

Session 9 – June 2

Fear is an important emotion and I'm sure all of us have felt its effect on our lives – some people more than others. It's not an emotion that any of us could have avoided completely. There are good biological reasons why we need fear. It has a prominent place in our physiology and psychology and has played an important role in our evolution. It is one of our most basic emotional needs and yet it can cause us all sorts of problems as well.

This brings to mind one of the earlier questions that I put to you. Do you control your emotions or do they control you? I had it on the board in the second and third sessions in Term 1. It's an important question so we will keep coming back to it. It's especially relevant as we look at the nature of fear.

Where we are heading in this course is towards an understanding of our emotional mind that will lessen any sense of being oppressed by our own feelings – although I am thinking of this in an educational rather than a therapeutic sense. People do become enslaved by their feelings, sometimes, but this is not the natural state. Our mind is designed for us to use – to exercise – in all sorts of ways – to enrich our experience of life – to make interesting meanings and bring us satisfaction – so the entire range of our emotional expression is there to help us, not to hinder.

We have looked briefly at two brain regions in the prefrontal area of our cortex or 'higher' brain. One was the anterior cingulate – associated with pleasure and reward – and the other was the anterior insula, which is vital for developing our sense of self and assessing how we are feeling. Today we will consider how these higher regions interact with the deeper regions of the brain in the limbic system which are the generators of the emotion of fear.

In the last session we touched on the folly of thinking badly about yourself. Negative self-assessment is something we all experience at times, but it is not helpful to us or anyone else. Our awareness of disgust points us very clearly in the direction of something better. Like all emotions it guides our behaviour and our judgement of what attracts us and what we want to avoid. As we appreciate the beauty around us we come to appreciate the beauty in ourselves. And it is not a simple either/or concept because there is meaning in contrasts and we need the blemishes to recognise the beauty.

Fear - #4 of the basic emotions – ties in with #5 surprise and #6 anger

The power of fear

Fear is linked with memory in the brain (can trap us in the past)

The place of fear:

One of three basic systems of emotion regulation – DRIVE, CALM and FEAR

Pathways of fear:

a 'low road' direct to the amygdala and a 'high road' via the frontal lobes

Coping with fear

Fear is number four of the six basic emotions and it will bring us into contact with numbers five and six – surprise and anger – because they are closely related to fear. The element of surprise almost always triggers a fear response and fear often leads to the generally destructive expression of anger and rage.

The power of fear

It's all very well to say I'm going to be in charge of my emotions, but there are situations in which that simply does not work. Fear is perhaps the best example. Fear can paralyse the mind and body. There are plenty of documented cases of this – amongst soldiers in the middle of a war zone, for example. The powerful physiological response to an immediate serious threat, which has been aptly described as 'fight, flight or freeze,' can put wings on your feet or nail your feet to the ground.

It's not just an immediate danger that can do this. Thinking about something ahead that could be fearful and not knowing how you might react to it produces a dread of fear, which is also a debilitating emotional state. Chronic anxiety is quite a common mental and physical condition in today's world. So we will need to look at the adverse effects of fear in our lives as well as the benefits it brings. And at the difference between being debilitated by it and using it wisely.

We need to distinguish between fear and anxiety because they are not exactly the same. Fear is an emotional response to a perceived threat that is designed to lead to avoidance of that threat, whereas anxiety is an emotional state that occurs when those threats are perceived to be unavoidable and they won't go away.

Today we will watch another extract from the video, *Brain Story*, and meet a severely disabled Vietnam veteran whose post-traumatic stress disorder has completely ruined his life. He is an example of how this emotion, more than any other, can trap people's minds in their past experience and prevent them from living in their present lives. Fear is closely linked to memories because of the way our brain functions. We will explore this today.

Also in this video we will meet a famous neuroscientist from Chicago who has done more than anybody else to draw attention to the emotional aspects of the mind and how they work in our daily lives. His name is Antonio Damasio and two of his books – *Descartes' Error* and *The Feeling of What Happens* – have been important source books for this course. You will hear him speak about how the emotional contours of our past influence all the ordinary decisions we make today.

