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ANXIETY

A Very Short Introduction

OXFORD

UNIVERSITY PRESS

Great Clarendon Street, Oxford, OX2 6DP,
United Kingdom

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First Edition published in 2012

1 3 5 7 9 10 8 6 4 2

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British Library Cataloguing in Publication Data

Data available

Library of Congress Cataloging in Publication Data

Data available

ISBN 978-0-19-956715-7

Printed in Great Britain

on acid-free paper by

Ashford Colour Press Ltd, Gosport, Hampshire

OXFORD
UNIVERSITY PRESS

Chapter 2

Theories of anxiety

As we saw in Chapter 1, the term 'anxiety' was rarely used by doctors and scientists until the 20th century. As interest in anxiety has grown, however, an increasingly rich and varied body of theoretical work devoted to understanding it has developed. In this chapter, we look at four key perspectives on anxiety, progressing from ideas that date back to the end of the 19th century to the most recent developments:

- psychoanalytic
- behavioural
- cognitive
- neurobiological

Psychoanalytic theories of anxiety

The deeper we penetrate into the study of mental processes the more we recognize their abundance and complexity.

A number of simple formulas which to begin with seemed to meet our needs have later turned out to be inadequate... Here, where we are dealing with anxiety, you see everything in a state of flux and change.

Sigmund Freud, 'Anxiety and the Instinctual Life'

An influential historical figure in the study of anxiety was the founder of psychoanalysis, Sigmund Freud (1856–1939). Freud trained as a medical doctor at the University of Vienna, specializing in neurology (the study and treatment of disorders of the nervous system). By the 1890s, Freud had come to believe that the symptoms displayed by many of his patients were the product, not of disease of the physical nervous system, but rather of their failure to deal with invisible, unconscious, and primarily sexual psychological drives. This insight became the cornerstone of psychoanalysis, which remained the predominant form of treatment for psychological problems in Europe and the United States until at least the 1970s.

Freud's interest in anxiety was marked by the publication in 1895 of his paper, 'On the Grounds for Detaching a Particular Syndrome from Neurasthenia under the Description "Anxiety Neurosis"'. As the title indicates, the principal purpose of this paper was to distinguish what Freud called 'anxiety neurosis' (*Angstneurose*) from other forms of nervous illness (or neurasthenia)

What were the symptoms of 'anxiety neurosis'? Freud listed:

- Irritability.
- Deeply engrained and distressing pessimism; the belief that disaster is just around the corner. Freud called this trait 'anxious expectation'.
- Panic attacks, often involving physical symptoms such as difficulty breathing, pains in the chest, sweating, vertigo, and trembling.
- Waking up at night in fear.
- Vertigo, in which the individual experiences 'sensations of the ground rocking, of the legs giving way and of its being impossible to stand up'.
- Phobias.
- Feelings of nausea, ravenous hunger, or diarrhoea.
- Tingling of the skin (pins and needles) or numbness.

Freud argued that, unlike other nervous illnesses, anxiety neurosis was caused by the failure to properly satisfy the build-up of sexual excitement. By way of example, Freud cited the cases of 'intentionally abstinent' men and women; men 'in a state of unconsummated excitement', for instance if they were engaged but not yet married; and women 'whose husbands suffer from ejaculatio praecox or from markedly impaired potency... [or] whose husbands practise coitus interruptus or reservatus'.

Rather ironically, given that psychoanalysis is all about the primacy of the mind, in 1895 Freud believed that anxiety was caused by *physical* factors. Sexual excitement certainly had a profound influence on the psyche, triggering the desire for sexual satisfaction, but its essence was physiological. In men, Freud argued, it consisted of 'pressure on the walls of the seminal vessels'. Freud thought an analogous process took place in the case of women, though he didn't know what this might be.

Anxiety

Freud's views on anxiety, however, evolved considerably over the decades. His later position is summarized in 'Anxiety and Instinctual Life', a lecture he gave in 1932. Neurotic anxiety still has its roots in sexual energy, but this energy is now seen as fundamentally psychological rather than physical.

You may have noticed the use of the term 'neurotic' here. This is because by now Freud was distinguishing between anxiety as a justified response to real danger, and so-called neurotic anxiety, which is excessive and irrational. Realistic anxiety arises from threats in the external environment; neurotic anxiety arises from within, though we are unaware of its true cause. Realistic anxiety helps us; neurotic anxiety can make our life a misery.

