more questions)

The PANAS

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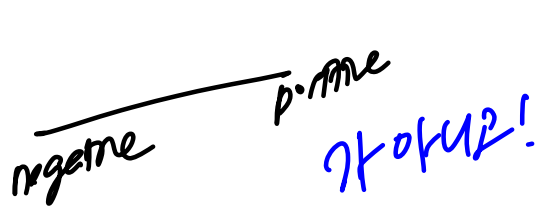
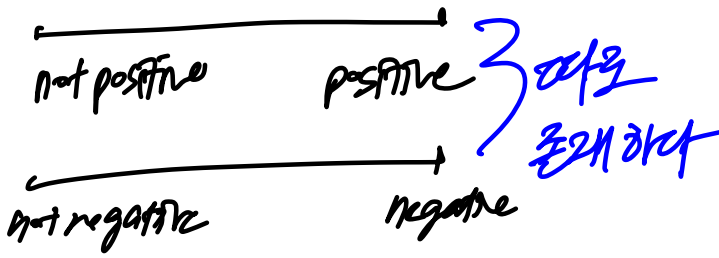
___ guilty
___ scared
___ hostile
___ enthusiastic
___ proud

___ irritable
___ alert
___ ashamed
___ inspired
___ nervous
___ determined
___ attentive
___ jittery
___ active
___ afraid

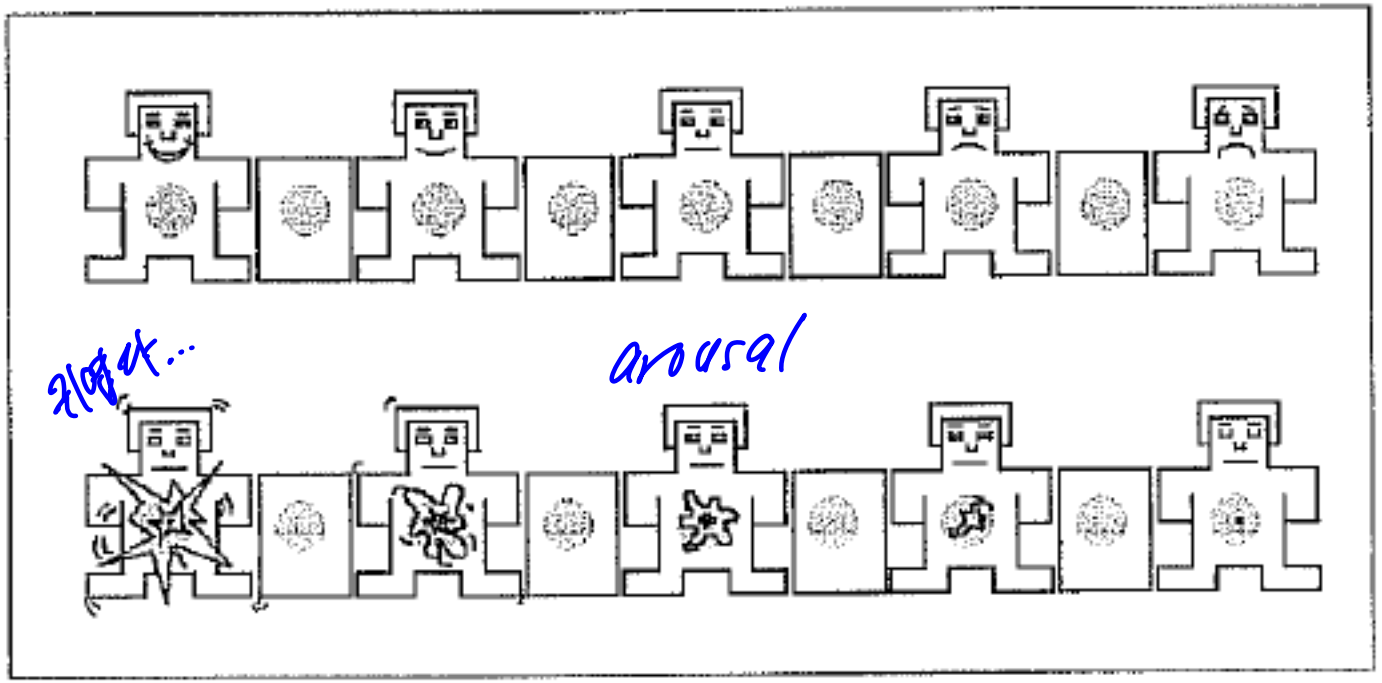
PANAS





- A measure of Positive and Negative Affect (monopolar constructs)
  - Two scales are orthogonally related
- Instructions can be varied
  - How do you feel right now?
  - How have you felt in the past week?
  - How do you generally feel?
- Also, peer reports: “Indicate to what extent your partner generally feels this way.” (note trait paradigm)
- Excellent internal consistency and discriminant validity

Self-Assessment Manikin (SAM)



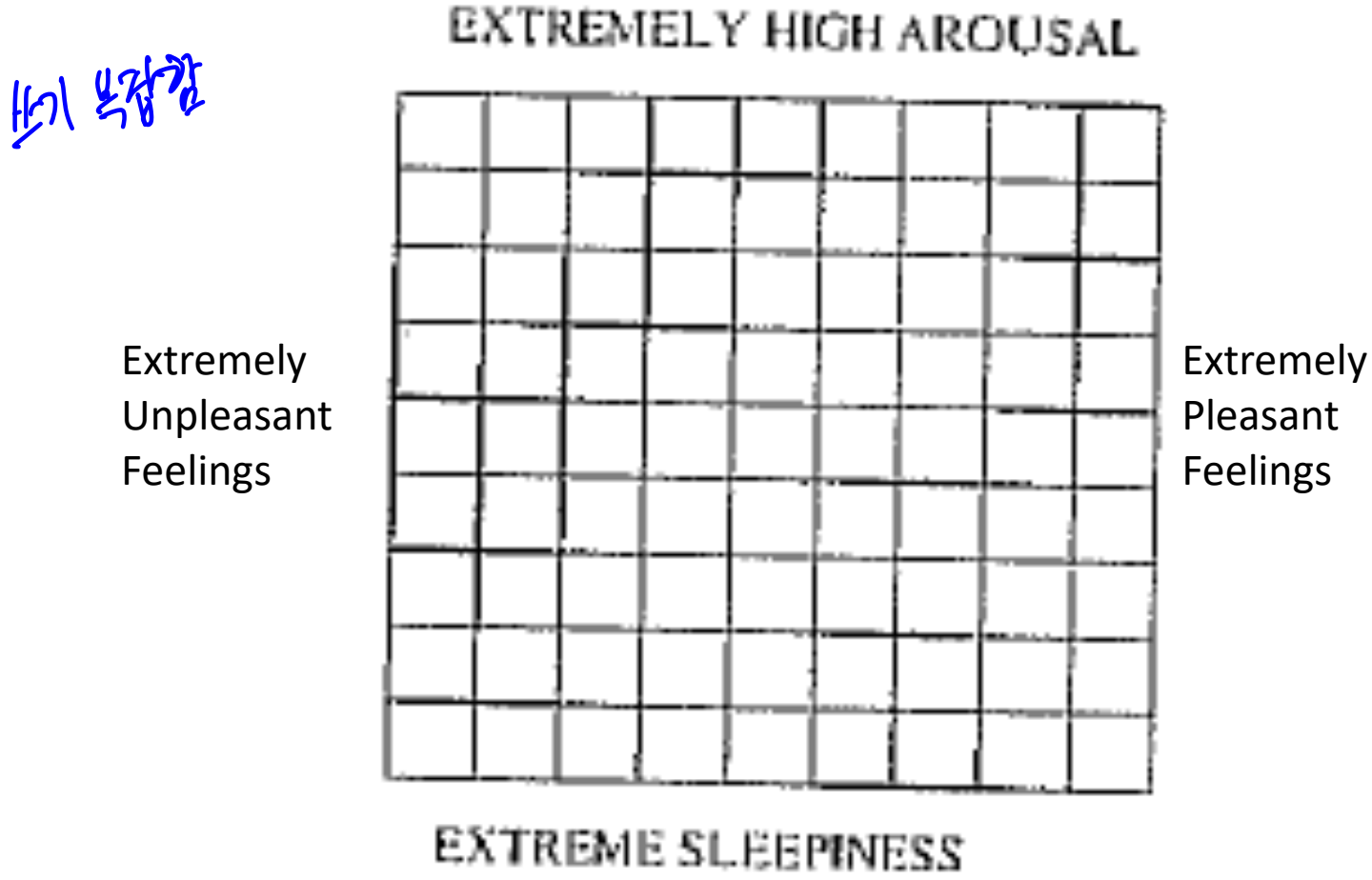
Scoring: 9 8 7 6 5 4 3 2 1

SAM

- EXTREMELY POPULAR!
- Useful:
  - When a very brief measure is required
  - In detecting frequent short-term changes in emotion
  - In studies that require a manipulation check
- But . . .
  - Can't test for internal consistency using a single-item scale
  - May have larger systematic or random error associated with it?