Our past emotional experience is wired into certain parts of our brain and will therefore affect the way we perceive the world today. We tend to think of all decision making as essentially rational and say that we use logic to make most of our decisions, but in fact our memories of what has been successful – in an emotional sense – and what has not, have a powerful influence on the choices we make. And we don't realise this because it is subconscious. As you might expect, fear is particularly important in this regard.

The awareness of danger must go back a long way in our evolution. Even lizards in the garden seem to startle at a movement or a sound. Our startle reflex is firmly established at a very young age and it is virtually impossible for anyone to avoid a little jump when hearing a sudden loud noise. Even if someone counts down from ten to indicate when it will happen, the sound of a gunshot will elicit a reflect startle reaction. This is really just a very obvious and fairly extreme form of the emotion of surprise.

It's difficult to tell whether a baby is experiencing fear or surprise, at least until about seven or eight months of age when more obvious fear responses are seen. As children start to hear stories which make them a bit fearful, there are the first signs of that attraction to a negative stimulus that we considered earlier – which is counterintuitive, but part of human nature. Scary stories may be requested by a child, but then sometimes lead to nightmares afterwards.

Up to age seven, such things as ghosts and monsters and being in darkness are strong triggers of fear. By ten or twelve, researchers have found that children are thinking about – and fearing – much more adult concepts such as murder or paedophilia or terrorist bombing attacks. Parents may be unaware of how much their children are worrying about these worldly and grown-up matters at such a tender age.

Then, for teenagers, the social fears which were not so evident before become the most prominent fearful stimuli – fear of being rejected or not liked or looking foolish. Substantial pruning of brain circuits occurs during adolescence so it is beneficial to be able to talk honestly about one's fears at this time. Dacher Keltner found that teasing associated with bullying could lead to severe fear responses. Memories from school can shape brain circuits that will affect our decision making much later in life.

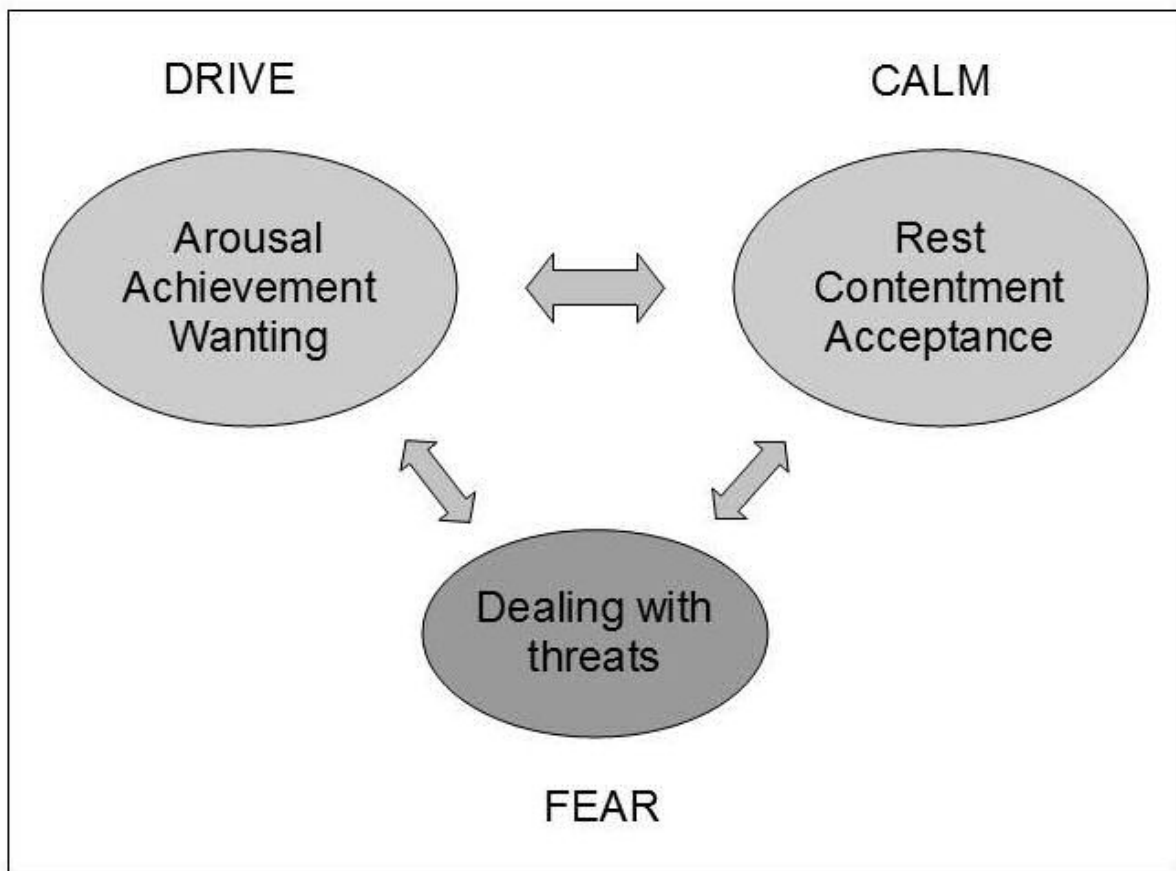
The way we experience fear is very obvious in our body as well as our mind. You might suddenly be aware of your heart pounding and begin to feel butterflies in your stomach or even nausea. Your hands are cold although the palms may be sweaty, your hands and legs may become shaky, your mouth