Key to Freud's theory of anxiety is what he called the *id*, a wild and primitive psychic reservoir of instinctive desires. The job of managing and controlling these desires, which are buried deep in our unconscious, falls to a second part of the Freudian psyche, the

ego. When the ego fails in this unenviable task, neurotic anxiety results, and the desire is thereby repressed. Freud also suggests that our episodes of anxiety recall our first encounter with danger: the trauma of birth. Each anxious fear we experience is an echo of this fundamental event.

Freud's mature theory of anxiety is illustrated by one of his most famous case studies: that of Little Hans. Hans was a five-year-old boy who developed a fear of horses. Freud, working principally from information communicated by Hans' father, argued that Hans' horse phobia was in reality a fear of his unconscious sexual desire for his mother and the retribution from his father that he unconsciously anticipated. The 'unacceptable' fear – unacceptable because resulting from an Oedipal infatuation with his mother – is transformed into a more acceptable phobia. The neat distinction between realistic and neurotic fears is thereby overturned: Freud shows that at the root of every neurotic anxiety is the fear of an external danger (in this case punishment, possibly by means of castration, at the hands of the father).

Freud was undoubtedly one of the most influential thinkers of the 20th century, yet his ideas are now deemed more or less irrelevant by scientists. As the psychologist Stanley Rachman has written: 'The entire enterprise, including the theory of anxiety, is rich in theorizing but lacking in methodological rigour and deficient in facts.'

Behavioural theories of anxiety

Anxiety is a learned response.

O. H. Mowrer

One of the most famous experiments in the history of psychology took place in London in 1920. Directing the experiment was the then-star of Anglo-American psychology, John Broadus Watson (1878–1958). Watson was the leader of *behaviourism*, an approach

that would dominate academic psychology for much of the 20th century.

Behaviourism constituted a vigorous rejection of the academic psychology pioneered by Wilhelm Wundt (1832–1920) and William James (1842–1910) and of psychoanalysis, which had rapidly become the dominant approach in Europe to understanding and treating the mind and its disorders.

Behaviourism, as its name suggests, took as its subject the behaviour of humans and animals (it saw no fundamental difference between the two). Indeed, Watson argued that behaviour was the *only* appropriate subject for a genuinely scientific psychology to study. Thoughts, emotions, dreams – all were irrelevant. How could such phenomena be studied scientifically? In his 'behaviourist manifesto' of 1913, Watson had written:

Psychology... is a purely objective experimental branch of natural science... Its theoretical goal is the prediction and control of behaviour.

For Watson and his followers, all behaviour had a simple explanation: we *learn* it. And this brings us back to that celebrated 1920 experiment. Starring opposite Watson in 1920 was an infant immortalized by Watson (together with his assistant and future wife Rosalie Rayner) as 'Albert B.':

Albert B. was nine months old, the son of a wet nurse at London's Harriet Lane Home for Invalid Children. Watson and Rayner began by testing Albert's reactions to a range of objects, including a white rat, a rabbit, a dog, cotton wool, and burning newspapers. Albert – who, according to the psychologists, was a happy, healthy, and stoical child – appeared perfectly content with them all.

Some weeks later, Watson and Rayner showed Albert the white rat for a second time. On this occasion, as soon as Albert touched the

rat, the psychologists slammed a hammer against a steel bar, producing a sudden and frighteningly loud noise. Over the next few weeks, they discovered that Albert was now afraid of the white rat, even when the steel bar wasn't struck. And not only that: the child was also scared of objects that in some way resembled the white rat, such as a rabbit or even Watson's hair.

Watson and Rayner used the term 'conditioning' to describe this process of learning to fear an unthreatening neutral object or situation because of its pairing with another more obviously frightening event. In this, they were heavily influenced by the work of the Russian scientist Ivan Pavlov (1849–1936). Pavlov famously demonstrated that, once a given stimulus (for example, a metronome) is associated with food, dogs will learn to respond to that stimulus in the same way as they react to food – by salivating – even when no food is present.

