

So ...

- What is an emotion????

In part, this can be seen by the DVs people use to study emotion

- Self-reported emotion
 - Fear, anger, happiness, etc.
 - Must have conscious access to internal state!
- Autonomic reactions
 - Electrodermal activity, heart rate, etc.
 - Need not have conscious access!
- Facial expressions and behavior
 - Need not have conscious access!
- Blend of any or all of the above

What causes an emotion?

- Evolutionary approach (e.g., Izard, Ohman)
 - People are biologically prepared to respond to specific events with specific emotional responses
- Appraisal approach (e.g., Frijda, Scherer)
 - Emotions are elicited by processes of evaluation that link events to ongoing goals/needs
- A blend of both

A good definition (Keltner & Gross, 1999)

- Emotions are “*episodic*, relatively short-term, *biologically-based* patterns of perception, experience, physiology, action and communication that occur in response to *specific physical and social challenges and opportunities*.”

For our purposes, emotion consists of:

- Transient subjective states
— i.e., fear, anger, happiness, guilt, etc.
- They are "normal" or "everyday"
— i.e., they are not incapacitating/chronic
- Associated behavioral tendencies
— Facial expression, approach/withdraw
- Associated physiological responses
— CNS and PNS

short lived → "arousal"

Component Processes: What could (should?) be measured

- Subjective feelings
- Motor behavior (facial, etc.)
- Cognitive appraisals
- Physiological arousal
- "Action readiness"
— Preparation to withdraw, engage, etc.

great explain my point



Component Processes: Do they cohere?

- Some argue that they should (William James, Roseman, Scherer, Lazarus) ...
- But research shows that they often do not (Bradley & Lang, 2000). Why?

why don't they cohere?

- Social Norms may require the inhibition of, say, a facial expression
- People who report and show less emotion often show less autonomic arousal!
— Confound between emotional experience and regulation?
- These data are lab-based
— Perhaps that thwarts coherence?
not real world data
- Time-course
— Perhaps the processes are measured at different times and/or decouple over time

Why? *don't they necessarily cohere?*

expression vs actual physiological results



* overriding a physiological reaction causes a lot of autonomic arousal

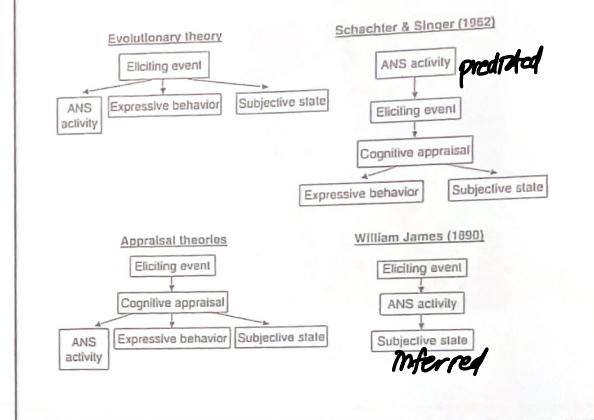
great explain my point



overriding a prepotent response

Theories of emotion

- How do they unfurl?
 - Eliciting event
 - ANS arousal
 - Subjective state
 - Facial/bodily expression
 - Cognitive appraisal



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Evolutionary Theories (Darwin 1872/1998)

- Emotions are biologically-based and adaptive *(functional!)*
- They represent appropriate problem-solving responses to environmental challenges
 - E.g., piloerection/upright posture during anger
- Facial expressions → *tend to be the first emotion*
 - Disgust corresponds with "expulsive" face
 - Anger shows canines
 - Signal emotion to perceiver, foreshadowing future actions

Evolutionary Theories (Cosmides & Tooby, 2000)

- Emotions are:
 - Genetically-coded (innate)
 - Triggered by objects or events that are evolutionarily recognizable
 - Serve a number of bodily functions
 - Motor systems
 - Perceptual systems
 - Altering effort allocation
 - Physiological reactions
 - To help solve problems.

Evolutionary theories focus on . . .

- Reproductive opportunities / threats to reproduction
- Plutchik (1984) found 8 adaptive behaviors
 - Withdrawing
 - Attacking
 - Mating
 - Crying for help
 - Pair bonding
 - Vomiting
 - Examining
 - Stopping/freezing

Problems

- Some doubt the existence of biologically relevant stimuli, or claim the set of relevant stimuli for each emotion is extremely small
- It cannot explain what causes an emotion to occur in the first place, other than some stimuli cause anger, other stimuli cause fear, etc.

