

Cognitive psychology and anxiety

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Cognitive psychology is the study of how the mind processes information. In other words, it involves information processing – that is, the notion that psychological processes can be described by the flow of information within the nervous system. Examples of cognitive processes include the ways that people select, interpret and remember information from their environment. These processes are influenced by the concerns or beliefs that a person holds, leading to a particular response. For example, a patient with spider phobia may believe that spiders are dangerous; they may scan their environment for spiders, detect a spider's web, notice that they feel anxious and come to the conclusion that a spider is nearby and about to approach them. They may then make an attempt to remember the location of the spider web and respond by avoiding that location in future. The cognitive processes that maintain other anxiety disorders may be similar to this example, but differ in their content and the concerns to which they relate. Examples of core concerns are provided in Figure 1 (see Harvey *et al.*, 2004). Cognitive therapy is thought to work by identifying and modifying the cognitive processes that maintain a particular anxiety disorder (see Salkovskis, 1996).

Core concerns in different anxiety disorders

Anxiety disorder	Core concerns	Stimuli used in lab-based experiments
Panic disorder	Fear of an imminent physical catastrophe such as fainting or a heart attack	Words relating to physical threat (e.g. 'coronary'); changes in heart beat; changes in levels of carbon dioxide in inhaled air
Social phobia	Fear of public scrutiny, embarrassment or humiliation	Words related to social threat (e.g. 'ridiculed'); noticeable feelings of anxiety; facial expressions
Specific phobia	Fear of the phobic object (e.g. spider, balloon) or situation (e.g. closed places)	Words relating to the phobic object (e.g. 'hairy' for a spider phobic); pictures of the phobic object
Obsessive–compulsive disorder (OCD)	Fear of being contaminated (e.g. by germs), or being responsible for harm to others (e.g. fear that one would kill another person)	Words relating to core concerns (e.g. 'dirty' for contamination fears); contaminated objects
Post-traumatic stress disorder (PTSD)	Current threat that relates to a previous trauma (e.g. being attacked again after an assault)	Words relating to the trauma (e.g. 'crash' for a traffic accident); pictures relating to the trauma

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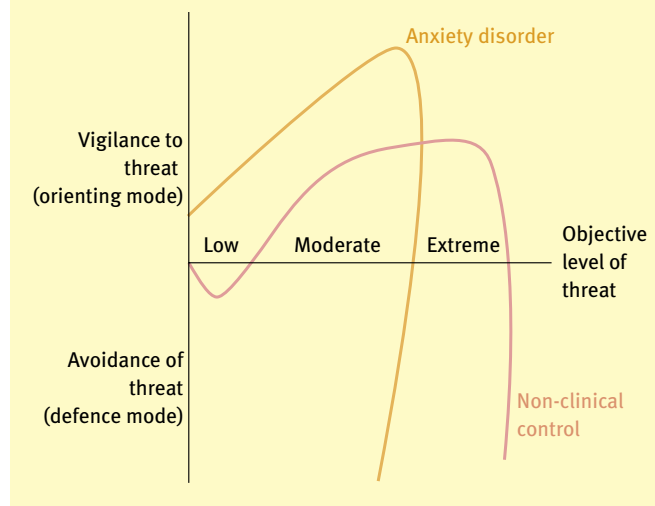
Selective attention

Our senses are constantly bombarded by a wealth of stimuli and therefore the brain's first task is to select certain information for further processing and to guide the individual's behaviour. This process is known as selective attention.

Biological mechanisms

The study of the fear response in animals helps explain how anxiety affects selective attention (see Mogg and Bradley, 1998; Eysenck, 1997). When anxious, the brain appears to be in one of two possible modes, an orienting mode or a defence mode. During the orienting mode, the animal scans the environment for threat and may be particularly sensitive or hypervigilant to signals of danger, such as a rustling sound in the grass. Notably, the heart rate appears to drop and the animal may freeze so as not to be noticed. When danger is imminent, however, such as a looming attack from a predator, the brain can switch into defence mode. This involves a readiness to carry out some form of safety behaviour that protects the organism (i.e. the 'fight or flight' reaction). The animal may escape the situation, fight back or shield itself. During this defensive state, attention may be directed towards the source of safety (e.g. an escape route) and avoiding the threat. This pattern of attention is displayed in Figure 2 and explained in more detail below.

Hypothetical relationship between level of threat and selective attention to threat in patients with an anxiety disorder and non-clinical controls



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Selective attention to threat

Several laboratory-based tasks developed to assess information processing have shown the effects of anxiety on attention in humans. Examples of the paradigms used are provided in Figure 3. Originally a task known as the emotional Stroop test was used extensively to assess selective attention, but it has proved impossible to ensure that the results on this task reflect selective attention rather than some other process. The dot-probe task is a more recently used paradigm whose mechanisms are better understood (Mogg and Bradley, 1998).