Affect Grid

9x9



Assessment of Facial Expression

- Facial expression assessment is crucial to emotions research
  - Part of "triumvirate" – self-report, facial, ANS
- Essential to leading theories of emotion
- There are a # of observer-based assessment methods
  - By far the most prominent is simply have 2-3 raters rate facial expressions on valence (negative to positive)

Facial Action Coding System (FACS)

- By far the most exhaustive and reliable
- Raters view videotapes of faces in slow motion
- Code facial expressions, which are decomposed into Action Units (AUs)
  - AUs are the smallest visually discriminable facial movements
- FACS does *not* tell you what a movement means, simply that it exists
  - That said, there is much literature available regarding the AUs associated with particular facial expressions

Conceptual Issues

- FACS measures "sign vehicles" – in essence, they describe:
  - The surface of behavior
    - Count how many times a face moves a particular way
    - How long a movement lasts
    - intensity

그냥. 웃는 표정을 짓는지

- Does not make "judgments" – making inferences behind the facial expression
  - Again, however, AUs have been related to specific facial expressions

Please note . . .

- That for facial *judgments* to be made, the face is simply input
- The focus is on the *receiver* of the message (i.e., the observer of the face)
  - How good is the receiver at detecting messages?
  - What is the observer's Least Noticeable Difference?
  - How quickly can the person form judgments?

Facial Sign Vehicles

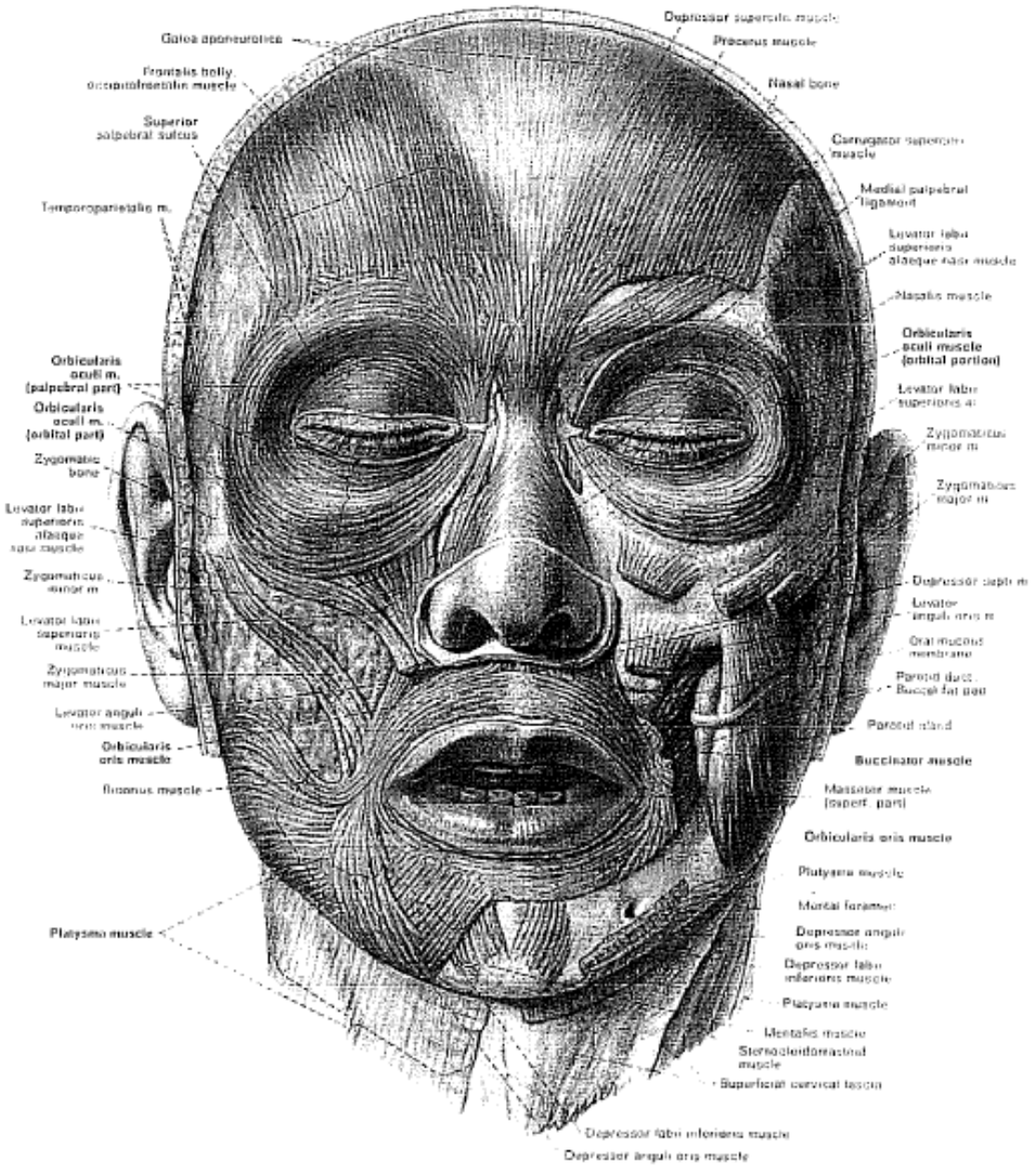
how well someone communicates *

- For Facial *Sign Vehicles*, the face is the output.
- Can then ask specific questions
  - How are AUs different between real and fake smiles?
  - How does AU contraction change during development? Across cultures?
  - Do autonomic changes correspond to specific AU contractions?
    - FFH

+ sign judgement: 내가 얼마나 잘 인식 하는지

Action Units

- With few exceptions (defects), all people have same facial muscles
  - 43 of them control facial expressions
- Ekman and Friesen began by stimulating muscles
  - Later learned to contract them voluntarily
- AUs were included only if they could be reliably distinguished from the contraction of other muscles
  - If two different muscles "looked the same," they were collapsed into the same AU
  - 27 AUs for facial expression (9 upper face, 18 lower face)


Galea aponeurotica
Frontalis belly occipitofrontalis muscle
Superior palpebral sulcus
Temporoparietalis m.
Orbicularis oculi m. (palpebral part)
Orbicularis oculi m. (orbital part)
Zygomatic bone
Levator labii superioris alaeque nasi muscle
Zygomaticus minor m
Levator labii superioris muscle
Zygomaticus major muscle
Levator anguli oris muscle
Orbicularis oris muscle
Risorius muscle
Platysma muscle
Depressor supercilii muscle
Procerus muscle
Nasal bone
Corrugator supercilii muscle
Medial palpebral ligament
Levator labii superioris alaeque nasi muscle
Nasalis muscle
Orbicularis oculi muscle (orbital portion)
Levator labii superioris al
Zygomaticus minor m
Zygomaticus major m
Depressor septi m
Levator anguli oris m
Oral mucous membrane
Parotid duct
Buccal fat pad
Parotid gland
Buccinator muscle
Masseter muscle (superf. part)
Orbicularis oris muscle
Platysma muscle
Mental foramen
Depressor anguli oris muscle
Depressor labii inferioris muscle
Platysma muscle
Mentalis muscle
Sternocleidomastoid muscle
Superficial cervical fascia
Depressor labii inferioris muscle
Depressor anguli oris muscle