Watson and Rayner used the example of Albert B. as evidence for their theory that all fears are the result of conditioning: we learn them, usually in our childhood:

the early home life of the child furnishes a laboratory situation for establishing conditioned emotional responses.

It is conditioning, they argued, that explains how irrational fears and phobias develop:

It is probable that many of the phobias in psychopathology are true conditioned emotional reactions...

One baby is not, of course, a scientifically robust sample; on the other hand, most of Watson's experiments were performed on rats.

Behaviourist ideas regarding anxiety were subsequently developed by the American psychologist O. H. Mowrer (1907–82). In what has been termed the *two-stage theory* of anxiety, Mowrer argued

that anxiety – and specifically the desire to avoid it – is a crucial driver of human behaviour:

anxiety (fear) is the conditioned form of the pain reaction, which has the highly useful function of motivating and reinforcing behavior that tends to avoid or prevent the recurrence of the pain-producing stimulus. [Mowrer's emphasis]

Mowrer's emphasis on the motivating power of experience anticipates the *operant conditioning* theory of the Harvard psychologist Burrhus Skinner (1904–90). Skinner focused on the effect our behaviour has on the world around us. If the effect is positive, we learn to repeat the behaviour; a negative effect teaches us to try something different next time. So, for example, because we know how much pain an angry pitbull could inflict upon us, and the terror we'd feel as it rushed towards us, we're careful not to make any sudden or threatening movements when we walk past one.

Such behaviour is eminently sensible when it comes to genuine risks. But Mowrer's theory also helps explain how irrational anxieties can take hold. A person who avoids flying because of the anxiety it triggers in them deprives themselves of the opportunity to discover that their fears are exaggerated: the chances of being killed or injured in a plane crash are minute and the fear that seems overwhelming eventually dissipates. By avoiding such situations, our anxiety merely tightens its grip.

Behaviourist approaches to anxiety struggled to supply satisfactory answers to several important questions. For example, why is it that of the many people who experience a frightening experience – a car crash, for example – only some go on to develop a phobia that means they are fearful of travelling by car again? Why do many people develop phobias of situations in which they have never been? And if, according to classical conditioning theory, we can learn to be frightened of *any* neutral stimulus, why is it that some fears are much more common than others? Why

are so many people afraid of heights and animals and so few scared of trees or chocolate?

More recent research has suggested explanations for at least some of these conundrums. It's clear, for example, that we do not actually have to experience an event ourselves to become afraid of its repetition. We can learn to fear from how others behave and from what they tell us. So if a parent has a phobia, there is an above-average chance of their child developing it too. And some fears may have been hard-wired by evolution. Thus, although we may never have encountered a snake or a dangerous spider, our ancestors would have had ample experience of their potential danger. The very common fears of heights can be understood in the same way. These apparently vestigial fears, relics of human pre-history, are termed 'prepared' fears by psychologists.

Behaviourism doesn't provide a complete explanation of anxiety (it would be remarkable if it did!). But its contribution has been huge. Many fears are indeed learned, if not in the relatively crude fashion of classical conditioning. Indeed, the capacity to learn from experience and formulate plans to avoid future danger is surely part of the explanation for humanity's success. As Mowrer wrote:

the fact that the forward-thinking, anxiety-arousing propensity of the human mind is more highly developed than it is in lower animals probably accounts for many of man's unique accomplishments.

Behaviourism has also informed some of the most successful strategies for treating anxiety problems. The South African psychologist Joseph Wolpe (1915–97), for example, developed *behavioural desensitization* to tackle fears and phobias. This technique, which involves gradually exposing individuals to the situation they fear – for example, heights or snakes – so they can learn that there's actually nothing to be afraid of, is still the standard treatment for phobias.

And the legacy of behaviourism can be seen in today's most widespread form of psychological therapy, cognitive behaviour therapy, or CBT. At the root of CBT is the insight that unhelpful thoughts, feelings, and behaviour are not innate but learned. And because they are not innate, they can be unlearned – and often surprisingly quickly with the help of a therapist.

Cognitive theories of anxiety

The fundamental idea is that emotions are experienced as a result of the way in which events are interpreted or appraised. It is the meaning of events that triggers emotions rather than the events themselves. The particular appraisal made will depend on the context in which an event occurs, the mood the person is in at the time it occurs, and the person's past experiences.