becomes dry and your chest feels tight. You get goosebumps and hairs stand up on the back of your neck, though not so obviously in humans. Extreme fear can even cause death through cardiac arrest.

A panic attack is an extremely intense fear that comes on suddenly. Typically it peaks after about ten minutes and lasts about 30 minutes – although this varies greatly. It can be a very disturbing and debilitating experience essentially because the sufferer doesn't realise that this is an exaggerated form of a perfectly normal bodily response.

The power of fear stems from the fact that it arises in a deep part of our brain and is very old in evolutionary terms. Our practical experience of fear depends on being able to put this rather primitive, but necessary, response into its proper place in our overall emotional experience.

Regulation of Emotions by Three Interacting Systems



The place of fear

To put fear into perspective we need to take a very broad view of the three basic systems that regulate our emotions generally (see diagram above). The way it works is that every component in the complex biochemical network that produces our constantly changing emotional states can be either speeded up or slowed down at any point in time. Regulation of our emotions depends on which bit is being stimulated and which is being suppressed – on the chemical actions of so-called 'uppers and downers.'

This balance between excitation and inhibition can be seen at all levels - from the molecular level right through to the broad scale of our fluctuating feelings and moods. For example, the most common general purpose neurotransmitter for stimulating nerve action is glutamate (glutamic acid) while the

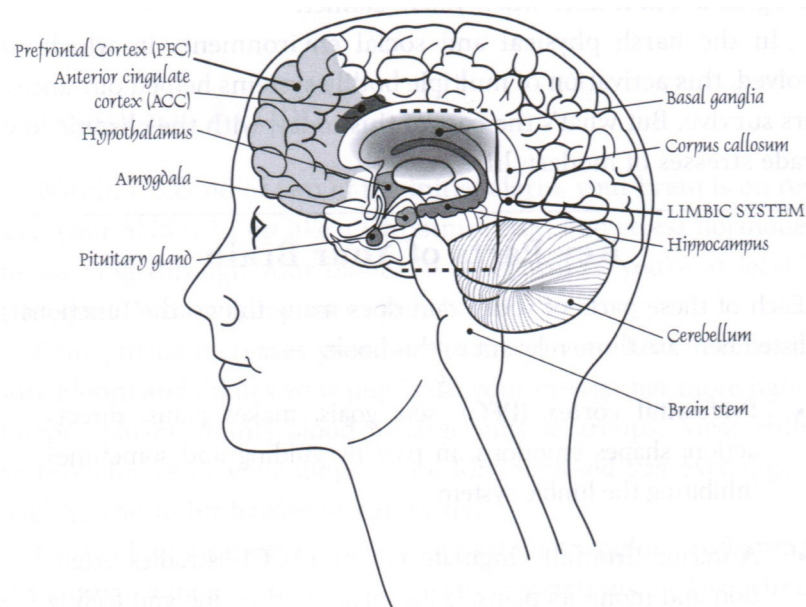
most common inhibiting agent at the molecular level is something called gamma amino butyric acid or GABA for short.