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Head and Eye Positions

- Largely ignored, but . . .
- Important!
  - Embarrassment: Smiling (AU 12) increases as head pitches forward and then decreases as head pitches back
  - Contempt: AU 14 with eye gaze to side

AUs can be additive or nonadditive

- In additive, appearance of each AU is independent
  - E.g., surprise is AU 1, 2, and 5
- In nonadditive, the appearance of one AU influences another
  - E.g., sadness is AU 1 + 4
    - AU 1 alone pulls inner eyebrows upward
    - AU 4 alone pulls inner eyebrows together and downward
    - AU 1 + 4 raises inner eyebrows and pulls them together

Scoring AUs

- Comprehensive (all AUs are assessed)
  - Takes ~100min per minute of videotape (rated frame-by-frame, ~30 frames/s)!
- Selective (pre-determined AUs are assessed)
  - Quicker!
  - Null results are suspect; did investigator choose "correct" AUs?
- Presence/Absence versus Intensity
  - Coded 0 vs 1, or A (trace) to E (extreme)
  - Selection may depend on research question
    - E.g., contempt facial expressions indicative of poor relationships/divorce (Carstensen et al., 1985)
    - *Degree* of pain may be better measured via intensity (Deyo et al, 2004)

Training

- May be done alone or, preferably, within a group with an expert leader
- Without an expert, thought to take about ~300-400 hours of training
- Take a certification test to demonstrate mastery

Electromyography (EMG)

- Very useful for assessing valence
  - Positive (zygomatic muscle activity)
  - Negative (corrugator muscle activity)
- Pros:
  - Objective
  - Efficient
- Cons:
  - Limited to short time durations
  - Not discrete (valence only)

Electromyography (EMG)

good for first check

- Pros:
  - Objective
  - Efficient
- Cons:
  - Limited to short time durations
  - Not discrete (valence only)

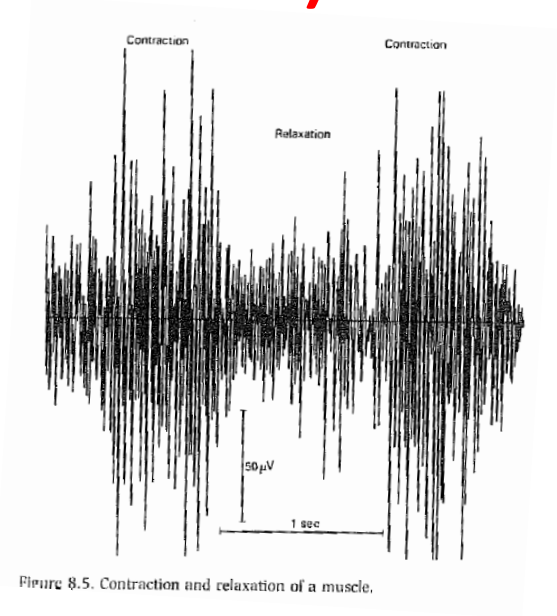


Figure 8.5. Contraction and relaxation of a muscle.

Note: EMG gets averaged out over longer periods (e.g., films). May be better for relatively discrete events . . .

Startle (Briefly)

- Startle is the amount of orbicularis oculi contraction in response to a sudden-onset, high-decibel noise (typically behind your head)

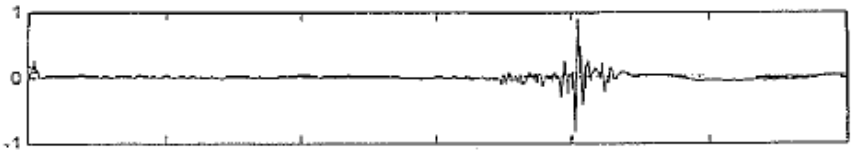
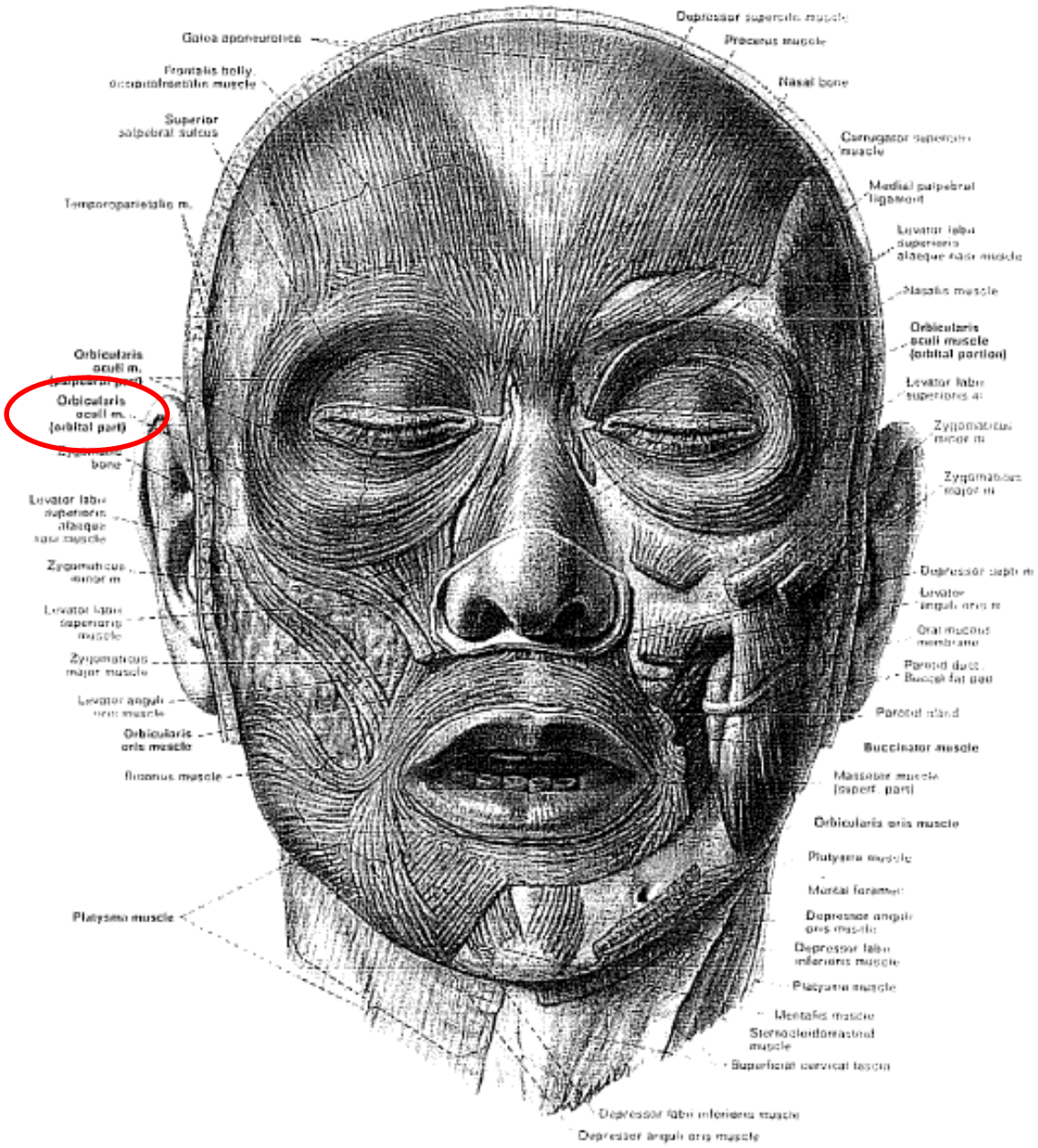


Figure 8.1. An example of the startle reflex. This figure shows an electromyogram (EMG) recorded from below the eye with the occurrence of a startle probe. In order to quantify the response, this signal would be rectified (all the negative values would be made positive) and integrated (the area under the curve would be computed).