Cognitive-Appraisal Theories

- Appraisals are “psychological representations of emotional significance” for the person experiencing the emotion (Clore & Ontony, 2000)
- Came from the notion that different people have different emotions to the same stimulus
 - Failing an exam → anger, fear, or shame

Dyadic interactions



① Schachter & Singer

- People try to explain their arousal of unknown origin
- Experiment??

② Modern Cognitive-Appraisal Theories

- Do not focus on unexplained arousal
- Do hold that discrete emotions arise from processes of evaluation of significant events and of attributions of the causes of those events

Modern Cognitive-Appraisal Theories

- Emotions do not unfold in a hard-wired way
 - The emotional significance of the events and objects depends on:
 - the goals of the individual
 - the perceived coping capacities of the individual
 - Emotions are differentiated and can be associated with different physiological processes and facial expressions, but the appraisal of the event determines which discrete emotion is experienced
- appraisal of event
depends on self individual*

③ William James

- Stated that stimuli cause changes in ANS activity
 - Each emotion is associated with different ANS patterns (HR, SBP, skin temperature, respiration, etc.)
 - We infer our emotional states from our ANS profile
- Stimuli cause changes in ANS activity
+ emotional states from our ANS profile*

Are emotions structural? Dimensional?

① Structural

- The number of irreducible experiences that count as emotions
 - Based on experiential/linguistic data and component process data

② Dimensional

- E.g., negative to positive

Experiential Data

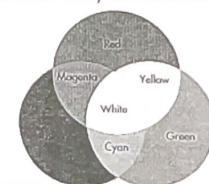
- Rely on people's self-reports
- Then factor analyze the data
 - This essentially calculates the correlations between all data points and detects common underlying themes or meanings (i.e., the "factors")

Component Process Data

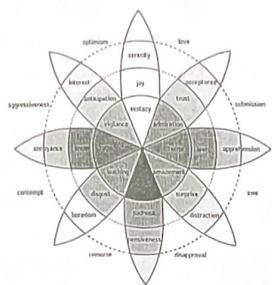
- The "stuff" other than self-report
 - E.g., behavioral expression, posture, vocal inflection, physiological responding
 - Boundaries are often unclear (e.g., ANS activity may look similar when comparing, say, anger to fear)

Basic Emotions

- *Discrete* categories of emotions
- Thought about in two ways:
 - Irreducible elements: Like a color wheel, basic emotions are the primary colors from which all other emotions may be formed



Robert Plutchik's (1980) Emotion Wheel



Basic Emotions

- Discrete categories of emotions
- Thought about in two ways:
 - They have a biological (evolutionary) basis, and are genetically encoded (Ekman, 1984; Izard, 1977; Tooby & Cosmides, 1990)

How many basic emotions are there?

- Almost all include these five:
 - Joy
 - Sadness
 - Anger
 - Disgust
 - Fear
- Many add:
 - Surprise
- "The precise number of basic emotions is less important than the hypothesis that each kind of emotion has certain functions" (Oatley & Johnson-Laird, 1996)

Early Linguistic studies

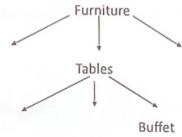
- Found 6-12 basic emotions which were:
- **Independent**
 - The fact that you may be experiencing 1 emotion means nothing about whether you are experiencing another emotion
- **Monopolar**
 - Ranged from "no feeling" to "extreme feeling".
 - E.g., anger from 1 (not at all) → 9 (most ever felt)

*mostly - & -
emotions together*

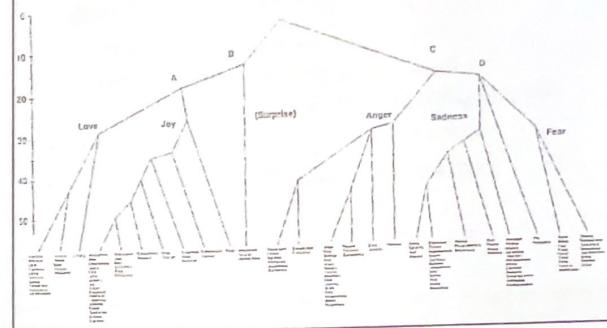
Rosch & Mervis (1975)

- Categories “cut nature at its joints”
- Categories are organized hierarchically

- Superordinate
- Basic
- Subordinate



Shaver et al., 1987



Component Analysis

- Facial Expression
 - Much literature supports the universality of emotional expression
 - Universality does not guarantee that emotion expression is an innate motor program, however.