In the overall regulation of our emotions we can distinguish a system for arousal and achievement, called the DRIVE system and a system for rest and contentment, called the CALM system. The system that is driving has 'wanting an outcome' or 'making a change' or 'consuming something' as its themes whereas the calming system's theme is acceptance – and therefore not wanting any new outcome or specified change.

Our living is a cyclic process which is alternating between these two systems - one will dominate for a time, then the other will take over, and so on. If we indulge too heavily in one or the other for too long, there will be an undue strain on that regulatory system and it may begin to break down. That's the well-known principle of balancing activity and rest.

These two balancing forces would be quite sufficient if we lived entirely on our own, but, as you know, our autonomous unity needs to interact with the world around it to stay alive. The driving and calming systems refer to our emotional experience as individuals, but everything that is going on around us is also going to affect how we feel at any time. Other people in particular and all the objects that make up the outside world cannot be expected to simply accommodate our needs at every moment. We have to be aware of them and often make allowance for them because, in some circumstances, they will pose a threat to our existence. They may interfere with or block what we want to do and they may actually harm or damage us in some way. The FEAR emotional system is designed for our self-protection – to maintain our biological integrity in the midst of a foreign world.

We need these three systems of emotion to simply be alive. The basic requirements of any living thing are (1) its own autonomous identity, (2) the ability to connect with its world and (3) the ability to make meaning of this situation. The Drive system is primarily concerned with individual wants and needs, whereas the Calm system involves more awareness of the bigger picture – the context in which we exist. There is always a tension between our individual needs and wants and those of the larger world in which we live – and to which we must remain connected. So we cannot do without all three of these systems.



From what we have noted previously about the right and left brain hemispheres you will realise that our all-important, leading, right brain has more to do with the Calm emotional system and our clever, achieving, left brain is concerned more with the Drive system. Compared to other animals we have a highly developed ability to remain calm by rationalising fearful stimuli – for example, a loud noise will no longer bother us once we know what caused it and realise there is no danger. This

depends on the higher 'thinking' regions of our brain over-riding the fear response coming from deeper within the brain's limbic system. Generally, our most powerful emotions of the Drive system arise in the limbic system whereas the Calm system relies more on the prefrontal cortex.

That shows how important the emotional mechanisms of fear are to our wellbeing. Joseph Le Doux, who wrote *The Emotional Brain* at a time when few neuroscientists were interested in emotional aspects of mind, said he chose to study the emotion of fear ahead of any other emotions because that would be the best way to get to understand them all. This has been criticised by other emotion researchers, especially Antonio Damasio, who said the title of Le Doux's book was misleading because it deals only with fear. As well as being the best-known fear researcher in the world, Le Doux has been a regular singer and guitarist in a New York band called The Amygdaloids.

Pathways of fear

We saw that disgust was strongly associated with a particular brain structure – the insula cortex. Fear is the only other emotion for which a definite part of the brain is known to be mainly responsible. The particular brain structure is the amygdala which is located within the limbic system – a part of our brain that is much older in evolutionary terms than the cortex. All other mammalian species have a very similar limbic system to our own.

The amygdala was given that name because its nerve cells form into a cluster that is roughly the shape of an almond – though a little larger – and that is the scientific name for almonds. Its role is generally described as emotional learning and memory, in particular the conditioning of fear. If you apply an electrical stimulus to the amygdala in a conscious patient, they will report a strong feeling of fear and experience the butterflies, muscle tension, etc, that is typical of fear.