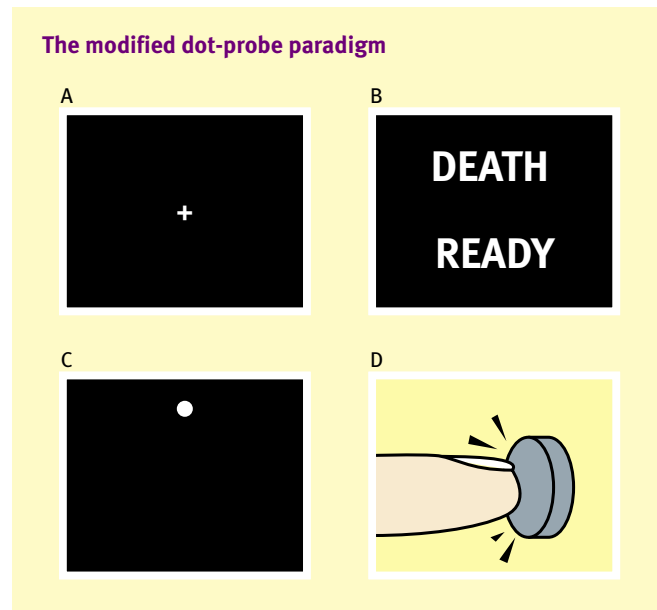
Experimental paradigms used to assess selective attention

Name of paradigm	Design	Measure of selective attention to threat
Modified dot-probe task	Threatening stimulus and neutral stimulus presented simultaneously on computer screen for a brief period (e.g. half a second) and then disappear	Shorter time to detect a probe that appears in the spatial location of the threatening stimulus relative to time to detect a probe that appears in the spatial location of the neutral stimulus
Dichotic listening task	Participant wears headphones and reads aloud a passage they hear through the 'attended' ear. Threatening and neutral words are presented in the 'unattended' ear	Longer time to respond to a visual probe (the word 'press' appearing on a computer screen) when a threatening word is presented in the unattended ear, relative to when a neutral word is presented in the unattended ear
Emotional Stroop test	Threatening words and neutral words presented one at a time in different coloured inks	Longer time to name the colour of threat words relative to the time taken to name the colour of the neutral words
Visual search task	A target stimulus presented in an array of background stimuli	Shorter time to detect the target stimulus when it is threatening relative to when it is neutral
Distraction task	A target stimulus presented in an array of background stimuli	Longer time to detect a neutral target stimulus when it is surrounded by threatening background stimuli, compared to when the target is surrounded by neutral background stimuli
Eye movement	Electronic apparatus tracks where the eyes are focused over time	Sudden eye movements towards the threatening stimulus; eyes fixated on the threat stimulus for longer periods of time

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In the modified dot-probe paradigm (see Figure 4), the participant focuses on a central fixation cross (4a) on a computer screen. After approximately 1 second, the cross is replaced by two stimuli, one above the other (4b). For example, the screen may display a threatening word, such as 'death', and a neutral word, such as 'ready'. The words disappear after a brief period, usually less than half a second, and a dot appears on the screen, either in the place where the threatening word had been displayed, or in the place where the neutral word had been displayed (4c). The aim of the task is to press a button as soon as the dot is detected (4d). Research indicates that people with anxiety disorders are quicker to respond to the dot that appears behind the threatening word, whereas people with low levels of anxiety are faster to respond

to the dot following the neutral word. This is thought to happen because the anxious individuals are selectively attending to the threatening word, whereas the low anxious individuals are ignoring or avoiding it (see Figure 2 – low to moderate levels of threat). This finding suggests that in everyday life anxious individuals are more likely to notice the threatening aspects of a situation and conclude that it is dangerous.



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Later developments

Further research has uncovered many other features of selective attention to threat in people with anxiety disorders.

- The effect is not specific to printed words; it also occurs when the stimuli are spoken words, faces, threatening pictures and even internal experiences such as one's own heartbeat (see Clark, 1999). Patients with certain anxiety disorders, such as generalized anxiety disorder (GAD) and post-traumatic stress disorder (PTSD), also appear to be hypervigilant to the sudden onset of neutral stimuli, such as novel sounds.
- The effect can happen very quickly, within hundredths of a second of the appearance of the stimuli. This suggests that the reaction is automatic and may not be under immediate conscious control (see Mogg and Bradley, 1998).
- Individuals with non-clinical anxiety have been trained to selectively attend to threat (see Mathews and MacLeod, 2002). After intensive training, they responded with increased levels of distress when later presented with threatening stimuli. In other words, selective attention to threat appears to have a causal effect on increasing levels of distress, and this suggests that it may be involved in causing increased distress in people with anxiety disorders.