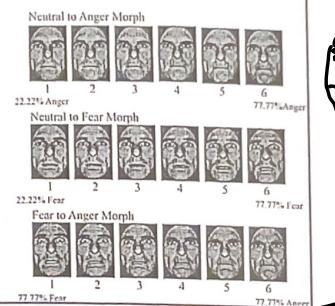
Where do colors begin and end?

Visible Spectrum



Facial Perception

- Magee (1992)
- People classify the endpoints correctly
- People categorize discrete emotions beginning at same location
- Supports discrete emotional categories



ANS Activity

- William James (1884) proposed that each emotion produced its own specific autonomic profile.
- Recent research suggests it's possible . . .
 - Levenson, Ekman, & Friesen (1990)
 - Christie & Friedman (2004)

Vocal Prosody

- inflection*
- People average about a 56% "hit" rate when identifying joy, sadness, anger, fear, and disgust voices (Scherer et al., 1991)
 - Across species, there are similarities in vocal expression associated with emotion:
 - Anger: loud, harsh
 - Fear: High-pitched, shrill
 - Jaak Panksepp rat work

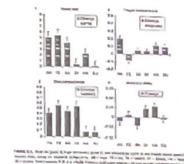
rats do enjoy!

→ rats also have vocal prosody

plays a fundamental role of all species

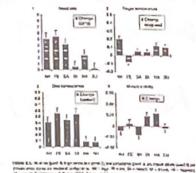
Levenson et al. (1990)

- Had people contract facial muscles to conform to different emotional faces.
 - Some (not all) reported changes in emotion
 - ANS changes could be used to predict the emotion, especially among those who felt it



Levenson et al. (1990)

- Problems
 - Only certain ANS parameters measured
 - Better categorization with more?
- ANS changes may reflect behavioral changes only



Results using ANS Pattern Classification

Table 1
Pattern classification matrix using ANS variables

37.39%, on average ($p < .005$)

Actual emotion condition	Predicted emotion condition							Total
	Amu	Ang	Cen	Dis	Fes	Neu	Sad	
Amu	11 (32.35)	2 (5.88)	7 (20.59)	3 (8.82)	6 (17.65)	0 (0)	5 (14.71)	34 (100)
Ang	1 (2.94)	13 (18.24)	7 (20.59)	4 (11.76)	5 (14.71)	1 (2.94)	3 (8.82)	34 (100)
Cen	0 (0)	1 (2.94)	21 (61.76)	0 (0)	3 (8.82)	4 (11.76)	5 (14.71)	34 (100)
Dis	5 (14.71)	2 (5.88)	8 (23.53)	7 (20.59)	7 (20.59)	1 (2.94)	4 (11.76)	34 (100)
Fes	0 (0)	0 (0)	7 (20.59)	1 (2.94)	18 (52.94)	2 (5.88)	6 (17.65)	34 (100)
Neu	1 (2.94)	1 (2.94)	13 (38.24)	0 (0)	6 (17.65)	6 (17.65)	7 (20.59)	34 (100)
Sad	1 (2.94)	1 (2.94)	11 (32.35)	1 (2.94)	4 (11.76)	3 (8.82)	13 (35.24)	34 (100)
Total	19 (7.98)	20 (8.4)	74 (31.09)	16 (6.72)	49 (20.59)	17 (7.14)	43 (18.07)	238 (100)

Key: Amu, amusement; Ang, anger; Cen, contentment; Dis, disgust; Fes, fear; Neu, neutral; Sad, sadness.