Paul Salkovskis

Behaviourism – with its exclusive focus on those aspects of human life that could be studied in the laboratory – dominated academic psychology in the US and UK for much of the 20th century. But things began to change in 1956 with the advent of the so-called 'cognitive revolution'. Cognitivism aimed to identify and understand the basic processes underlying how human beings think; behaviourism had declined to study thoughts because they aren't the sort of thing you can observe directly.

The new approach was summarized in the ground-breaking *Cognitive Psychology*, published by Ulric Neisser (1928–2012) in 1967. Its subject was:

all the processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used... Such terms as sensation, perception, imagery, retention, recall, problem-solving, and thinking, among many others, refer to hypothetical stages or aspects of cognition.

To clarify these processes, cognitive psychologists mapped them out using a metaphor drawn from another boom area of the time: computing. Sensory information was depicted as being received by the brain and then processed via a series of binary yes/no steps, just like the flow diagrams on which many computer programs are based. Today, the models are more sophisticated: rather than a linear flow chart, in which a specified part of the brain deals with inputs one at a time, multiple mental processes occur simultaneously and in tandem across a complex, multi-layered 'neural network'.

Cognitivism is now the dominant strand in contemporary psychology. So what does it have to tell us about anxiety?

Perhaps its key insight is that anxiety – like other emotions – arises from our *appraisal* of a situation. Initially that appraisal, or interpretation, may not be a conscious process; often, it's a case of 'intuition'. Our senses function as an early warning system, picking up on something potentially important and then passing it on to the more rational, deliberative part of our brains to consider. When we detect a threat we're not confident we can handle, we feel anxiety. These latter, conscious thoughts about threat are crucial, and they're what modern psychological treatments for severe anxiety set about changing.

Imagine, for example, that you are woken in the early hours of the morning by a noise downstairs. How you interpret that noise will determine your emotional response. If you decide it's your cat clattering around, you might feel mild irritation at being disturbed before turning over and going back to sleep. But if you believe it may be the sound of a burglar rather than your pet cat, you'll almost certainly be gripped by anxiety and lie awake wondering whether you ought to investigate. It's not the event that determines our emotional state, but rather the way in which we make sense of that event.

The perceived threat can be either external – like the noise in the night – or internal. For example, panic attacks are very often triggered by the mistaken belief that odd but otherwise normal physical sensations – a tightness in the chest, perhaps, or a twinge in an arm – are symptoms of serious illness, such as a heart attack. Indeed, a vicious cycle can be triggered in which the physical manifestations of anxiety (for example, breathlessness, racing heart beat, queasiness) are taken as confirmation of impending collapse or death, which in turn leads to more anxiety. Again, it is the individual's appraisal of these internal signals that is crucial. This means that if you change your thinking, you can change your emotion.

But why is it that one person interprets a little breathlessness after running up stairs as a sign of imminent death, and another scarcely notices it? Why does one person assume a noise in the night is nothing to worry about, and another find themselves paralysed by anxiety? The answer lies in our preconceptions, ideas, and habitual thought processes – what the founder of cognitive behaviour therapy Aaron T. Beck termed 'schematic beliefs'. These schematic beliefs are forged through our life experiences. And they're so ingrained and automatic that we're usually unaware of their existence.

There's nothing inherently negative about cognitive schemas: they allow us to quickly orient ourselves to the situations in which we find ourselves. But Beck discovered that people with anxiety disorders typically possess unhelpful schematic beliefs about themselves, the world around them, and the future (what's known as the *cognitive triad*). For example:

- 'It's always wisest to assume the worst.'
- 'Trouble can strike at any moment; I must always be ready.'
- 'I'm a vulnerable person.'
- 'I must be in control.'



2. Aaron T. Beck is recognized as the father of cognitive behaviour therapy, the most effective form of treatment for anxiety problems. One of the world's leading researchers into psychological disorders, he is Professor Emeritus of Psychiatry at the University of Pennsylvania and founder of the Beck Institute for Cognitive Behavior Therapy. Beck has been acclaimed by the American Psychological Association as 'one of the five most influential psychotherapists of all time'

If we believe such things, we're likely to overestimate the threat facing us, and underestimate our capacity to cope with it.