Avoidance of threat

In addition to hypervigilance – which involves attention towards threat – the avoidance of threatening stimuli has been observed in people with anxiety disorders (see Figure 2 – moderate to extreme levels of threat). For example, when people with spider phobia are placed in a room with a live spider, they pay attention towards the exit in a room, presumably to identify a way to escape from the spider. In another example, people with social phobia have been shown to attend away from images of faces on the dot-probe task (see Clark, 1999). This is thought to be an automatic response to avoid eye contact and to try to take other people's attention away from them. Indeed, they report focusing attention on themselves rather than on the situation around them. They may attend to thoughts, bodily sensations and images of how they think they appear to other people. This is known as self-focused attention and is a particular characteristic of social phobia.

Addressing selective attention in cognitive therapy

The therapist may try to modify selective attention to threat by encouraging the patient to focus on other, non-threatening aspects of their environment. At other times, patients are seen to be avoiding attending to threat in order to try to protect themselves. In these situations, the therapist may encourage the patient gradually not to use their safety behaviours, to focus on what they perceive to be dangerous and to realize that

they may not, in fact, be in danger (see Clark, 1999; Salkovskis, 1996). Research indicates that biases in selective attention in anxious patients are reduced after successful cognitive therapy (see Mogg and Bradley, 1998). This may be because they no longer regard their feared stimuli as dangerous, and therefore their pattern of attention becomes more like that of non-clinical controls (as in Figure 4).

Memory

Memory involves the encoding, storage and retrieval of information. Anxious patients have better memory for threatening information. For example, people with obsessive-compulsive disorder (OCD) who have contamination fears are better than non-clinical controls at remembering the location of objects that have been 'contaminated' by the experimenter. When expecting to present themselves in a speech, people with high levels of social anxiety selectively remember more negative than positive information about how they are seen by other people (see Clark, 1999). Socially anxious people may therefore conclude that they might be judged very negatively and that they should avoid the situation.

Autobiographical memory and intrusive memories

Cognitive psychologists discriminate between several different kinds of memory. Autobiographical memory is memory for the events of one's life, in contrast to semantic memory, which refers to facts and properties of features of the self and the world. A particular kind of autobiographical memory investigated in anxiety disorders is intrusive memory. Intrusive memories typically involve the recall of threatening autobiographical information that has the following features:

- it is often triggered automatically
- it is experienced as involuntary
- it is in the form of highly vivid imagery
- it may date back to a traumatic or aversive event.

Often patients are unaware that their experiences are in fact a memory because they experience it as though the event is actually happening at that moment. An example of an intrusive memory that contains all of these qualities is a flashback in post-traumatic stress disorder (PTSD). During a flashback, PTSD patients feel as though they are actually re-experiencing their trauma, including many of the same emotions, physiological changes and behavioural responses that occurred during the event. In another example, many patients with social phobia report experiencing intrusive images when they are in feared situations that have been found to relate to past experiences of severe embarrassment, criticism or humiliation (see Clark, 1999).

Processing of threatening experiences

A series of experimental studies has been conducted to try to understand how intrusive memories are formed (Holmes *et al.*, 2004). Non-clinical volunteers were shown a 'traumatic' film of a road accident. They reported intrusive images of the more threatening sequences of the film over the next few days. The frequency of intrusive images was greater in people who tended to 'dissociate' (i.e. feel cut off or detached, or emotionally numb) during the film. Those participants who experienced a drop in heart rate also reported more intrusive memories of the film, indicating that they may be orienting to threat, as described above. It is thought that a specific kind of cognitive processing known as data-driven processing may be prioritized in this state of mind and involves the processing of sensory information, in contrast to the more common conceptual processing, which incorporates a meaningful interpretation to events (see also Clark, 1999). Consistent with this view, if the participants were instructed to carry out a task that disrupted data-driven processing of the film, they reported fewer intrusions. Cognitive therapy may encourage conceptual processing by allowing patients to make links between their experiences, memories of traumatic events and other events in their lives. Cognitive models of memory suggest that this type of processing converts the memories into forms that are more easily put into words and less likely to be intrusive and distressing.

Reasoning

Reasoning involves the use of information to make judgements about the self and the world. This information may be derived from the products of selective attention and the retrieval of particular memories. Cognitive psychologists have shown that people use heuristics (rules of thumb based on mental processes) in order to reason. For example, the simulation heuristic involves a mental replay of a series of events in one's mind.

