

Module: Psychological Foundations of Mental Health

Week 3

Introduction to emotion and emotional processing

Topic 2

Emotion processing: bottom-up effects of emotions on cognitive processes – Part 1 of 3

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Lecture transcript

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In this section, we will consider the effects of emotions on attention processing, the degree to which individuals differ on how much emotions enhance or interfere with attention. And finally, how these individual differences can be considered factors in the maintenance or even onset of certain mental health conditions.

Attention is a set of cognitive functions that select and prioritise some information for further processing. This selection occurs due to limits in our cognitive capacities to process all information. Within this selective process, emotional stimuli, that is objects, events, or situations that signal potential danger or reward, can grab attention.

From an adaptive evolutionary perspective, this makes a lot of sense because emotional stimuli signal events or situations that can effect our survival. They are therefore likely to filter through the selection process to be processed further, both physiologically, for example, through autonomic arousal. And cognitively, for example, to be learned, consolidated, and remembered.

All of the consequences of the further processing of emotional stimuli is to enable us to act accordingly. To fight or flight in the present situation, but also on future occasions.

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Even artificial threats stimuli as presented in laboratory tests can pop out and capture our attention. In one study by Ohman and colleagues in 2001, participants were presented in one condition with a discrepant fear relevant stimulus, a snake or a spider, embedded in a grid like array of fear irrelevant stimuli, such as flowers or mushrooms.

In another condition, a discrepant fear irrelevant stimulus, such as the flower or mushroom, appeared within a grid array of either fear relevant stimuli so, for example, snakes and spiders. Participants on each trial had to locate the discrepant stimulus.

Participants were found to be far quicker at detecting discrepant fear relevant stimuli from fear irrelevant distractors than they were at identifying the discrepant fear irrelevant stimuli from fear relevant distractors. In other words, they were quicker on trials in the first condition than in the second condition.

What was also interesting was that the speeded reaction times of the participants for detecting these fear relevant stimuli was unaffected by other task factors, such as the number of distractors or the actual location of the target stimulus, suggesting a robust pop out effect.

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A variation of this task is the faces in the crowd study where similar findings were also reported for identifying a discrepant angry face from a crowd of happy faces. The finding that even mildly threatening stimuli as presented in a laboratory can grab our attention shows how strong and natural the tendency to detect and respond to actually dangerous situations is.

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But individuals can vary from one another in this selective attention bias to threat. They can differ in the degree to which their attention is automatically captured by mild threats, even if briefly presented. They can also differ in the extent to which they can disengage or unlock their attention from that threat allowing it to disrupt other ongoing cognitive processes. And they can also differ in the type of threat stimulus that captures their attention.

People with mental health problems have been found to show heightened attention for threatening stimuli. Particularly ones that are congruent with their concerns. Experimentally, this has been studied using a task known as the visual probe task. In this task, participants are presented with a fixation cross first to orient their attention to the middle of the computer screen. Next, two stimuli, and these can be words or pictures as long as one is always emotional and the other neutral, are flashed up side by side for a certain time duration.

After the stimuli have disappeared, a probe appears to which the participants have to respond. This probe can be an arrow either pointing to the left or right. And participants have to press one button if it is on the left, and one button if it is on the right. Their accuracy and reaction times in responding to this probe are recorded. So the response to the probe is a measure of where your attention focus is at that particular time.

The crucial experimental manipulation is whether the probe, in this case, the arrow, appears in the place of the threatening stimulus or the neutral stimulus. If it appears in the place of the threatening stimulus, we call this a congruent trial. And if it appears in the place of the neutral stimulus, we call it an incongruent trial. An attention bias for threat index can be derived by taking the difference between reaction times to the probe on congruent versus incongruent trials.

What researchers have found fairly consistently is that amongst people with some mental health problems, if the threat stimulus matches their concerns, they are quicker at responding on congruent trials, and slower to respond on incongruent trials. What this pattern of responding suggests is that their attention had been very quickly captured, and possibly locked in by the presence of the threatening stimulus.

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Illustrating this bias is the study using the visual dot probe task to investigate the attention processing of stimuli relating to eating, body shape, and body weight in women with and without eating disorders and an anxious control group. Trials present a control stimulus with an emotional stimulus for about one second followed by a probe.

In this case, the emotional stimuli could be a picture of a positive eating scenario, such as eating something healthy. A negative eating scenario such as eating junk food. A neutral eating scenario such as a picture of a restaurant. A positive body shape stimulus so someone looking of normal weight about to go for a swim. A negative body shape stimulus, someone's figure. A neutral body shape stimulus such as the body part. Or a neutral weight stimulus such as scales.