- Sensitive to valence:
  - Negative affect: Increased contraction
  - Positive affect: Decreased contraction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Orbicularis oculi m. (orbital part)
bone
Levator labii superioris alaeque nasi muscle
Zygomaticus minor m
Levator labii superioris muscle
Zygomaticus major muscle
Levator anguli oris muscle
Orbicularis oris muscle
Risorius muscle
Platysma muscle
Depressor supercilii muscle
Procerus muscle
Nasal bone
Corrugator supercilii muscle
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Nasalis muscle
Orbicularis oculi muscle (orbital portion)
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Zygomaticus major m
Depressor septi m
Levator anguli oris m
Oral mucous membrane
Parotid duct
Buccal fat pad
Parotid gland
Buccinator muscle
Masseter muscle (superf. part)
Orbicularis oris muscle
Platysma muscle
Mental foramen
Depressor anguli oris muscle
Depressor labii inferioris muscle
Platysma muscle
Mentalis muscle
Sternocleidomastoid muscle
Superficial cervical fascia
Depressor labii inferioris muscle
Depressor anguli oris muscle

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Psychophysiological Recording

- Important!
  - Part of the multicomponent process of emotion
- Helps to avoid fallibility of self-report
  - Some may err
  - Social desirability issues
- May identify how multicomponent processes diverge
- May help identify aberrant patterns underlying psychopathology

Which part was recorded?

자기가 기분 좋았었나?

okay if people don't feel anything in particular

ANS으로 알 때다

└ sociopaths are very good @ communicating emotions w/ very little physio.

Electrodermal Activity (EDA)

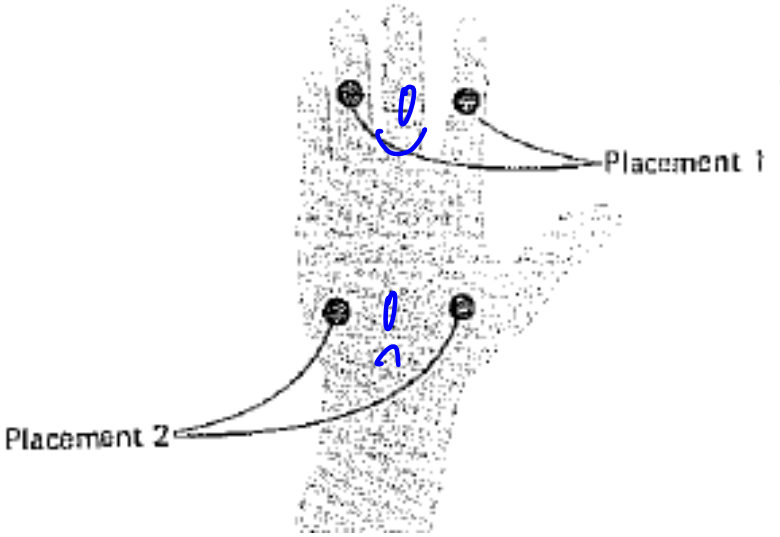
- Perhaps most widely used psychophysiological parameter
- Body covered in sweat glands to help regulate body temperature
- "Eccrine" sweat glands on palms of hands, however, provide moisture to improve grasping (?)
  - More prone to emotional provocation than thermal stimuli

EDA

- Two electrodes placed on surface of skin
- Small current passed between two electrodes
- When sweat fills the pores, there is more of a conductive path along the normally electrically resistant outer skin.
- Follows Ohm's law: Voltage (V) = Resistance (R) * Current (I)
  - Used to be measured as resistance (Ohms) and is now measured (more intuitively) as conductance (Siemens)

Placement of electrodes

- Fill electrodes with electrode past most similar to human sweat (0.05 NaCl)



SCR Data – What are the primary variables?

- Skin Conductance Responses (SCRs) – perturbations off sweat response; defined as .05 mS increase conductance
  - May measure # of increases
  - And/or magnitude of increases
- Skin Conductance Level (SCL) – tonic level of skin conductance, averaged across all events

Data – what do they look like?

- DIFFERENCE between SCR and SCL.

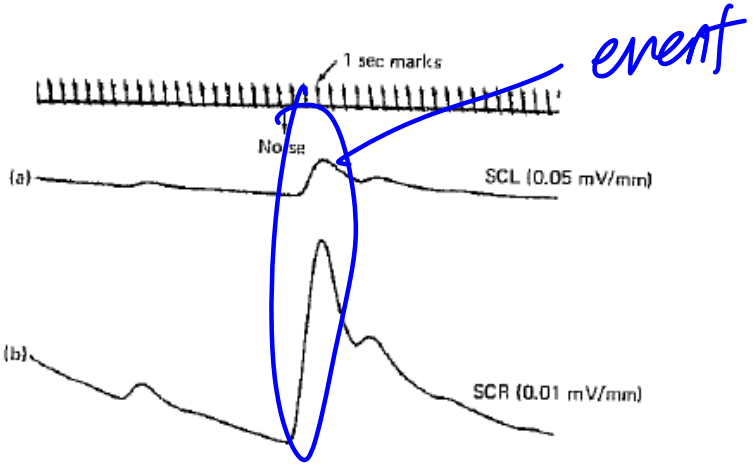


Figure 13.4. A simultaneous recording of SCL (a) and SCR (b) to a n

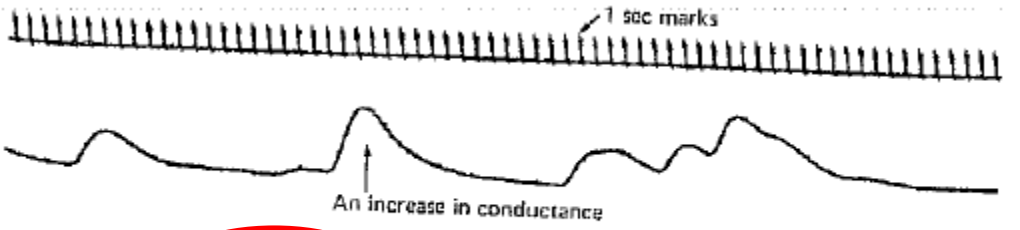
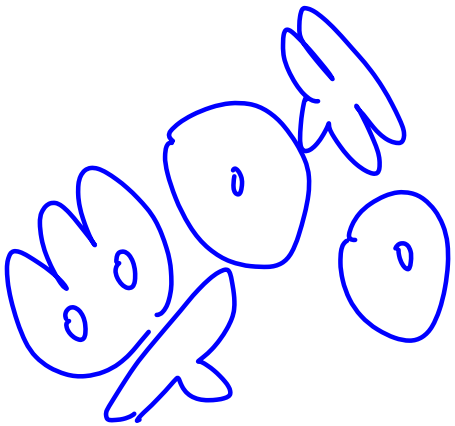


Figure 13.5. Spontaneous skin conductance activity.

What does EDA measure?

- Sweat from the eccrine sweat glands, which is:
  - Entirely controlled by the sympathetic nervous system!
- Thus,
  - SCL = tonic sympathetic activation
  - SCR = phasic sympathetic activation

arousal



What does EDA respond to?

- Emotion
- Temperature
- Novelty
- Noise
- Attentional Capture
- Effort
- Almost everything!
  - The SNS is constantly being modulated by environmental demands

Thus . . .

- It’s critical to:
  - Control as tightly as possible as many variables as possible (temperature, difficulty between tasks, etc.)
  - Interpret data cautiously

Examples of research

- SCR increases as IAPS arousal level increases (Greenwald et al., 1989)
  - Regardless of valence (positive, negative > neutral)

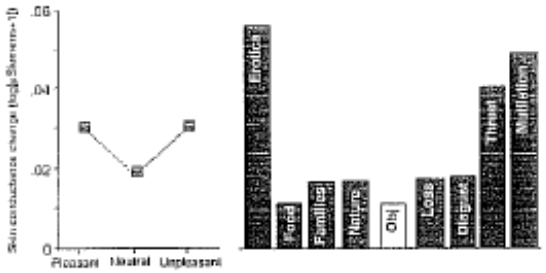


Figure 2.7. Skin conductance activity for sets of IAPS pictures selected on the basis of normative ratings of pleasure (left panel) and for specific picture contents (Bradley, Codispoti, Cuthbert, & Lang, 2001).