The potent effect of activity in the amygdala lies in the fact that it has strong connections to the hypothalamus which activates the sympathetic branch of the involuntary nervous system releasing adrenaline and stimulating heart rate, blood pressure, muscle tension and all forms of arousal. The hypothalamus also produces small peptide hormones that trigger the release of the major hormones from the pituitary gland. These travel around the body to set off other hormones, in particular the main stress hormone, cortisol, from the adrenal gland. It increases blood sugar mobilising more energy for defence against danger, suppresses parts of the immune system to reduce inflammation and does lots of other things that can be helpful in an emergency, but harmful over the long term. So the amygdala is in a powerful position to turn on the immediate 'fight or flight' response and the longer-term response to stress.

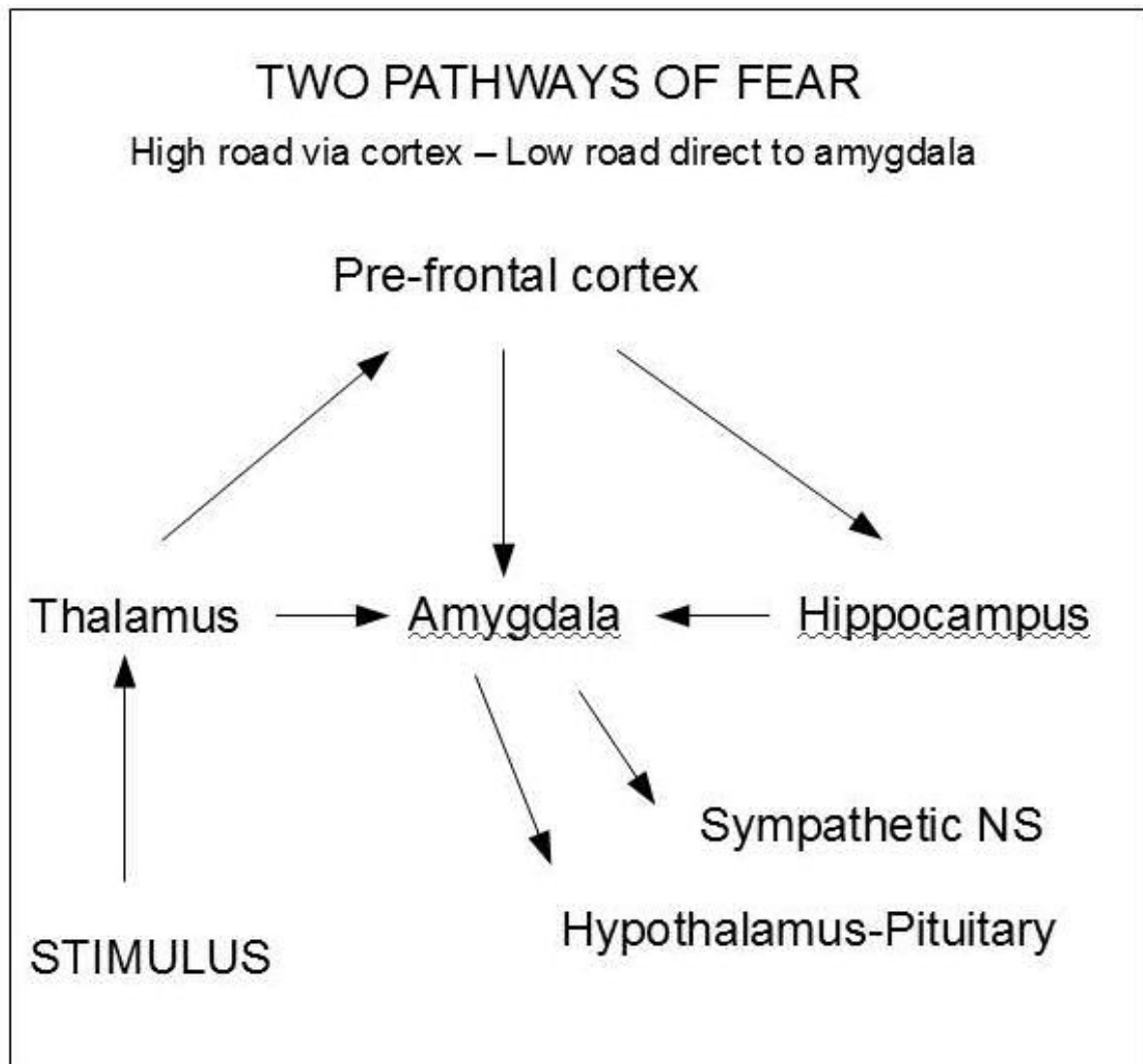
The amygdala does not work alone, of course. As well as its crucial connections to the cortex that we will consider shortly, it forms a very close association with another nearby part of the limbic system. This is the hippocampus – a larger, elongated structure that is crucial for long term memory processes including spatial memory and navigation - knowing where you are with regard to place. It is one of the first regions affected by Alzheimer's disease. Its name comes from the fact that it is shaped rather like a seahorse. These contextual memories play an important part in regulating the fear response.

