How do emotions work?

Not all emotional responses are equal; some of our emotional experiences are thought out and evaluated, while others are immediate and reflexive. This is suggested to be part of the reason why sometimes we can be in conflict with ourselves and not understand our own emotional state. The most prototypical example of this, is the difference between fast and slow fear. The aforementioned emotions have focused more on fast fear-type reactions; the type of reaction where you immediately respond to a stimulus with a panic response. By contrast, some of the time, you'll only to start to have that emotional reaction after you've thought about what's going on around you. This is the slow or cognitively-mediated emotion pathway. This is a non-trivial distinction, because importantly, what's happening here is a common response, i.e. fear, arising through two different pathways in the brain.

Cerebral Cortex ("Thinking" Brain)

Sensory Information (from the environment) → **Thalamus** → **Amygdala**

Sensory information comes into a section of the brain called the thalamus, and in slow fear, the information gets passed into your cerebral thinking, i.e., the thinking part of your brain, and then down into your amygdala, where your fear reaction gets kicked off from. But in the fast reaction, it goes straight from the thalamus to the amygdala, bypassing your cerebral cortex.

We have these two pathways because sometimes it's really important for you to react extremely quickly to a threatening environment, e.g. to get away from a snake or to pull your hand away from a hot object, but not everything is this threatening, as in this instance, and it can be costly for us to have that big fear reaction every time we find something that is a little bit startling. So, we have this fast reaction to keep us safe from very serious things; sometimes gets colloquially attributed to our "lizard brain", which is the primitive bit of our brains that immediately reacts to things that can kill us. But it can be really disruptive for us to have a panic reaction every time we're a little bit startled; can be debilitating. So, by contrast to this, it's good to be able to have a cognitive process or a slow fear response to stave off some of those unnecessary fear responses, for when we need them. So, the fact that we have this cognitively-mediated process, it raises some interesting questions about the nature of our emotions and our emotional experience. What would be the relationship between these appraisals to our emotional experience? Does our heart race because of our thoughts, or do we think we're afraid because our heart is racing, or is there something else that causes us to both think of fear and have a physiological reaction?

James-Lange

Stimulus → Physiological Response → Subjective Experience

There are two early explanations of this relationship. The first states that our conscious emotions, which is our experiences of fear, happiness or disgust, are the last thing that happens. This is the James-Lange explanation; says that, in response to your eliciting stimulus and the environment, your body has certain autonomic reactions, which are things that you can't control, and then you interpret those reactions to decide what you're feeling. So, you think you're afraid, because you've got an increase heart rate, flushed skin, slight nauseated sense, and the shakes. The reasons for this explanation are kind of sensible. Basically, William James and Carl Lange argued that you wouldn't recognise fear or rage, unless it had those associated physiological reactions, and so why not consider those the primary response. It's important to recognise that just because things sound sensible, doesn't mean they're right though. This model is okay with fast fear reaction, but it doesn't really work so well with the slow fear reaction, and so this is the foundation of the theory that rises in response to this concern. This competing theory, known as the Cannon Bard theory arose from two major points: firstly, that our bodily reactions to stimuli in the environment aren't always that fast, and secondly, if what James and Lange had suggested, in that we experience emotion because of information, being passed to our physiological systems, of which we then interpret, to inform our emotional state, and so by virtue of this, if we severed the connection somewhere along the way, so that signals from our bodily organs couldn't return to our brains, then we shouldn't experience those emotional reactions. So, Bard conducted experiments in which he performed surgery on animal subjects, cutting

the nerves that brought bodily signals back to the brain, and yet the animals still expressed normal emotional reactions in response to stimuli. This has been replicated within the context of people with spinal cord injuries, who aren't able to feel the lower parts of their body, yet still have emotional reactions. So, obviously, this explanation for our emotional experiences being driven by our autonomic, physiological responses, can't be correct. Instead, the Cannon-Bard theory suggests that there are some processes that initiate both our physiological and cognitive reactions, about stimuli, at the same time.

Cannon-Bard

Stimulus → Neurological Response → Physiological Response OR Subjective Experience

But neither of these explanations is really consistent with the way that we think about it in the modern era; nowadays, we have reasons to believe that there's a lot more complexity in this than we had initially been thinking. In order to understand these explanations, we really need to start by separating two parts of our emotional experience, which is the arousal and the appraisal. The arousal component is our physiological response; this tells us how much of the emotion we're feeling, or how strongly we feel about something. Whereas the appraisal is the cognitive labelling; how we decide what we're feeling. People who are anxious are generally told to "tell themselves their excited"; tells people to engage in cognitive reappraisal, which is relabelling the arousal that one is already experiencing. These two components are the two factors that make up the Schachte-Singer two-factor theory of emotion. By saying that appraisal and arousal are two separate things, we can begin to characterise emotions as the combination of different levels on these separate components. One model taking this approach is the circumplex model, and it discusses affect, in terms of activation, which is arousal, and positive and negative valence, which is the tone of the emotion, and is comparable to what appraisal is. So, if you have high activation and positive valence, you might characterise that as excitement, whereas if you have high activation and negative valence, you might characterise that as anger. Positive valence but neutral activation might be called content, and negative valence but low activation might be called boredom.

But the circumplex model isn't the only model thinking about separate components of emotion, and how to talk about emotions remains a very active area of research. Being able to distinguish between arousal and appraisal, also allows us to make sense of the Schachte-Singer and Lazarus studies. These are some of the most influential studies in the field of psychology, because they demonstrate not only how our body reacts and how it informs the way we interpret our emotional states, but also the way in which we interpret our situation, also interprets our physiological response. In other words, arousal affects appraisal, and appraisal affects arousal. These bidirectional relationships are called reciprocal relationships. Lazarus and colleagues demonstrated that appraisal affects arousal in a classic study from 1964; they showed participants a traumatic film and measured their physiological reactions, in the form of heart rate and skin conductance, which was more or less, how much they sweating. To test if appraisal affected participants' physiological reactions, they overdubbed the video with different audio tracks, either making it seem more traumatic, less traumatic or otherwise being completely silent. Quite robustly, people who had the traumatic soundtrack had stronger skin conductance responses, despite the fact that their visual experiences were exactly the same. Given the only thing that was different between these participants was the way they were encouraged to think about the situation, by the overdubbed audio, this presents quite good evidence for the suggestion that appraisal is influencing arousal, and Lazarus called this the 'appraisal theory'.

Lazarus

Stimulus → 'This is terrifying' OR 'This is fine' → Arousal

In a series of studies, Schachte and Singer conducted, they injected participants with they said was a vitamin, to help participants with their eyesight, but in practice, was either epinephrine, i.e. adrenaline, saline which acted as a placebo or inert control, or a tranquiliser. The idea is, that the participants don't know that they've had their arousal manipulated by the experimenter; that is, either inflated by the epinephrine injection, left as they were with the injection of sterile saline, or suppressed if they got the tranquiliser. So, if they reported differences in their emotions in the rest of the experimental paradigm, that would suggest that