Results from their first experiment suggested that women with an eating disorder were quicker at responding if the probe appeared behind the negative eating stimulus than the control stimulus.

They were also slow to respond to the probe if it followed the positive eating stimulus than if it replaced the control stimulus. Finally, they were also quicker to respond to the probe if it appeared behind the neutral weight stimulus.

Together, these data suggested that women with an eating disorder had an attention orienting bias towards negative eating stimuli and the neutral weight stimuli. But that they tended to turn their attention away from positive eating stimuli. That is, they showed an attention avoidance.

These biases were greater than in the anxious control group and in the healthy women, even amongst those who reported having high shape concern. These findings were then replicated in a second experiment, but where they also found an attention orienting bias for negative and neutral shape stimuli, which was not found in the first study.

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While the visual probe task has been used a lot in its simple form, there are some limitations. One criticism is that it is not easily able to differentiate between whether it's a hypervigilance towards the emotional stimulus, what has been called an attention orienting response. Or if it is the inability to unlock your attention or has been called disengaging your attention away from the stimulus.

Another criticism is that it is difficult to trace the time course of attention vices. That is, at what point do people revert attention away from the stimulus because it is too distressing?

One way of differentiating between these explanations is to use eye tracking methodology. Eye tracking methods enable a more continuous measure of attention because they can measure initial fixations to particular stimuli as they appear on a screen. As well as the length of time spent gazing at a particular stimulus before a fixation away from the stimulus occurs.

Thus, one can obtain more precise information about the time course of attention vices from early to late. And map out the direction of the bias when it changes from vigilance to avoidance.

A number of studies have used eye tracking to measure attention biases for threats or negative stimuli in relation to anxiety and depression. And these studies are summarised in a review paper that appears on your reading list.

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Another way that individuals can differ is the extent to which attention to an emotional stimulus can disrupt and interfere with the ability to complete an ongoing task. The effects of emotional stimuli, such as threats on simple cognitive tasks such as labelling the colour of a word, have been shown to differentiate people with certain mental health problems and healthy controls.

This has been shown through the administration of a task known as the emotional Stroop task. I'm going to show this to you now. In this task, you will see some words. I want you to label the colour of each word. You can do this out loud.

I want you to repeat the task again, but this time, thinking whether you noticed anything special about the content of the words. Did you notice how the content of the words effected your ability to name the colour in a timely fashion?

This task has been used to show differences between anxious and non-anxious people. Namely that anxious people are much more affected by the threatening content of the word than are non-anxious people. In a classic study, Matthews and MacLeod in 1985 asked group of anxious patients to complete the same task. Amongst their patients, there were people with social concerns. For example, they would find it embarrassing to talk to new people. While others had physical concerns. For example, they thought it was likely that they would have a heart attack.

What the authors found was that while non-anxious control participants showed no difference in

colour naming reaction times between the threat and non-threat words, patients with anxiety were much slower at this task for threat words than for the non-threat words.

What the study also showed was that which words affected attention, very much depended on the content of the word, and the concerns of the patient. So whereas all anxious patients were disrupted on social threat cues, only physical worriers were disrupted on the physical threat words.

Indeed for people with other psychiatric conditions, there was a similar disruption of their performance on colour naming when the word is close to their concern. So for example, people with depression can be more affected by words that trigger inadequacy to reflect their low self-esteem. For example, loser. People with eating disorders are disrupted by words around body weight and shape.

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In summary, threat stimuli and negative stimuli can quickly capture attention and take up cognitive resources so that it disrupts ongoing cognitive processing. We have discussed how this may be an adaptive process because it facilitates our detection of danger and allows us to act.

However, not all threatening and negative stimuli may actually be dangerous. And in those situations, having our attention captured by the stimuli that don't have an impact on our survival, can be a drain on our resources. In these circumstances, being hypervigilant to a mild threat or negative cue is maladaptive. Something which we think may characterise individuals with mental health conditions, such as anxiety disorders, eating disorders, and depression. Research suggests that such biases in attention could contribute to the maintenance or onset of psychopathology.

On the other side of the coin, it is important to note that positive and rewarding stimuli also capture attention. And that individuals can also vary in this tendency. With those who are depressed, showing an absence of this tendency, and those with more optimistic and resilient traits, showing greater vigilance for positive stimuli.