Anxiety problems, if untreated, can be extremely persistent. But why is this? Anxious people can spend huge amounts of time worrying about events that have never happened to them, and indeed are very unlikely to occur. Why don't they realize that their anxiety is misplaced? Why don't they learn from experience?

This is a question that has received a great deal of attention from clinical cognitive psychologists. One of their key discoveries is that people with anxiety problems adopt a range of strategies – known as *safety behaviours* – designed to prevent the occurrence of whatever it is they fear. So, for example, a person fearful about social situations will seek to avoid them; if this is impossible, they'll fall back on other techniques such as ensuring they attend with a friend, dress as unobtrusively as possible, and keep a low profile. These safety behaviours may reduce anxiety in the short term, but they prevent us discovering that our fearful thoughts are unwarranted – and thus end up strengthening our anxiety.

Researchers have built on Beck's work to identify other *cognitive biases* underlying and sustaining anxiety disorders. Like safety behaviours, patterns of thought and behaviour that seem designed to ward off anxiety only end up tightening its grip. For example, people with anxiety problems are extremely vigilant for possible threats. But because their attention is so focused on potential danger, they tend to overlook those events that don't fit this rather bleak view of the world. This in turn can lead to an overestimation of the likelihood of danger occurring (psychologists call this *threat anticipation*) and lots of false alarms – all of which only fertilizes the ground on which anxiety grows.

There's a tendency to interpret ambiguous events negatively. This is a particular problem given that so many of the situations we encounter are inherently ambiguous, usually because it's so difficult to know how other people really think and feel. A telling example of this *attentional bias* was provided by an experiment that asked participants to spell a series of homophones (words that sound identical but have different meanings), for example: die/dye, slay/sleigh, pain/pane, weak/week, and guilt/gilt. The more anxious a participant was, the greater the likelihood that they would opt for the more threatening spelling of the words.

People with anxiety disorders are also prey to unsettling or even downright alarming images, rather than thoughts. An individual with social anxiety may possess an entirely inaccurate mental image of themselves when in social situations. Rather than thinking things through rationally, they use instinctive *emotional reasoning*. David Clark, the leading cognitive psychologist of anxiety, has explained:

It seems as though a mental model of the patient's observable, social self was laid down after an early traumatic social experience and this model is reactivated in subsequent social encounters.

This matters all the more because research suggests that images exert a much more powerful influence on emotions than do thoughts. As with the other cognitive biases, this susceptibility to mental images enables anxiety to perpetuate and intensify itself.

Neurobiological theories of anxiety

When it comes to detecting and responding to danger, the [vertebrate] brain just hasn't changed much. In some ways we are emotional lizards.

Joseph LeDoux

What happens in our brains when we feel anxiety? Until the relatively recent development of neuroimaging technology, which allows biochemical activity in the brain to be recorded and pictured, scientists could only conjecture. But remarkable advances have been made in recent years, as we'll see in a moment.

First, however, a word of caution. Neuroscience has come a long way in a short space of time. But even were we to understand exactly how our brains function – and we are still a very long way

indeed from that end point - we wouldn't thereby possess a complete explanation for our experiences. For example, though scientists can now be much more certain than ever about which parts of the brain are involved in anxiety, it is understood that no emotion can be reduced merely to a set of brain events and structures. There are always other levels of explanation, including the behavioural and cognitive aspects we've discussed already in this chapter.

The way in which such levels work has been nicely captured by the neurobiologist Steven Rose:

The language of mind and consciousness relates to the language of brains and synapses as English does to Italian; one may translate into the other, though always with some loss of cultural resonance. But we do not have to assign primacy to either.

