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# Topic: Emotion

How do our emotions influence decision making?

# Article Discussed

Lempert, K. M., & Phelps, E. A. (2014). Neuroeconomics of Emotion and Decision Making. In *Neuroeconomics* (pp. 219–236). https://doi.org/10.1016/B978-0-12-416008-8.00012-7

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# Brief summary

This article was a review of the current approaches to understanding the complex relationship between emotion and decision making. Research today shows that a two-system approach does not suffice in capturing the relationship between emotion and decisions. As emotion and cognition began to be more widely researched together, two issues appeared. One being that cognition without emotion is not necessarily applicable in the real world. The second being that cognition and cognitive neuroscience go hand-in-hand.

# Cognitive process neuroimaging analysis

Neurosynth term: “emotion”

## Top 5 Pubmed articles:

1: Dolcos F, Katsumi Y, Weymar M, Moore M, Tsukiura T, Dolcos S. Emerging Directions in Emotional Episodic Memory. Front Psychol. 2017 Dec 4;8:1867. doi: 10.3389/fpsyg.2017.01867. eCollection 2017. Review. PubMed PMID: 29255432; PubMed Central PMCID: PMC5723010.

2: Kozlowski D, Hutchinson M, Hurley J, Rowley J, Sutherland J. The role of emotion in clinical decision making: an integrative literature review. BMC Med Educ. 2017 Dec 15;17(1):255. doi: 10.1186/s12909-017-1089-7. Review. PubMed PMID: 29246213; PubMed Central PMCID: PMC5732402.

3: Lennarz HK, Lichtwarck-Aschoff A, Timmerman ME, Granic I. Emotion differentiation and its relation with emotional well-being in adolescents. Cogn Emot. 2018 May;32(3):651-657. doi: 10.1080/02699931.2017.1338177. Epub 2017 Jun 12. PubMed PMID: 28602148.

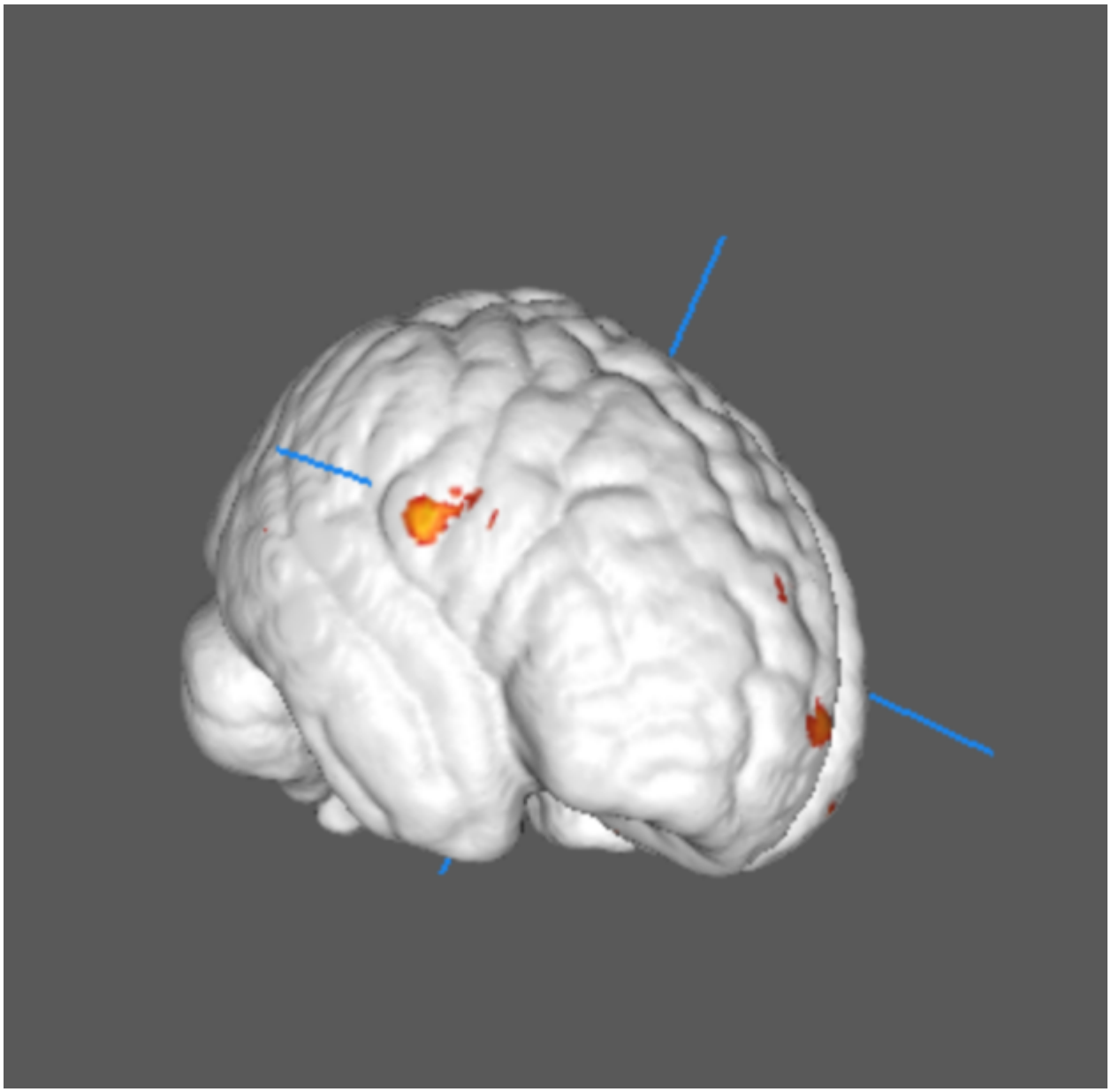
4: Palmer CA, Alfano CA. Sleep and emotion regulation: An organizing, integrative review. Sleep Med Rev. 2017 Feb;31:6-16. doi: 10.1016/j.smrv.2015.12.006. Epub 2016 Jan 14. Review. PubMed PMID: 26899742.