People may judge that if they can simulate a series of events more easily, then it is more likely to happen in future.

Biases in interpretation

People with anxiety disorders tend to overestimate the likelihood of bad events happening to them, and the severity of these events (see Eysenck, 1997). When anxious patients are presented with ambiguous sentences or phrases, they are more likely to make threatening interpretations of them. If an anxious patient is presented with the phrase 'the doctor examined little Emma's growth', later on in the experiment she is more likely to recognize the phrase 'the doctor examined little Emma's tumour' than the phrase 'the doctor examined little Emma's height'. Recently, it has been shown that non-clinical volunteers can be trained to make the same kinds of threatening interpretations as anxious patients, and this in turn increases their levels of distress when they are presented with future ambiguous situations (see Mathews and MacLeod, 2002). Therefore, biases in reasoning may have a causal effect on increasing distress.

Emotional reasoning

Anxiety disorders appear to be associated with a particular heuristic known as emotional reasoning. Studies have shown that patients use their own feelings of anxiety as evidence of danger: a patient with social phobia may interpret her feelings of anxiety as indicating that she appears stupid and incompetent to others; a patient with panic disorder may interpret his racing heart as evidence of an imminent heart attack. Cognitive therapy encourages patients to question these beliefs about their feelings and to test them out in real-life situations. For example, patients with social phobia can benefit from video feedback of themselves in which they can see that they do not appear as anxious and incompetent as they had reasoned on the basis of their own sensations of trembling and sweating (see Clark, 1999; Wells, 1997).

Thought processes

Besides reasoning, people develop other strategies to manage their thoughts, some of which can be counter-productive.

Worry

People with anxiety disorders report that they worry extensively. In most anxiety disorders, the source of worry is related to their core concern: people with social phobia worry about their social performance, whereas people with panic disorder worry about having another panic attack. The process of worry often involves generating several 'worst possible scenarios' in one's mind and thinking of ways to avoid them. It is not therefore not hard to imagine how extensive worrying can increase levels of anxiety and distress. In GAD, the topic of worry may vary widely and not appear to relate to a specific concern. Experimental tasks have shown that people with GAD more easily engage in worry, even about neutral topics. It is thought that they have extremely negative beliefs about worry, e.g. 'my worrying will send me mad', but also positive beliefs about worry, e.g. 'my worrying helps me prepare for the worst' (see Wells, 1997). Thus, GAD patients are motivated to continue worrying, but this makes them feel more frightened. Cognitive therapy may involve exploring, testing and modifying the patient's beliefs about his or her worry.

Thought suppression

Cognitive psychologists have conducted experiments which indicate that trying to suppress one's own thoughts can have counter-productive effects. In the 'white bear' paradigm, the participant has to try as hard as possible not to think of a white bear. Studies show that people given these instructions actually have more 'white bear' thoughts than people instructed not to suppress them. This is called a rebound effect. Experiencing the rebound effect can give patients the feeling that their thoughts are out of control. Cognitive therapy may involve demonstrating the white bear effect and work to reduce thought suppression; patients are encouraged to talk about the content of their thoughts, challenge their threatening interpretations and try to accept them rather than trying to suppress them (see Salkovskis, 1996).

Conclusion

Cognitive psychology has provided a useful framework in which to try to understand what processes maintain anxiety disorders and how they can be treated using cognitive therapy. Researchers have developed laboratory-based cognitive tasks to pinpoint

specific pathological cognitive processes under controlled conditions. To date, the evidence suggests the following.

- Patients with anxiety disorders selectively attend to threatening stimuli that relate to their fears. However, when they perceive themselves to be in danger, they switch to avoiding these stimuli and seeking sources of safety.
- They selectively remember threatening information relating to their fears and they experience autobiographical memories that are often distressing and intrusive.
- They tend to make threatening interpretations of events that relate to their fears, and they often make excessive judgements of danger based on their feelings rather than on the situation itself.
- Finally, their thinking is often characterized by worry and they often try to suppress their distressing thoughts, leading to a rebound effect.

There is good evidence to support the existence of these biases, and some evidence to show that they have a causal effect on increasing anxiety, but further research is required to investigate how the biases may be modified during cognitive therapy. ◆

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Practice points

- Cognitive psychology is the study of the way the mind processes information
- The key cognitive processes that have been investigated in anxiety disorders are attention, memory, reasoning and thought
- Compared with healthy controls, patients with anxiety disorders show biases in cognitive processes that may maintain their anxiety; cognitive therapy is thought to modify these biases
- Patients with anxiety disorders show reduced biases after therapy, but the exact mechanisms of change are not yet known