- Manning & Melchiori (1974) evidenced same pattern using words

SCRs are the basis of the Somatic Marker's Hypothesis

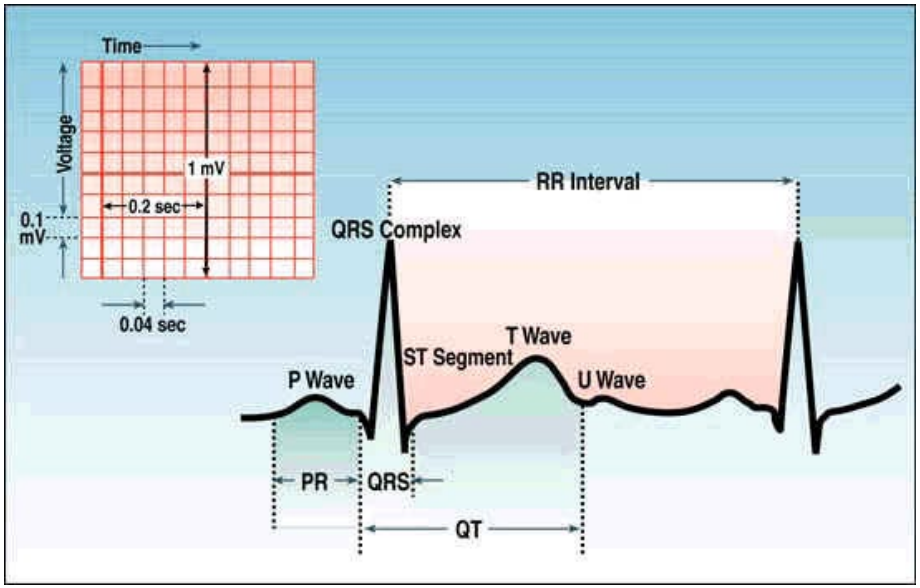
- People respond correctly prior to knowing what is correct! Why?
  - Bodily response cues.

Electrocardiogram (ECG or EKG)

- Can be used to get a measure of HR (bpm)
  - Or IBI (inverse of HR, measures in ms)
- Please not that HR is controlled by
  - SNS (sympathetic fibers releasing NOR)
  - PNS (vagus nerve releasing ACh)
    - It is non-specific!
- Respiratory Sinus Arrhythmia (RSA) or Heart Rate Variability (HRV)
  - A discrete measure of parasympathetic activation

EKG

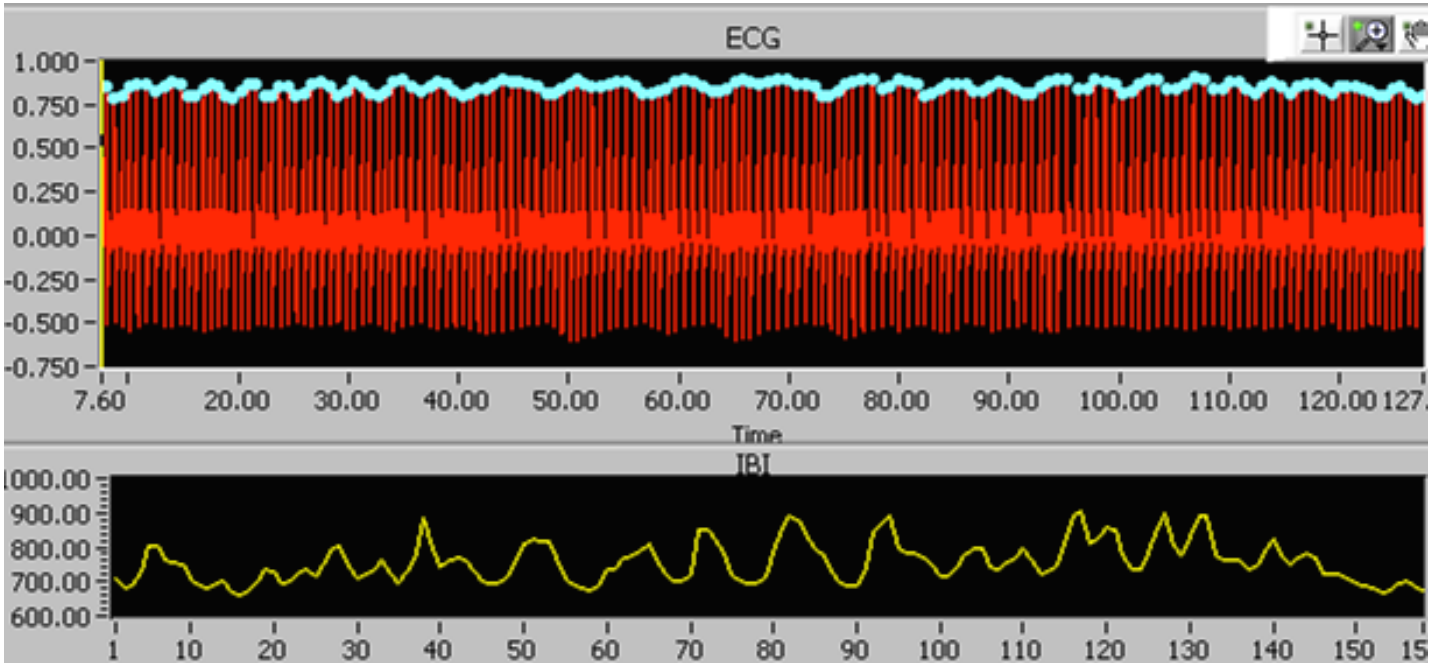
- ECG data collected at standard thoracic sites
  - R-waves are detected and IBIs computed
  - Can achieve measure of HR or IBI



HR or IBI

- May be quantified from EKG data

may be masked by respiratory sinus arrhythmia

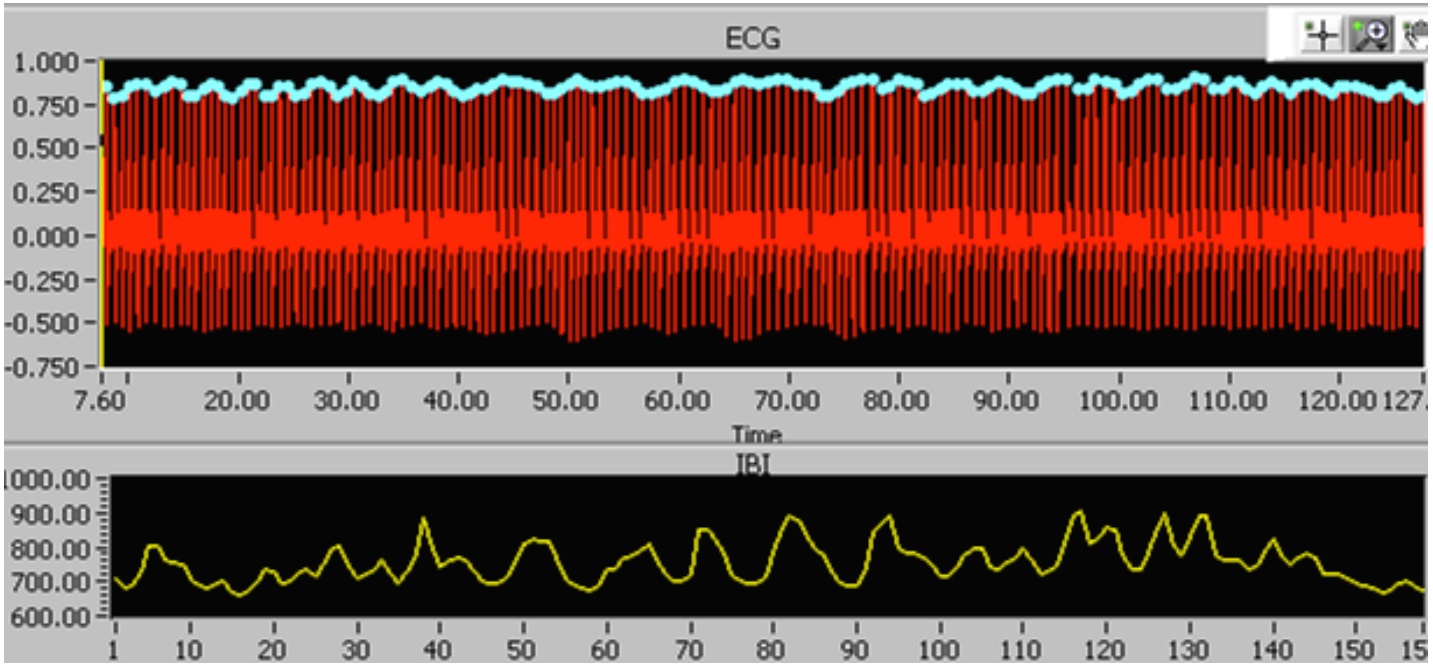


What about parasympathetic influences?