5: Sheppes G, Suri G, Gross JJ. Emotion regulation and psychopathology. Annu Rev Clin Psychol. 2015;11:379-405. doi: 10.1146/annurev-clinpsy-032814-112739. Epub 2015 Jan 2. Review. PubMed PMID: 25581242.

## Top 5 Neurosynth articles:

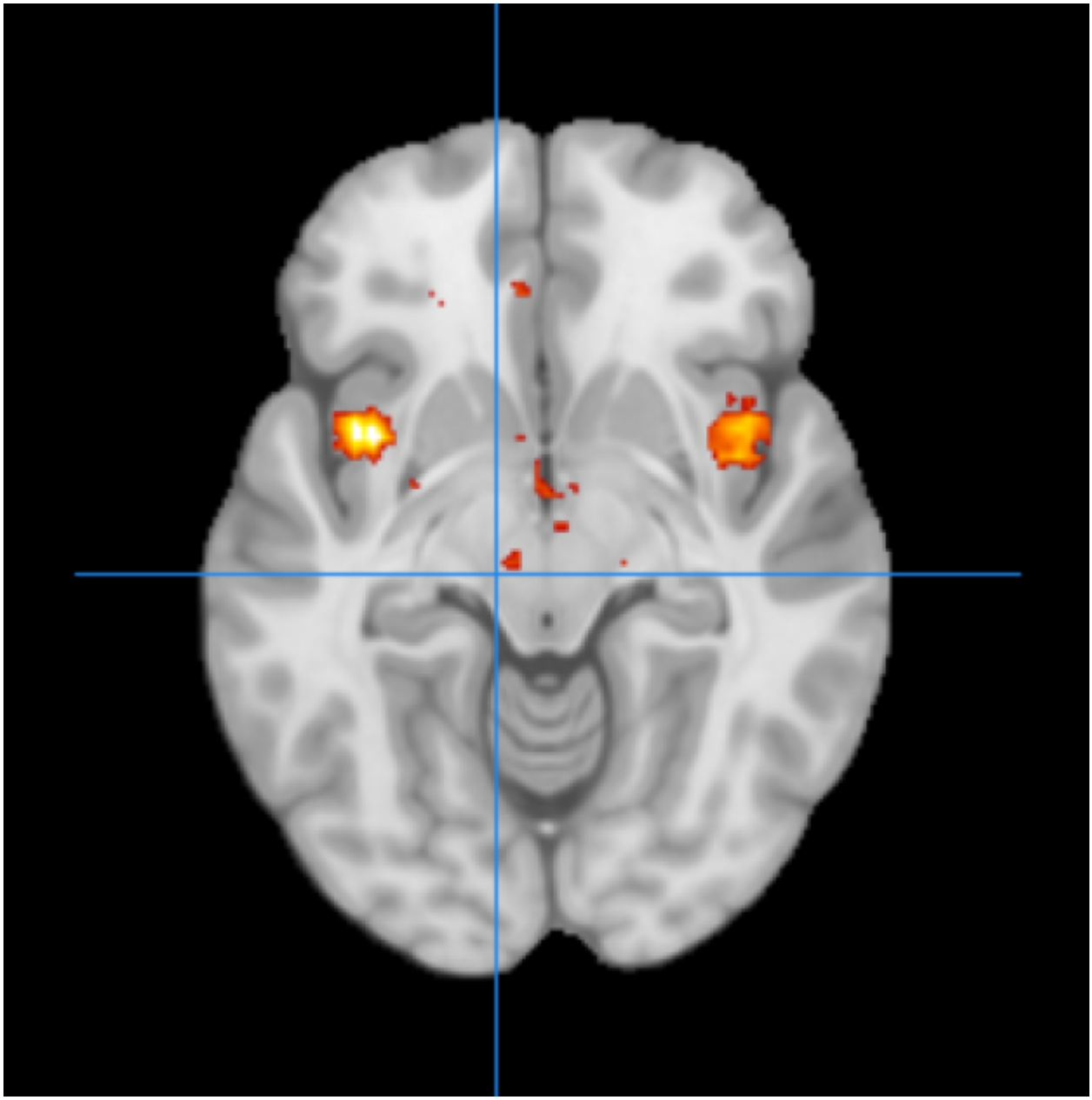
| | | | | |
|---|---|---|---|---|
| **5-HTTLPR differentially predicts brain network responses to emotional faces.** | Fisher PM, Grady CL, Madsen MK, Strother SC, Knudsen GM | Human brain mapping | 2015 | **25929825** |
| **Aberrant brain responses to emotionally valent words is normalised after cognitive behavioural therapy in female depressed adolescents.** | Chuang JY, J Whitaker K, Murray GK, Elliott R, Hagan CC, Graham JM, Ooi C, Tait R, Holt RJ, van Nieuwenhuizen AO, Reynolds S, Wilkinson PO, Bullmore ET, Lennox BR, Sahakian BJ, Goodyer I, Suckling J | Journal of affective disorders | 2016 | **26406969** |
| **Ability to maintain internal arousal and motivation modulates brain responses to emotions.** | Sterpenich V, Schwartz S, Maquet P, Desseilles M | PloS one | 2014 | **25438046** |
| **Abnormal brain response during the auditory emotional processing in schizophrenic patients with chronic auditory hallucinations.** | Kang JI, Kim JJ, Seok JH, Chun JW, Lee SK, Park HJ | Schizophrenia research | 2009 | **18818053** |
| **Abnormal cerebral effective connectivity during explicit emotional processing in adults with autism spectrum disorder.** | Wicker B, Fonlupt P, Hubert B, Tardif C, Gepner B, Deruelle C | Social cognitive and affective neuroscience | 2008 | **19015104** |