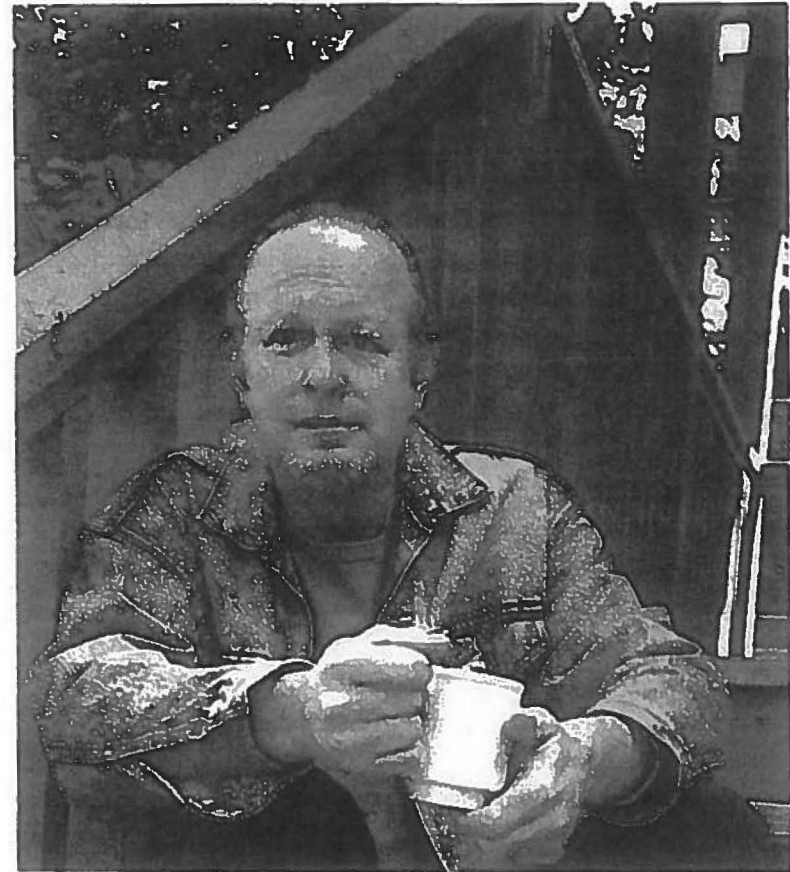
Anxiety

It's the same with anxiety; scientists approach the issue from different perspectives, but none of those perspectives has priority and all are interrelated. The best theories join up the different levels, and cognitive neuroscience has begun to do that, as we'll now see.

Long before the advent of neuroimaging, scientists had suspected that the brain's *limbic system* plays a major role in the production of emotions. The limbic system in humans closely resembles that found in the first mammals around two hundred million years ago. It is part of the forebrain, a relatively recent part of the brain in evolutionary terms, and is arranged in an approximate circle around the much more ancient brainstem ('limbic' is derived from the Latin for 'border'). Its job is to make a rapid and pre-conscious appraisal of a situation in order to help determine which emotion (and therefore reaction) is appropriate.

Also located within the forebrain are two other key components of our emotional system. The *frontal lobes* of the cerebral cortex lie

directly behind the eyes, and handle many of the tasks we tend to regard as quintessentially human, such as planning, decision-making, language, and conscious thought. It's the frontal lobes that consciously think through and regulate our emotional responses.



Theories of anxiety

3. Joseph LeDoux (b. 1949) is a US neuroscientist and Director of New York University's Center for Neural Research. LeDoux's ground-breaking research has highlighted the central role played by the brain's amygdala in the experience of anxiety and other emotions. LeDoux is also vocalist and guitarist with The Amygdaloids, a rock band who specialize in 'songs about love and life peppered with insights drawn from research about mind and brain and mental disorders'

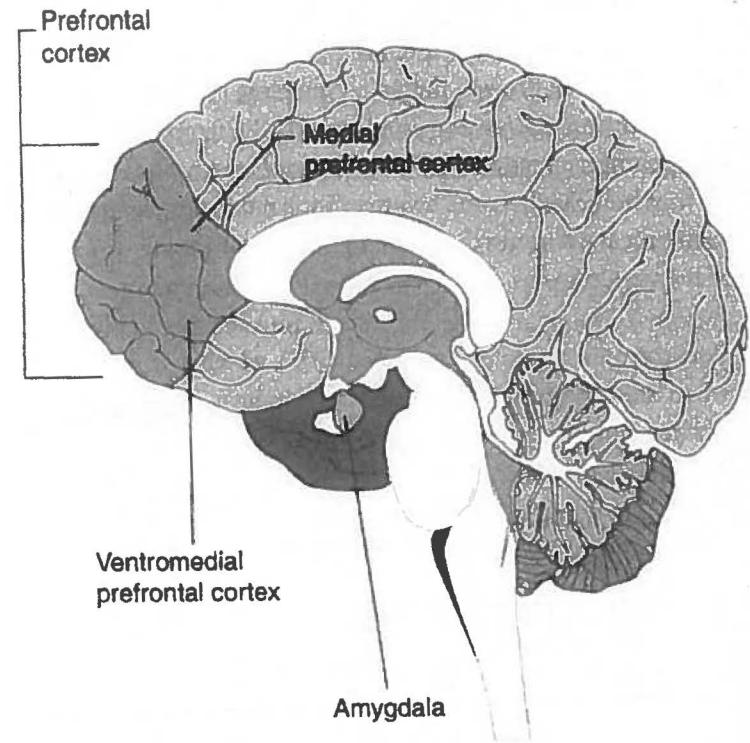
In this, the frontal lobes are assisted by the *hippocampus*, which helps form and store contextual memories – vital benchmarks as the frontal lobes figure out how best to react in a given situation.