- Important to assess both sympathetic and parasympathetic branches
- SNS and PNS may act reciprocally (as expected), but often they may co-activate!

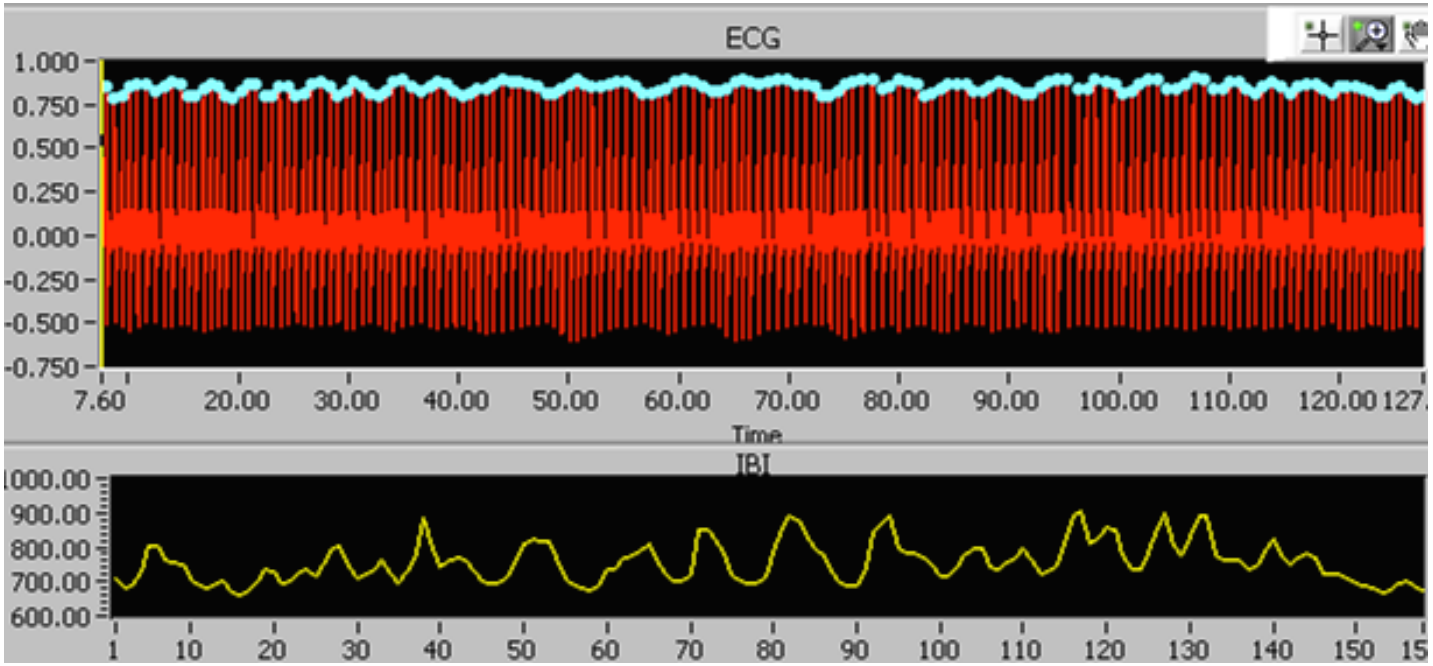
Cardiac Vagal Control

- May be indexed by Respiratory Sinus Arrhythmia (RSA)



Cardiac Vagal Control

- Notice how HR/IBI changes as an apparent result of respiration! This is well-known, and is completely controlled by the PNS!

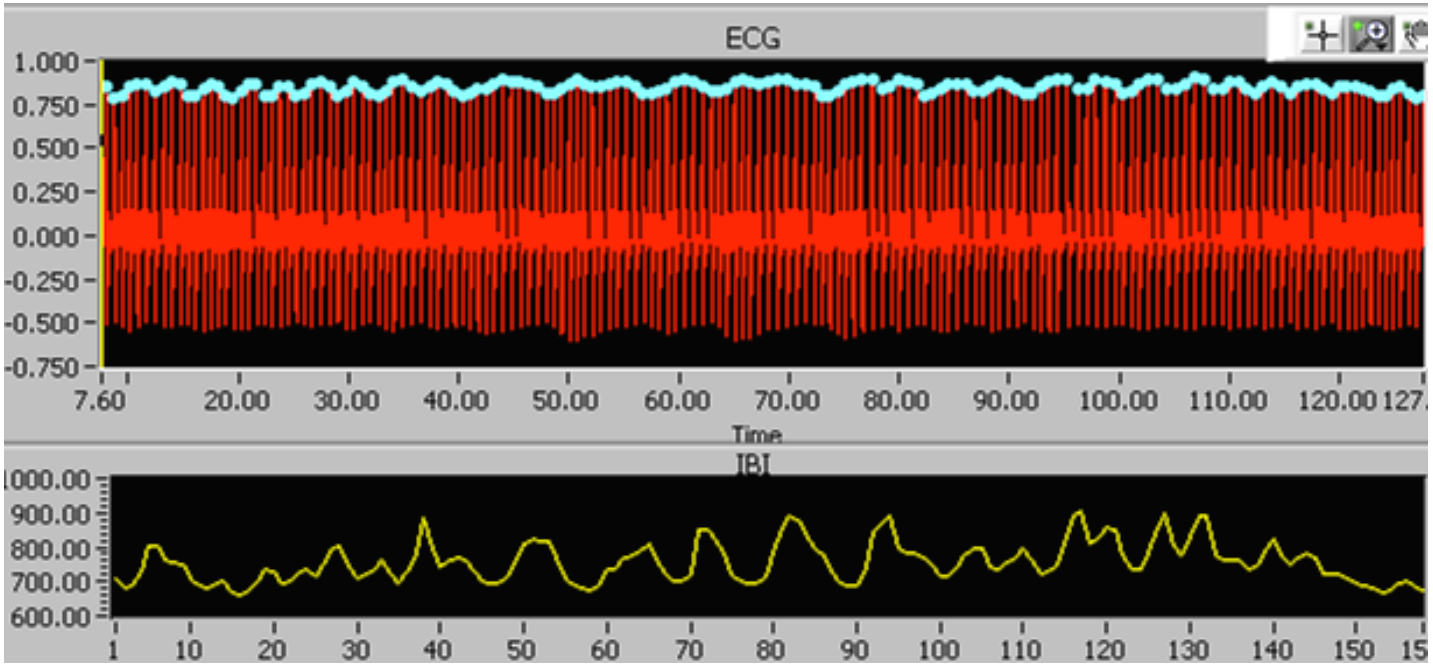


Cardiac Vagal Control (con't)

- IBI series may be submitted to Fast Fourier Transformation to calculate RSA
  - Essentially quantifies the degree to which HR changes within a "moving window" of .15-.40Hz (cycles/sec)
  - Corresponds to ~9-24 respiratory cycles/minute

Cardiac Vagal Control

- RSA is completely abolished with the administration of atropine, a potent ACh antagonist!