Christie and Friedman (2004)

- Looked at:
 - Amusement, anger, contentment, disgust, fear, neutral, and sadness (induced by films)
- Used ANS variables:
 - SBP, DBP, Mean Arterial Pressure (MAP), IBI (HP; define)
 - MSD (RSA; define), SC
- Used self-report variables
 - 18 questions about discrete emotions (amused, fearful, angry) and dimensional (good-bad, calm-tense, etc.)

ref: stimulus anything
stimulus anything

Results using SR Pattern Classification

68.07%, on average ($p < .005$)

Table 3
Pattern classification matrix using dimensional ASR variables

Actual emotion condition	Predicted emotion condition							Total
	Amu	Ang	Cen	Dis	Fes	Neu	Sad	
Amu	29 (55.29)	0 (0)	5 (14.71)	0 (0)	0 (0)	0 (0)	0 (0)	34 (100)
Ang	0 (0)	26 (76.47)	0 (0)	3 (8.82)	1 (2.94)	1 (2.94)	3 (8.82)	34 (100)
Cen	4 (11.76)	0 (0)	10 (55.24)	0 (0)	0 (0)	0 (0)	0 (0)	34 (100)
Dis	4 (12.12)	3 (9.09)	0 (0)	19 (57.58)	1 (3.03)	0 (0)	6 (18.18)	33 (100)
Fes	8 (23.53)	1 (2.94)	3 (8.82)	1 (2.94)	20 (58.82)	0 (0)	1 (2.94)	34 (100)
Neu	7 (20.59)	1 (2.94)	13 (38.24)	1 (2.94)	1 (2.94)	11 (32.35)	0 (0)	34 (100)
Sad	1 (2.94)	3 (2.94)	2 (32.35)	1 (2.94)	0 (11.76)	0 (8.82)	27 (38.24)	34 (100)
Total	53 (22.36)	34 (14.35)	53 (22.36)	25 (10.55)	23 (9.7)	12 (5.06)	37 (15.61)	237 (100)

See Table 1 for emotion abbreviations.

Both pretty good!

Table 2
Significance tests for classification using ANS variables

Film	N	Observed	Expected	Z	P
Ang	34	11	4.86	3.01	0.0003
Ang	34	13	4.86	3.99	<0.0001
Con	34	21	4.86	<0.0001	
Dis	34	7	4.86	1.03	0.3485
Fea	34	18	4.86	6.44	<0.0001
Neu	34	6	4.86	0.56	0.2877
Sad	34	13	4.86	3.99	<0.0001
Overall	238	89	34	10.19	<0.0001

See Table 1 for emotion abbreviations.

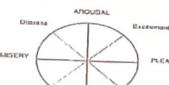
Table 4
Significance tests for classification using ASR variables

Film	N	Observed	Expected	Z	P
Ang	34	29	4.86	11.83	<0.0001
Ang	34	26	4.86	10.36	<0.0001
Con	34	30	4.86	12.32	<0.0001
Dis	34	19	4.86	6.93	<0.0001
Fea	34	20	4.86	7.42	<0.0001
Neu	34	11	4.86	3.01	0.0013
Sad	34	27	4.86	10.85	<0.0001
Overall	238	163	34	23.71	<0.0001

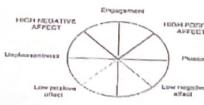
See Table 1 for emotion abbreviations.

How different? Bipolar versus monopolar axes

Flusser, 1986
 Label relevant axes:
 — = monopolar
 — = bipolar



Watson & Tellegen, 1985



Larsen & Diener, 1992



1/20
1/15
etc
etc

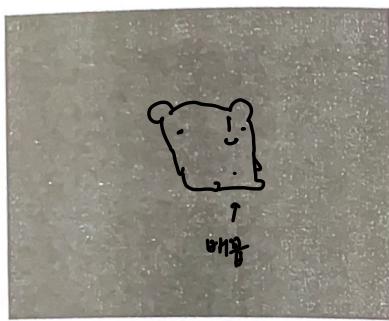
What is so different about Watson & Tellegen?



Negative and positive valence are independent,
i.e., you can feel both simultaneously!
 In the others, you can only vacillate.

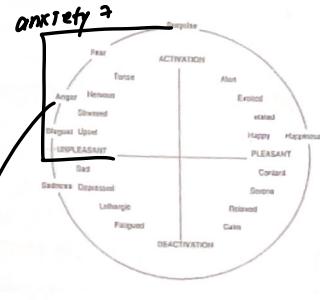
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Is it possible to feel negative and positive emotions simultaneously?



Circumplex Model

- Typically used to disentangle emotions



anger makes you want to anger
fear makes you pull away