Joseph LeDoux has been foremost in identifying one particular region of the limbic system as the brain's 'emotional computer', and as especially important in relation to fear and anxiety. That region is the *amygdala*, two small pieces of tissue shaped, in the view of early scientists, like almond seeds (*amygdala* is the Latin for 'almond seed'). The amygdala seems to be responsible for fear reactions in all species that have one, including reptiles and birds as well as mammals. It houses a store of *unconscious* fear memories, meaning that we can become anxious without knowing why. And it is extremely well connected to other parts of the brain. LeDoux has written:

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The amygdala is like the hub of a wheel. It receives low-level inputs from sensory-specific regions of the thalamus [another area of the forebrain], higher level information from sensory-specific [areas of the cerebral] cortex, and still higher level (sensory independent) information about the general situation from the hippocampal formation. Through such connections, the amygdala is able to process the emotional significance of individual stimuli as well as complex situations. The amygdala is, in essence, involved in the appraisal of emotional meaning.

The amygdala's connections don't end there. Through the hypothalamus, it can influence the basic processes that comprise the autonomic nervous system (for example, breathing, blood pressure, and body temperature). As we saw in Chapter 1, changes to the autonomic nervous system when we're anxious can lead to a wide range of physical effects including elevated heart rate, dilated pupils, and altered breathing.



4. The brain, showing the location of the amygdala

The amygdala is able to make an appraisal of a potentially threatening situation extremely rapidly – so rapidly, in fact, that we may not realize why we're suddenly feeling afraid. LeDoux has suggested that the amygdala offers a 'low road' to fear responses, supplying a 'quick and dirty' reaction to events that is designed to save our life first and ask questions later. The 'high road', by contrast, involves sensory information being processed by the frontal lobes (the part of the brain responsible for thinking things through) *before* it reaches the amygdala. The high road is more accurate, but slower. As you might imagine, both routes have their advantages and disadvantages.

Theories of anxiety

Important though the amygdala seems to be, we shouldn't forget that anxiety – just like any other emotion – is the result of an extremely complex process involving multiple regions of the brain. As we've mentioned, these regions include the frontal lobes and the hippocampus; also involved is the *insula*, a part of the cerebral cortex that helps us become aware of internal feelings, and several neurochemicals. Among the most significant of these neurochemicals are:

- Corticotropin-releasing hormone (CRH), which is triggered when the amygdala detects danger and in turn sparks the release of stress hormones to ensure that we're ready for action in the face of danger; and
- Gamma aminobutyric acid (GABA), which calms us down when we're anxious.

Given that anxiety is the result of a system rather than one element, what happens when that system malfunctions? LeDoux and others have speculated that people with anxiety disorders may possess:

- An overactive amygdala, and/or:
- insufficiently active frontal lobes, and/or:
- a hippocampus that doesn't pinpoint exactly which elements in a situation on the basis of past experience signal danger, meaning that they may become anxious unnecessarily.

The amygdala, as we've seen, is a kind of rapid-response unit, triggering 'just in case' fear reactions that are then appraised by the more deliberative areas of the brain. But if the frontal lobes, for example, can't make themselves heard over the noise emanating from the amygdala, we're likely to experience unnecessary anxiety over what are essentially false alarms.