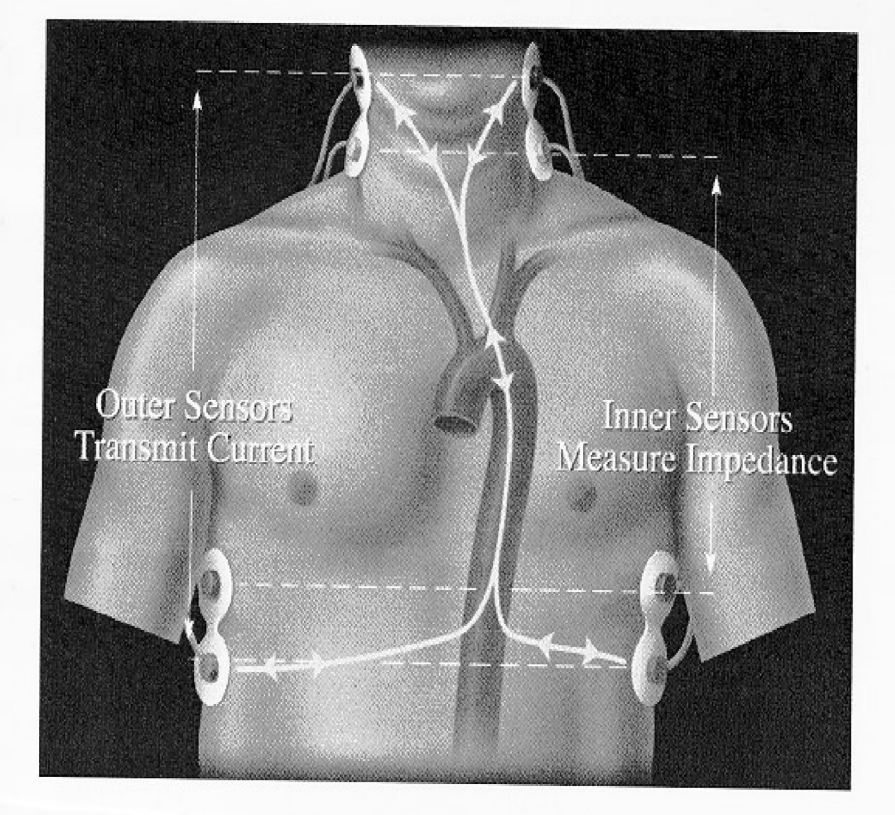


RSA

- Thought to reflect adaptability to changing environmental demands
  - High RSA → Greater behavioral flexibility ad greater self-regulation
  - Low RSA → Worse self-regulation and prone to affective disorders

Measures: Physiological

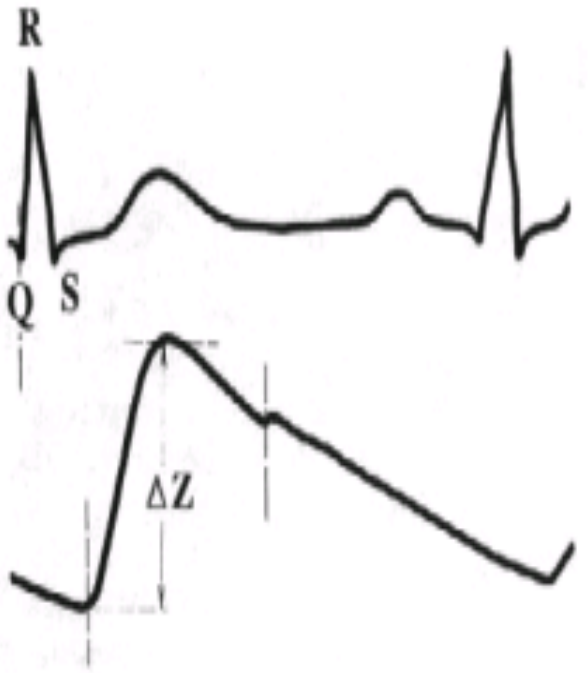
- Impedance Cardiography (IC)



Pre-ejection period (PEP)

- The most sensitive non-invasive measure of cardiac sympathetic control
  - Berntson et al., 1994; Cacioppo et al., 1994

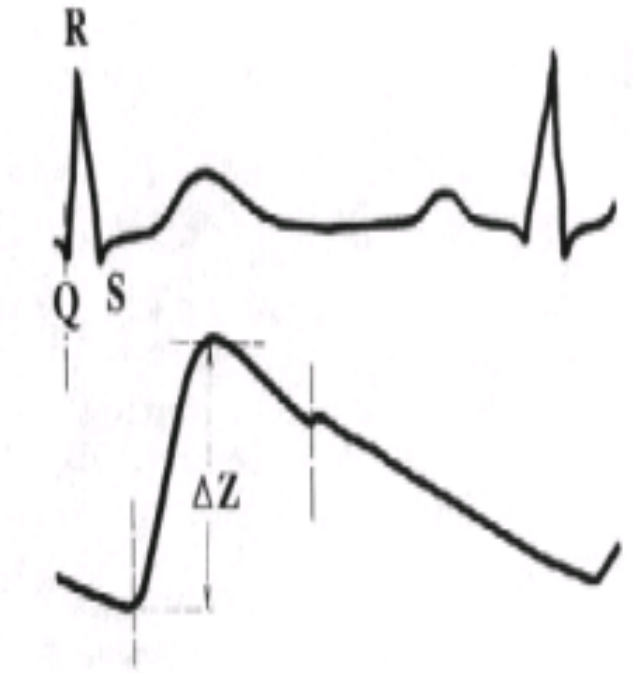
- Difference between ventricular depolarization (Q-point) and the onset of ventricular ejection (B-point) (Sherwood et al., 1990)
  - The shorter the PEP, the greater the cardiac sympathetic control



Pre-ejection period (PEP)

More forceful and rapid ejection of blood from thorax, due to the inflexibiliy of the heart muscle

- Shorter PEP indicates greater sympathetic arousal



Sample Research

- Among male undergraduates, self-reported anger predicted greater PEP shortening during a mental arithmetic task (Burns et al., 1992)
- Emotional suppression shortens PEP relative to watching a film naturally.
  - Again, multiple demands may shorten PEP – emotion, effort, etc.

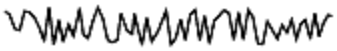
Electroencephalography (EEG)

- Recordings are derived from summated postsynaptic potentials within brain
- Rhythmic sinusoidal patterns of electrical activity
  - Characterized by frequency and amplitude
- Four (main) EEG bandwidths
  - Delta (1-4Hz)
  - Theta (5-7Hz)
  - Alpha (8-13Hz)
  - Beta (13-30Hz)

Brain Waves (EEG)

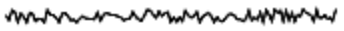
- Delta
  - <4 Hz
- Theta
  - 5-7 Hz
- Alpha
  - 8-13 Hz
- Beta
  - 13-30 Hz

LOW



- Synchronous
- High amplitude
- Low frequency

"Arousal"