## Neurosynth map for the term:



# Brain region chosen for the term

Brain region “substantia niagra”



## Other Neurosynth terms associated with this brain region:

MNI Coordinates: -11, -22, -9

Associations with meta-analysis maps

Show 10 entries Search:

| | Individual voxel | | Seed-based network | |
|---|---|---|---|---|
| Name | z-score | Posterior prob. | Func. conn. (r) | Meta-analytic coact. (r) |
| gamma | 8.7 | 0.87 | 0.31 | 0.47 |
| mm | 8.03 | 0.87 | 0.21 | 0.41 |
| sources | 6.23 | 0.77 | 0.24 | 0.32 |
| noise | 5.85 | 0.76 | 0.01 | 0.07 |
| beta | 4.91 | 0.78 | 0.07 | 0.1 |
| finger movements | 4.88 | 0.8 | -0.07 | 0.02 |
| stroke | 4.8 | 0.76 | 0.04 | 0.08 |
| muscle | 4.31 | 0.78 | -0.01 | 0.02 |
| somatosensory | 4.18 | 0.67 | -0.11 | -0.01 |
| finger | 4 | 0.7 | -0.08 | -0.01 |

Showing 1 to 10 of 1,335 entries First Previous 1 2 3 4 5 ... 134 Next Last

# Questions posed by the class

## Background Vocabulary

## Q: What is the neocortex? And what does phylogenetics matter to it?

WelcomeSoda: “The neocortex, also called the neopallium and isocortex, is the part of the mammalian brain involved in higher-order brain functions such as sensory perception, cognition, generation of motor commands, spatial reasoning and language.” The neocortex is the newest part of the cerebral cortex to evolve. A higher neocortex ratio is thought to correlate with social variables. Humans have a large neocortex:rest of the brain ratio. The neocortex is smooth in smaller and less cognitively advanced animals but has deep grooves and ridges in larger mammals such as humans to allow greater surface area.

## Q: Can someone explain figure 12.2 in the article?

Answer:

Figure 12.2 displays how the removal of candidate outliers strengthens the correlation.

The following studies focus in changes in choices, namely loss aversion. Moreover, these studies examined loss averse behavior, its physiological correlates, and the impact of an intentional regulation strategy. The first experiment is divided in two parts. In part 1, participants were initially endowed with $30 and were paid this sum plus actual gains or losses from 10% of the trials selected at random upon its completion. Hence, part 2 had an identical behavioral session as part 1. However, participants returned for a separate session. In this session, skin conductance response was measured. According to researchers, participants’ skin conductance was measured to quantify bodily arousal responses and relate these responses to behavior.

This experiment, specifically part 2, demonstrates that behavioral loss aversion may correlate with a physiological arousal measure. Furthermore, part 2 also indicate that individuals who are the most successful at reducing their degree of loss aversion by taking a different perspective had a corresponding reduction in the physiological arousal response to loss outcomes (Sokol-Hessner et al., 2009). The second experiment is a follow-up fMRI study. Researchers found that implementing this perspective shift technique reduced amygdala activation to losses, and led to an overall increase in BOLD responses in the striatum, vmPFC and dlPFC. Therefore, the magnitude of the amygdala BOLD response also correlates with loss aversion. (Sokol-Hessner, Camerer, & Phelps, 2012). Results from both experiments fit together with another study demonstrating that patients with amygdala damage are less loss averse overall (Martino, Camerer, & Adolphs, 2010).

## Q: Can someone re-explain reverse inference and give an example?

PoloBravo: Its basic structure begins with a generalization “G” about the way humans act while performing a task “Z”. There is an array of competing processes that could all potentially explain “G”, so this process is a way to determine which process explains the way humans act on a given task. The four

parts of the structure of this are P1, P2, P3, and C, where the P's are the premise and C is the conclusion. For an example, say there are only 2 competing processes "M1" and "M2" which take place in brain regions "N1" and "N2" respectively. They also have subprocesses that assist the main processes called "m1" and "m2". An example of a premise could be; "During the task, we notice initial activation of n2 by m2, but it fades fast while activation of region n1 by m1 is present throughout the whole activity.". Then there would be two other premise to try to show that M1 is more likely to be the defining process in how the person acts. The conclusion would say something along the template of "Because P1 and P2, then M1 is more likely to be causing the behavior." It is basically philosophy related to brain function. You are making an inference that certain regions are functionally selective and that activation means function.

Nathan, M. J., & Pinal, G. D. (2017). The Future of Cognitive Neuroscience? Reverse Inference

in Focus. Philosophy Compass, 12(7), e12427. https://doi.org/10.1111/phc3.12427

### Q: In a simplified definition, what is future anhedonia?

ExactTulip:

- "An affective forecasting error that we call future anhedonia, which is the belief that hedonic states will be less intense in the future than in the present" (Kassam, Gilbert, Boston, & Wilson, 2008).
- "These studies suggest that one reason why people prefer to enjoy benefits in the present and pay costs in the future is that they do not realize how they will feel when those costs and benefits are actually experienced" (Kassam, Gilbert, Boston, & Wilson, 2008)"
- In relation to this definition, a hedonic state is considered to be when someone experiences happiness or pleasure upon exposure to a certain stimulus. When using this definition to define future anhedonia, it describes why a person might make a decision to choose a pleasurable activity such as binge watching TV, impulsive purchases, etc. despite having potential consequences for those choices in the future.