There's evidence that persistent anxiety (through the effects of stress hormones) can alter the way in which the brain functions, for example, by impairing short-term memory or even shrinking the size of the hippocampus. These effects are usually reversible, but in the long term they can become permanent.

In the next chapter, we'll look at two more perspectives on anxiety. How much of a role do life experiences play in making us vulnerable to anxiety, and how significant are genetic factors?

Chapter 2

- Barlow, D.H. (2002). *Anxiety and its Disorders*, 2nd edn. (New York: Guilford Press).
- Barlow, D.H. and Durand, V.M. (2005). *Abnormal Psychology: An Integrative Approach*. (Belmont, CA: Thomson Wadsworth).
- Beck, A.T. and Emery, G. (1985). *Anxiety Disorders and Phobias: A Cognitive Perspective*. (Cambridge, MA.: Basic Books).
- Bishop, S.J. (2007). Neurocognitive Mechanisms of Anxiety: An Integrative Approach. *Trends in Cognitive Sciences*, 11: 307-316.
- Britton, J.C. and Rauch, S.L. (2009). Neuroanatomy and Neuroimaging of Anxiety Disorders. In M.M. Antony and M.B. Stein (eds.), *Oxford Handbook of Anxiety and Related Disorders*. (New York: Oxford University Press).
- Cannistraro, P.A. and Rauch, S.L. (2003). Neural Circuitry of Anxiety: Evidence from Structural and Functional Neuroimaging Studies. *Psychopharmacology Bulletin*, 37: 8-25.
- Charney, D.C. and Nestler, E.J. (2004). *Neurobiology of Mental Illness*, 2nd edn. (New York: Oxford University Press).
- Clark, D.A. and Beck, A.T. (2010). *Cognitive Therapy of Anxiety Disorders*. (New York: Guilford).
- Clark, D.M. (1999). Anxiety Disorders: Why They Persist and How to Treat Them. *Behaviour Research and Therapy*, 37: S5-27.

- Damasio, A.R., Grabowski, T.J., Bechara, A., Damasio, H., Ponto, L.L.B., Parvizi, J., and Hichwa, R.D. (2000). Subcortical and Cortical Brain Activity during the Feeling of Self-generated Emotions. *Nature Neuroscience*, 3: 1049-1056.
- Edelmann, R.J. (1992). *Anxiety*. (Chichester: Wiley).
- Freud S. (1895/1979). On the Grounds for Detaching a Particular Syndrome from Neurasthenia under the Description 'Anxiety Neurosis', in *On Psychopathology* (London: Penguin).
- Freud, S. (1933/1991). Anxiety and Instinctual Life, in *New Introductory Lectures on Psychoanalysis*, vol. 2. (London: Penguin).
- Gray, J.A. and McNaughton, N. (2000). *The Neuropsychology of Anxiety*, 2nd edn. (Oxford: Oxford University Press).
- Holmes, E.A. and Mathews, A. (2005). Mental Imagery and Emotion: A Special Relationship? *Emotion*, 5: 489-497.
- LeDoux, J. (1998). *The Emotional Brain*. (New York: Phoenix).
- Mathews, A., Richards, A., and Eysenck, M. (1989). Interpretation of Homophones Related to Threat in Anxiety States. *Journal of Abnormal Psychology*, 98: 31-34.
- Mowrer, O.H. (1939). A Stimulus-Response Analysis of Anxiety and Its Role as a Reinforcing Agent. *Psychological Review*, 46: 553-565.
- Oatley, K., Keltner, D., and Jenkins, J.M. (2006). *Understanding Emotions*, 2nd edn. (Oxford: Blackwell).
- Rachman, S. (2004). *Anxiety*, 2nd edn. (Hove and New York: Psychology Press).
- Rose, S. (2011). Self Comes to Mind: Constructing the Conscious Brain by Antonio Damasio. *The Guardian*, 12 February 2011.
- Salkovskis, P. (ed.) (1996). *The Frontiers of Cognitive Therapy*. (New York: Guilford).
- Sheehy, N. (2004). *Fifty Key Thinkers in Psychology*. (London and New York: Routledge).
- Watson, J. and Raynor, R. (1920). Conditioned Emotional Reactions. *Journal of Genetic Psychology*, 37: 394-419.