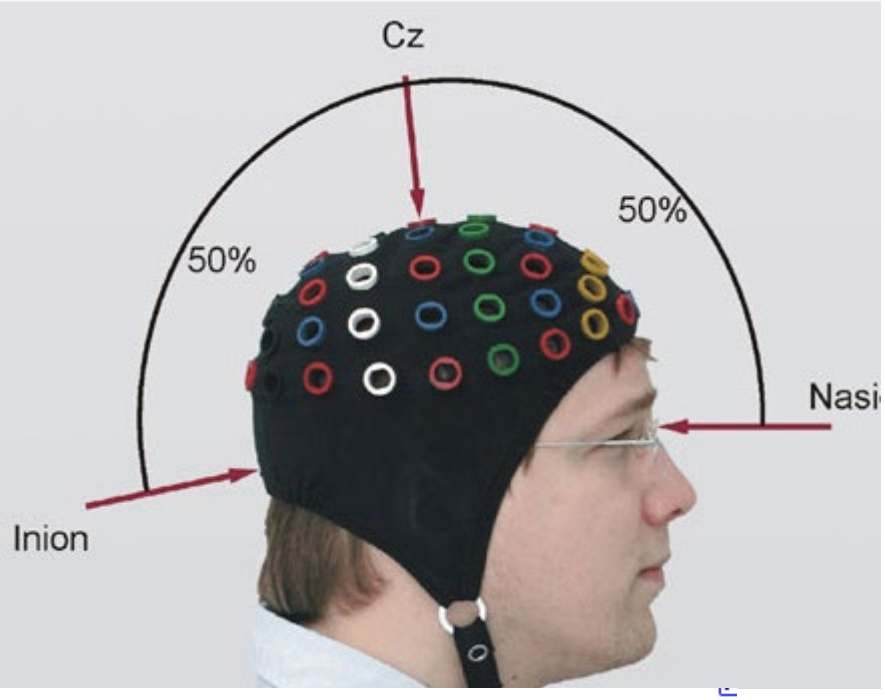
HIGH

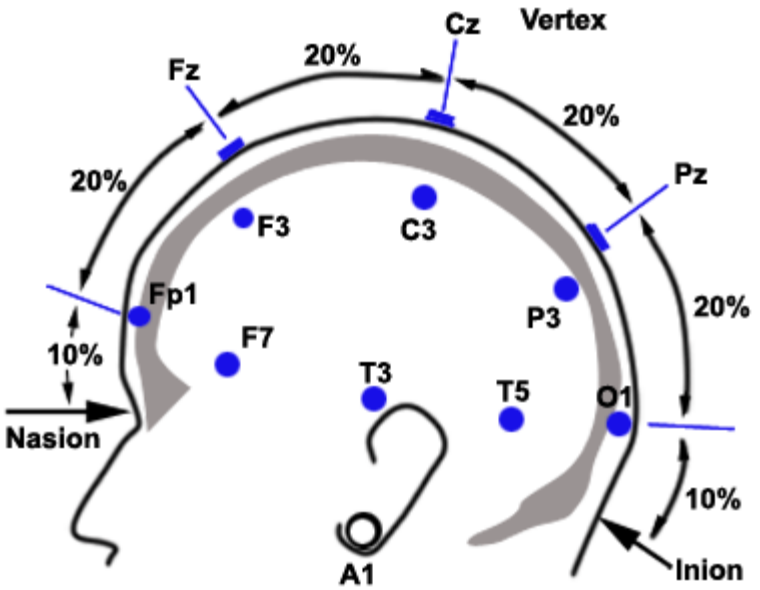
- Desynchronous
- Low amplitude
- High frequency

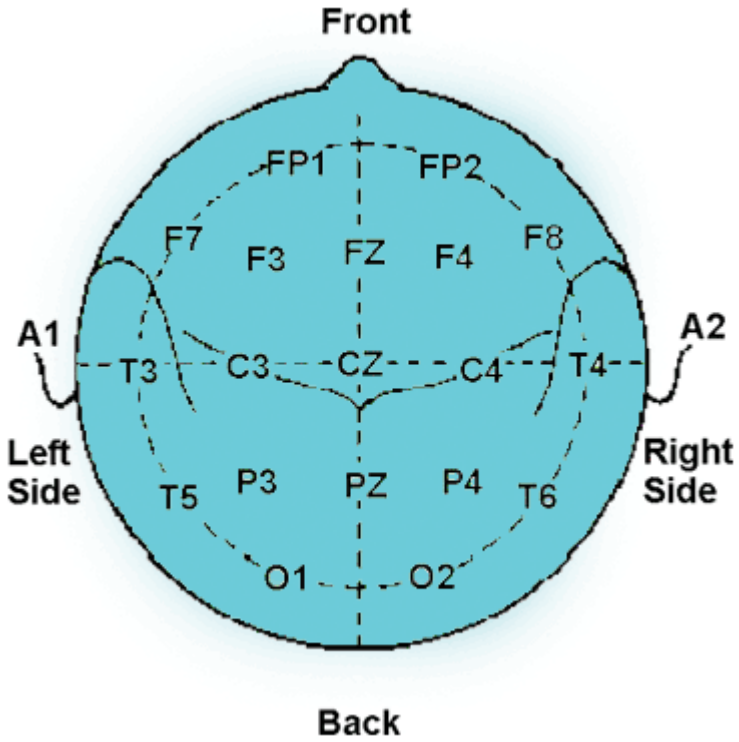
From http://thalamus.wustl.edu/course/sleep.html

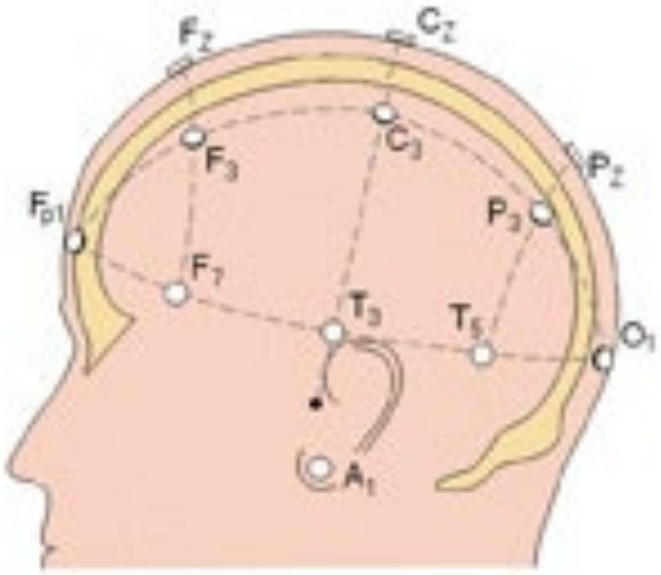
Electrodes

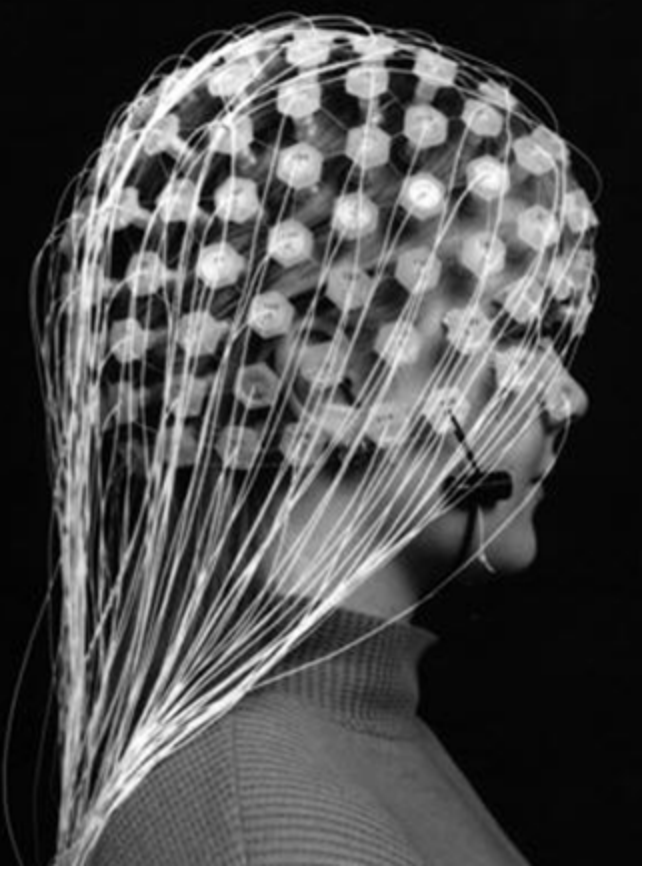
- Applied singly with adhesive material or as a group using a net or cap
- Evenly placed around scalp, according to the "10-20 system"
  - Uses fixed cranial landmarks (nasion, inion); electrodes placed standard distances away from these


Cz
50%
50%
Nasi
Inion


Cz
Vertex
Fz
20%
20%
20%
Pz
F3
C3
Fp1
P3
20%
F7
10%
T3
T5
O1
Nasion
10%
A1
Inion


Front
FP1
FP2
F7
F3
FZ
F4
F8
A1
T3
C3
CZ
C4
T4
A2
Left Side
Right Side
T5
P3
PZ
P4
T6
O1
O2
Back


Fz
Cz
Pz
F3
C3
P3
Fp1
F7
T3
T5
O1
A1



EEG

시간 반응하다

- Excellent temporal resolution
  - Much better than, say, fMRI
  - Thus, well-suited for measuring brain activity which changes rapidly with behavioral/emotional states.
- Poor spatial resolution, however
  - "Source localization" is used to infer the location of the generator, but there is no unique solution for the pattern of signals
    - 1 generator? Two? More?
    - May be "most valid" for presumed simple generators (movement, as opposed to cognitive/emotional variables)

Frontal Asymmetry

- As you know . . .
- Greater left-frontal activation is associated with greater "positive" and "approach" motivation
  - . . . and with greater approach response! (PA and anger)
- Greater right frontal activation is associated with greater negative-withdrawal motivation
  - . . . and with greater withdrawal response! (balance of NA)