Kassam, K. S., Gilbert, D. T., Boston, A., & Wilson, T. D. (2008). Future anhedonia and time discounting. *Journal of Experimental Social Psychology*, *44*(6), 1533–1537. https://doi.org/10.1016/j.jesp.2008.07.008

## Affective Neuroscience

## Q: What do affective neuroscientists study?

SodaOxford: An affective neuroscientist does research and experimentation on animals to analyze how neurons behave in relation to human emotions.

What is Neuroscience? (n.d.). Retrieved February 19, 2019, from https://www.psychologycareercenter.org/what-is-neuroscience.html

## Q: In the emotion portion of the article he references the term “affect” very briefly but says the definition is beyond the scope of the paper, what is a true example of affect?

DivideSegment:

- The comment in from the text: “The term affect is generally used as the overarching term to describe this collection of processes. It is beyond the scope of this chapter to review theoretical debates about various affective component processes”
- An example of affect would be the processes of emotions that can be observable, either through tone, facial expressions, etc.
- An individual's negative and positive affect can be associated with utilization of emotional regulation strategies for managing these affects, which contributes to positive or negative events interpersonal relationships

Hamilton, J. L., Burke, T. A., Stange, J. P., Kleiman, E. M., Rubenstein, L. M., Scopelliti, K. A., … Alloy, L. B. (2017). Trait Affect, Emotion Regulation, and the Generation of Negative and Positive Interpersonal Events. *Behavior Therapy*, *48*(4), 435–447. https://doi.org/10.1016/j.beth.2017.01.006

## Q: What is incidental affect?

MileImport: “Research has demonstrated that two types of affect have an influence on judgment and decision making: **incidental affect (affect unrelated to a judgment or decision such as a mood)** and integral affect (affect that is part of the perceiver’s internal representation of the option or target under consideration).”

Västfjäll, D., Slovic, P., Burns, W. J., Erlandsson, A., Koppel, L., Asutay, E., & Tinghög, G. (2016). The Arithmetic of Emotion: Integration of Incidental and Integral Affect in Judgments and Decisions. *Frontiers in psychology*, *7*, 325. doi:10.3389/fpsyg.2016.00325

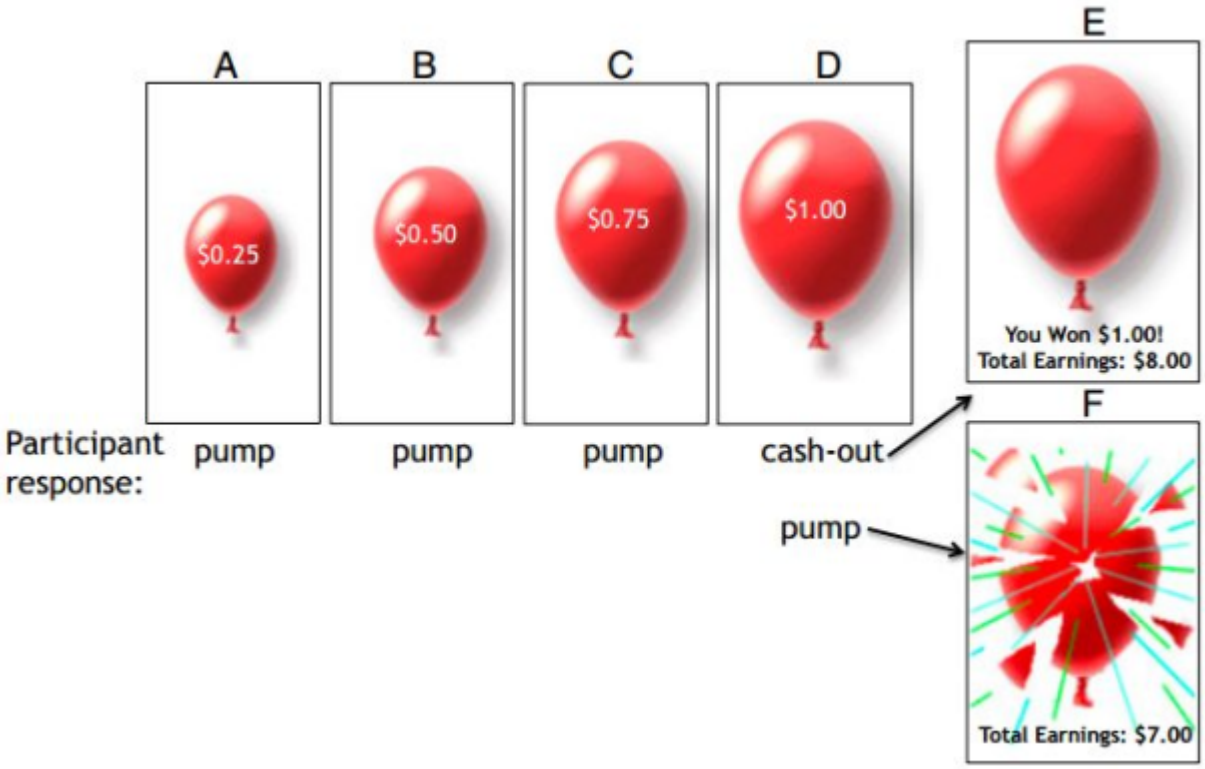
# Neuroscience Methods

## Q: What is the Balloon Analog Risk Task (BART)? And, how does it work?

SincereZigzag:

- The BART is presented as a computer-based measure of risk-taking propensity
- During the task, the computer screen showed a small simulated balloon accompanied by a balloon pump, a reset button labeled “Collect $$$”, a permanent money earned display labeled “Total Earned”, and a second display listing the money earned on the last balloon and labeled “Last Balloon.” With each pump, 5 cents were accrued in a temporary reserve (the amount of money in this reserve is never indicated to the participant). Once a balloon was pumped past its individual explosion point, a “pop” sound effect is emitted. When a balloon exploded, all money in the temporary bank was lost. At any point during each balloon, the participant could stop pumping the balloon and click the Collect $$$ button. Clicking this button transferred all money from the temporary bank to the permanent bank, during which the new total earned would be incrementally updated cent by cent while a slot machine payoff sound effect played. After each balloon explosion or money collection, the participant's exposure to that balloon ended and a new balloon appeared until all 30 balloons (i.e. trials) had been completed. All balloons had a different explosion point with the weakest balloon exploding on the first pump and the strongest balloon exploding after 128 pumps.

Lejuez, C. W., Aklin, W. M., Zvolensky, M. J., & Pedulla, C. M. (2003). Evaluation of the Balloon Analogue Risk Task (BART) as a predictor of adolescent real-world risk-taking behaviours. Journal of Adolescence, 26(4), 475–479. https://doi.org/10.1016/S0140-1971(03)00036-8




## Q: What is the basis behind choice-blindness?

RespondLlama:

- I read through two interesting studies related to choice-blindness. In the first, consumers were asked to taste two different types of tea and tell which was their favorite. They were then presented again with the tea they didn't choose and asked why they chose that way. No more than 30% realized that their choices had been switched. In the second study, people were shown pictures of two separate females and asked which they found more attractive. After they decided, they were shown the picture of the opposite female (without them knowing the photos had been switched) and asked why they chose the way they did. Again, no more than 30% detected any switch.
- "In change blindness experiments participants are usually more likely to notice changes when they concern features of particular relevance to the scene, or if they are of central interest to the participants, or if the participants are particularly knowledgeable about them. For choices it would almost seem to be a defining feature that they concern properties of high relevance and interest, or things we are very knowledgeable about. But in our experiments, in the great majority of trials, our participants were blind to the mismatch between choice and outcome. While intending to choose X (a central interest, non-peripheral, valenced stimuli), they failed to notice when they ended up with Y. This is a result that ought to be surprising even to the most seasoned change blindness researcher."

Johansson, P., Hall, L., & Sikström, S. (2008). FROM CHANGE BLINDNESS TO CHOICE BLINDNESS.

*PSYCHOLOGIA*, *51*(2), 142–155. https://doi.org/10.2117/psysoc.2008.142

Hall, L., Johansson, P., Tärning, B., Sikström, S., & Deutgen, T. (2010). Magic at the marketplace: Choice blindness for the taste of jam and the smell of tea. *Cognition*, *117*(1), 54–61. https://doi.org/10.1016/j.cognition.2010.06.010

## Q: What does it mean to be “risk-seeking in the loss domain and risk-averse in the gain domain”?

NitroMotor: “Individual decisions are dramatically susceptible to the frame in which decision-making problems are described. The frame in terms of gains and losses has a remarkable influence on individual decision-making: When people make a choice between a risky and a sure option that have equal expected values, they tend to prefer the risky option in the loss frame, whereas they tend to be risk-averse in the gain frame (Kahneman and Tversky, 1979, 1984; Tversky and Kahneman, 1981).”

“According to prospect theory, people are risk averse in the gain frame, preferring a sure gain to a speculative gamble, but are risk seeking in the loss frame, tending to choose a risky gamble rather than a sure loss (Kahneman and Tversky, 1979, 1984; Tversky and Kahneman, 1981). For example, when people face a choice between ‘a sure gain of $250’ and ‘a 25% chance to gain $1000,’ they tend to choose the former option. In contrast, when people face a choice between ‘a sure loss of $750’ and ‘a probability of 75% of losing $1000,’ they prefer the latter option.”

Zhang, X., Liu, Y., Chen, X., Shang, X., & Liu, Y. (2017). Decisions for Others Are Less Risk-Averse in the Gain Frame and Less Risk-Seeking in the Loss Frame Than Decisions for the Self. Frontiers in Psychology, 8. https://doi.org/10.3389/fpsyg.2017.01601

## Q: Does stress from test taking have the same effect on you as the stress that would occur during the Cold-Pressor Task?

TelecomElegant: This is a great question, and there are some more or less obvious similarities and differences. For one, blood pressure and other autonomic responses are going to change from beginning to end in both tasks. However, one key difference between the task of taking a test and soaking your hand in freezing cold water is the ability and timeframe in which you can withdraw from the stressful situation. In a test, I suppose you could technically “withdraw” by giving up on a hard problem or simply bubbling in multiple choice answers to leave, but for the most part, you can’t simply lift your hand from water and end the stressful situation. Also, the stress from the test may linger as you await the result whereas the stress from the Cold-Pressor task is likely to fade once your hand reaches its normal temperature.

von Baeyer, C. L., Piira, T., Chambers, C. T., Trapanotto, M., & Zeltzer, L. K. (2005). Guidelines for the cold

pressor task as an experimental pain stimulus for use with children. *The Journal of Pain: Official Journal of the American Pain Society*, *6*(4), 218–227. https://doi.org/10.1016/j.jpain.2005.01.349

# Thought Systems: System 1 & 2

## Q: Do you think decisions based on emotional responses more often occur in system 1 or system 2?

PolarisUnique: I think that emotional responses would more often occur in system 1 than system 2 because according to this article from the Observer, “Any gut-level, rapid, effortless thought or behavior comes from System 1.” Emotional responses come from system 1, but not system 1 decisions are based on emotion.

(“What Is ‘System 1’ Thinking—and Why Do You Need to Learn It?,” 2017, p. 1)

## Q: Would the Limbic system be an important part of system 2 because it has more of a “fight or flight” response?

RavioliJaguar: The limbic system contains an integral part of system 2 reactions. The amygdala and its projections are responsible interpreting sensory data. If the amygdala perceives a stimulus that is threatening in the environment like a loud noise it will send an alerting message to the hypothalamus and pituitary gland to release hormones and messengers into the bloodstream and activate system 2 reactions. Where the limbic system and Autonomic Nervous System overlap is at the adrenal glands. Both systems will send out neurochemical and hormonal signals to help individuals in “fight or flight” situations.

The Fight or Flight Response: Understanding and Identifying Stress Indicators. (2017, June 16). Retrieved February 19, 2019, from https://www.asi-mag.com/fight-flight-response-understanding-identifying-stress-indicators

## Q: “When surveying this research today, it is hard to imagine how a two-system

**approach could capture the breadth of the interaction of emotion and decisions. Why then has the two-system approach continued to dominate discourse in many circles?" Our readings seemingly contradict on two-system thought. Why?**

VideoSport: Our reading seems to contradict it because it's not true. It shows time and time again that in reality the systems are connected and continually interact. The following is largely speculative, I'm going to answer and then look for sources. From a sociological perspective you can look at why society might adopt and perpetuate this point of view (I realize that this is a psych class but it's my other major and I think the interaction of the two subjects is interesting and informative!). I once read somewhere, and I need to find a source, that the conception of this perspective that intelligence and good decision-making etc. are incompatible and distinct from emotion, including compassion, was developed primarily in Europe while they were colonizing and committing genocide all over the globe, and while the concept of race was also being created. Kant and Freud ,alive during the 1700s-1800s and 1800s-early 1900s respectively, were noted in the article for their contributions to the idea of reason and emotion being distinct. The contribution of their theories lines up with timelines of imperialism and race issues (Bunjun & Gracias, 2008). Arguably, one could say that the reason rationality was conceptualized as so distinct from emotion could be to justify the systemic violence that was being committed. I also think that it is important to consider the gendered implications of this. Men are largely put in charge in our society. They are most of our political leaders, most of our CEOs, largely considered the head of the household, although that is all slowly changing. Men are considered rational and logical, they are seen as the decision-makers. Women are considered emotional and this is often used as justification for why they should not be in positions of power. I think that this reading demonstrates that, in fact, we are all impacted by emotion in decision-making, albeit sometimes in different ways.

# Emotions and Decision Making

## Q: An example of each of the two primary ways that emotion can influence decision? (Page 220 last paragraph)

AmbientBenefit:

1. First way emotions can influence decisions from the article: "The affective response is incidental to the choice or choice options, but nevertheless influences the assessment of subjective value and the decision." Basically summarizing the article, examples would be stress influencing a decisions, or affective priming and mood induction.
2. Second way emotions can influence decisions from the article: "The choice of choice outcomes

elicit an emotional reaction, and this discrete reaction modulates the value calculation." An example used in the article was that if one of the choice options in a set elicits a fear reaction, that reaction might contribute to a negative evaluation of the choice, and that option would be avoided. So, physical measures of arousal and future directed-affect are the main ideas for the second way an emotion can influence decisions.

### Q: If emotions are flexible for different situations, what is the impact of the lack of flexible emotions?

CoolActive: "Low trait resilient participants did not exhibit divergent startle responses when the preceding picture was negative. High trait resilient individuals, therefore, appear to be better able than are their low-resilient counterparts to either switch or maintain their emotional responses depending on whether the emotional context changes. "

Waugh, C. E., Thompson, R. J., & Gotlib, I. H. (2011). Flexible Emotional Responsiveness in Trait Resilience. *Emotion (Washington, D.C.)*, *11*(5), 1059–1067. https://doi.org/10.1037/a0021786

## Types of Stress

### Q: How is acute stress different than normal stress? Are there other types of stress?

WindowComrade: There are various types of stress, each having its own impact on the mind and body. Acute stress happens due to specific events or situations that involve novelty, unpredictability, threaten our ego, or leave us with a poor sense of self-control. Examples of acute stress can be giving a speech in front of a group of people, or almost getting into a car accident. The signs of acute stress typically fade after some time - including heightened awareness and rapid heart beat. Chronic stress is caused by repeated exposure to situations that lead to the release of stress hormones. Chronic stress is far more dangerous for the body. It has been linked to diabetes, depression, high blood pressure, high cholesterol, and heart disease. There really is not a "normal" stress. Acute stress is normal in day-to-day life because it keeps our response systems in check, but any type of chronic stress can be detrimental to the body long-term.

(Acute vs. chronic stress – CESH / CSHS. (n.d.). Retrieved February 19, 2019, from https://humanstress.ca/stress/understand-your-stress/acute-vs-chronic-stress/)

# Participant Variables (Subject Variables)

## Q: Even though the 'mood induction' is assessed with surveys, can it be trusted since there is wide variation in how each participant processes and reacts to each emotion?

WelcomeSoda: According to this article, the biggest issue with mood induction procedures are demand effects. People often times try to act like their mood was affected because they assume that is what is supposed to happen/the intention of the experiment. There are some good results with some methods of mood induction but not always.

Westermann, R., Spies, K., Stahl, G., & Hesse, F. W. (1996). Relative effectiveness and validity of mood induction procedures: a meta-analysis. *European Journal of Social Psychology*, *26*(4), 557–580. https://doi.org/10.1002/(SICI)1099-0992(199607)26:4<557::AID-EJSP769>3.0.CO;2-4

DivideSegment: It is important to keep in mind when assessing surveys that participant bias may have occurred and the variation of emotional responses.

## Q: The article mentioned the findings of a study that found stressed participants made fewer utilitarian judgments when responding to moral dilemmas. In other words, they were less likely to choose the outcome that would result in better consequences for a greater number of people. This prompted me to think about first responders since their job is to act in stressful situations for the greater good. Is this the result of extensive training, innate personal characteristics or both?

NitroMotor: I was a volunteer firefighter in high school so this is mostly based on personal experience. Most first responders (and military personnel) share some innate characteristics such as the urge to run towards a potentially dangerous scene and the need to help others. This coupled with extensive training helps first responders make utilitarian judgements on the fly. The training helps responders process information from the scene much more efficiently since they are trained what to expect and how to react. It also helps the first responders become desensitized to disasters so that they can make less emotional and more logical decisions. All first responders are trained on how to handle stress and make the best possible decisions based on the situation. First responders also choose to be a part of the disaster-response-community and know what they are signing up for. They are more mentally prepared to handle stressful situations everyday in every setting, unlike bystanders that may suddenly find themselves in

the midst of one.

# Gender Differences

### Q: On page 222, the author mentions that men tend to make more impulsive and riskier decisions when under stress compared to women. What is the biological basis for this, if there is one at all?

IsotopeNirvana:

Male vs Female Brain Connectivity

- Male Brain: less connective in frontal-lobe, more connections front to back which affect motor control and spatial skills
- Female Brain: more connections in frontal-lobe (emotional reasoning) and side to side connections affect verbal skills and intuitive abilities

DuBois, G. (n.d.). How men's and women's brains are different. Retrieved February 19, 2019, from http://stanmed.stanford.edu/2017spring/how-mens-and-womens-brains-are-different.html

VideoSport: This could be connected to the idea of women as nurturers. In situations of stress the may be more likely to be defensive and protective because of "the tending instant" in which they want to protect those around them (Taylor, 2003). Hormonal responses to stress differ between men and women and differ in women depending on the hormonal stage they are in of their cycle (Goldstein, Jerram, Abbs, Whitfield-Gabrieli, & Makris, 2010).

# Implications for Health and Clinical Disorders

## Q: In the article it is stated that “stress has been shown to impact dopaminergic neurons in the ventral tegmental area and the striatum.” What exactly is the effect of these dopaminergic neurons in these brain regions?

AmbientBenefit:

- The ventral tegmental area (VTA) is “a heterogenous brain structure that serves a central role in motivation and reward processing.”
- Dopamine activity (specifically phasic activity) “encodes from reward prediction errors.” (Prediction error is the difference between the expected reward and actual reward or lack of one.) It is also associated with depression within the VTA specifically, but this study doesn’t seem to be sure if it is elevated or lowered levels of dopamine that are causing depression.
- The article also said that “DA neurons may have distinct behavioral functions based on their projection targets.”

(Lammel, Lim, & Malenka, 2014)

## Q: According to the study, during a stress induced moment glucocorticoid is released. Is there a dysfunction or problem that stops the glucocorticoid not being released which can make people fearless or have no reaction to stress?

ZeroCanary:

- “Familial glucocorticoid deficiency is a condition which hormone-producing glands do not produce certain hormones called glucocorticoids. These hormones, aid in immune system function, help maintain normal blood sugar levels, help trigger nerve cell signaling in the brain, and serve many other purposes in the body.
- A shortage of adrenal hormones (adrenal insufficiency) causes the signs and symptoms of familial glucocorticoid deficiency. These signs and symptoms often begin in infancy or early childhood. Most affected children first develop low blood sugar (hypoglycemia). If left untreated, hypoglycemia can lead to seizures, learning difficulties, and other neurological problems. Other features of familial glucocorticoid deficiency can include recurrent infections and skin coloring darker than that of other family members (hyperpigmentation).”

https://ghr.nlm.nih.gov/condition/familial-glucocorticoid-deficiency

Yes, this is a great question. Addison’s disease this is often called adrenal insufficiency because of the its lack of cortisol production. Cortisol is in the glucocorticoid class of hormones and is released in response to stress. This is often caused by tuberculosis.

I haven’t seen anything of people being fearless though common symptoms of addison’s include depression and extreme fatigue which can be to some extent a lack of stress.

~Optiontemple (“Addison’s disease - Symptoms and causes,” n.d.)

## Q: Could administering propranolol, aβ-adrenergic blocker that limits the physiological response to stress, help those with binge-eating disorders?

PaintLevel: “Investigations using a novelty-induced feeding suppression test have demonstrated that acute administration of anxiolytic compounds (diazepam, chlordiazepoxide, propranolol) and chronic administration of antidepressant compounds (buspirone, desmethylimipramine) decreased the latency to feed in the novel environment, but not in the home cage, whereas the stimulant and anxiogenic compound, amphetamine, increased the latency to feed in both home and novel environments.”

Bello, N. T., Yeh, C., Verpeut, J. & Walters, A. L. (2014). Binge-like eating attenuates nisoxetine feeding suppression, stress activation and brain norepinephrine activity. *Plos One, 9*(4)

https://doi.org/10.1371/journal.pone.0093610

## Q: Do studies on patients with PTSD demonstrate that the same/similar brain areas are affected as the areas that are affected by stress in decision-making?

Mobile super:

- In a study on PTSD and acute stress of first responders scientists studied the differences in performance in situations of acute stress and PTSD.
- “For instance, paramedics exposed to high-stress events show impairments in the ability to calculate drug dosages, to provide cardiac resuscitation, and to recall pertinent details from clinical scenarios.”
- “Levels of PTSD symptoms were not associated with global performance in police recruits or paramedics. However, these measures assessed specific competencies on highly learned tasks. They perhaps do not reflect the influence of PTSD on more complex clinical decision-making. An unexpected finding related to PTSD and professional judgment occurred in the child protection worker study.”

## Q: What is a common cause of damage to the orbitofrontal cortex?

TwinNevada: Humans suffering damage to the orbitofrontal cortex (OFC) are often described as impulsive. The most famous example is Phineas Gage , a railroad worker, who suffered extreme frontal lobe damage. He survived but had extreme change in personality, including increased inappropriate behavior (impulsiveness).

Torregrossa, M. M., Quinn, J. J., & Taylor, J. R. (2008). Impulsivity, Compulsivity, and Habit: The Role of Orbitofrontal Cortex Revisited. *Biological Psychiatry*, *63*(3), 253–255. https://doi.org/10.1016/j.biopsych.2007.11.014

### Q: "When there is a highly emotional and arousing event, the amygdala modulates hippocampal storage processes to help ensure that the memory is retained." This seemingly contradicts memory repression. Is there a consensus in the scientific community about this?

Answer:

According to these studies, the amygdala participates in affectively influenced memory. Memory storage is influenced by the activation of b-adrenergic systems and the amygdala. In the first experiment, participants were exposed to either an emotionally neutral story or a more emotionally arousing story, to examine the effect of the b-blocker propranolol, or a placebo, on long-term memory each. Also, each story consisted of 12 slides and was accompanied by a narration. For the emotional arousing story, the placebo controls showed enhanced memory. Conversely, propranolol selectively impaired memory for the emotionally arousing section. Although, it did not impair memory for the neutral story or the emotionally arousing story, specifically its initial and final portions. The drug effect could not be attributed to the subjects' emotional reactions to the stories. These results suggest that memory storage by emotional arousal depends upon activation of b-adrenergic receptors (McGaugh, Cahill, & Roozendaal, 1996). The second experiment examined the effects on b-blockers on enhanced memory by physically induced arousal, for example increased muscle tension. Findings suggest the arousal did not enhance retention in elderly subjects who were taking b-blockers (Nielson & Jensen, 1994). The third experiment followed the same general procedures. Thus, its result indicate that emotional arousal did not enhance long-term memory for participants with bilateral degenerative lesions of the amygdala (Cahill et al., 1994). As a result, the findings from these three experiments provide strong evidence that the amygdala, especially the basolateral nucleus, plays a central role modulating long-term memory storage of emotionally arousing experiences.

## Marketing Implications

### Q: Would a commercial that uses emotion or reason be more effective in convincing consumers to buy a product?

DecimalSponsor: Yes, studies have concluded that effectively inducing emotion in the audience of a commercial is a great way at generating extra revenue. According to NeuroScienceMarketing, commercials that are purely emotional perform about twice as well as the commercials that are purely rational. This indicates that people like to feel the commercial and what is being advertised as opposed to just seeing its practicality on the screen.

Florent. (2017, September 8). Research Shows the Most Effective Advertising Focuses on

Emotion. Retrieved February 19, 2019, from https://medium.com/@FlorentGeerts/research-shows-the-most-effective-advertising-focuses-on-emotion-6b442b0d5572

## Cognitive Research

### Q: Has there been research on how individuals with XYY chromosomes amygdala's are affected with regards to hippocampus function and memory?

SOCIALANVIL: Individuals with XYY chromosomes are referred to as having Jacob's syndrome. For the most part, from my research, it appears as though these individuals live normal lives apart from a few non-threatening hallmarks of the syndrome. For example these males will be taller, have less muscle tone, and difficulties with motor and speech development. After looking at the literature, there is no specific study that looks into the relationship between XYY and specifically amygdala or hippocampal dysfunction. The paper that I read found that there was severe and pervasive language impairment. Overall the study concluded that the cognitive impairments were mild. From these findings I would hypothesize that there is not a large deficit in memory function in this group of people. However, studies that look into emotion processing within a specific brain structure in xyy individuals would be interesting and provide more insight into the syndrome.

Ross, J. L., Zeger, M. P., Kushner, H., Zinn, A. R., & Roeltgen, D. P. (2009). An extra X or Y chromosome: Contrasting the cognitive and motor phenotypes in childhood in boys with 47,XYY syndrome or 47,XXY Klinefelter syndrome. Developmental Disabilities Research Reviews, 15(4), 309-317. doi:10.1002/ddrr.85

# Ethical Considerations

### Q: What are some controversial/unethical methods of mood induction?

BanditMeter:

- “It is unethical to randomly assign participants to conditions eliciting profound emotional states such as grief or depression”
- Any method that prolongs deep and/or intense feelings are unethical especially if they could lead to stress, anxiety, depression, and other mood disorders (specifically can occur during prolonged methods of experimental data)

Parrott, W. G., & Hertel, P. (2005). Research Methods in Cognition and Emotion. Handbook of

Cognition and Emotion, 61-81. doi:10.1002/0470013494.ch4

### Q: Is changing people’s stress levels to change their reaction ethical?

MileImport: This is a difficult question to answer given the wide range of stress levels that a study can induce. However, a simplified answer from the Journal of Ethics states that as long as the stress that is induced results in mild, acute stress, that the body’s reaction is actually deemed beneficial. There is an increase in performance, primarily involving working-memory and spatial abilities. However, the consensus from the scientific community is that any induction of chronic stress, or even the possibility of doing so, is deemed unethical given the significant data that shows the negative consequences of long-term stress.

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