It was Joe Le Doux from New York University who worked out that there are two different pathways involved in the fear response as we normally experience it. Feeling fear is a very old mechanism that evolved before any of the thinking processes that we now enjoy. The very first thing that happens – which he called the 'low road' – is a direct signal to the amygdala for an immediate response. There is no thinking involved – this is the alarm reaction that prepares for fight or flight.

The signals of fear also travel to various parts of the prefrontal cortex where they can be assessed in a much broader context, but this is a slower process. This 'high road' is what enables us to shut down a severe alarm reaction when our thinking tells us it's the kind of threat that can be easily avoided or which represents no real danger to us at that time.

If you lived near an artillery range, for example, you would be fairly accustomed to the noise, but still would be startled when the first bang comes unexpectedly. Your heart will jump a little, maybe

start racing – palms might sweat or your muscles tense – but this will be short-lived. Very soon you calm down because you know what it is and there is no reason to be afraid that your life is in danger.



Even the quick and dirty route – the low road – can be attenuated by the thinking process – for example, when you are viewing snakes or sharks behind glass in a museum you aren't frightened of them. We learn to manage many everyday dangerous situations without much fear by using the higher parts of our brain to maintain a sensible perspective about what is happening.

Once you've learnt to avoid a particular danger the amygdala's involvement becomes quite minimal and you hardly notice it at all. Driving a car at 100 kph, heading towards oncoming vehicles, should be terrifying, but it's not – most of us do it every day. You don't cross the street with your heart in your mouth every time – unless perhaps you are in a city you don't know where you perceive the traffic to be chaotic – like some Asian capitals – or Paris, for that matter,

As we experience the emotional changes that either drive us toward some goal or enable us to be calm and content, we are continually evaluating the threats around us and our overall wellbeing depends, to a large extent, on how much this Fear system intrudes upon the other two systems. It always has some effect at a subconscious level on the decisions we make and the range of our thinking, but will not normally cause us problems unless there is some kind of emotional disorder.

Coping with fear

Sometimes it happens that fear seems not to be our friend – it looms as a problem and we have to find some way of coping with it. Emotional disorders are when natural responses such as fear or sadness are occurring out of context. The clinical test they use is the appropriateness of the emotion for the situation. Persistent fear – such as with post-traumatic stress disorder - and severe depression both cause the hippocampus to shrink, thus weakening the appreciation of context and distorting memories which could be helpful to the bigger picture. Antidepressant medication actually prevents and may even reverse this shrinkage.

People with post-traumatic stress disorder scare much more easily and their flashbacks produce large bursts of adrenaline which stimulates their bodies far beyond what is appropriate for the situation. This over-arousal leads to damage in very mechanisms that are designed to protect us from danger. The role of the hippocampus is important here because its more general memory functions are weakened while the amygdala remains strong so its more specific fear memories become more and more inappropriate and out of context.

The Mind-Life Institute which organises the dialogues between the Dalai Lama and the world's leading neuroscientists devoted a whole meeting to what they called *Destructive Emotions*, which they defined as emotions that cause harm to ourselves and others. There is a book of that name which makes interesting reading. They acknowledged, as I have done here, that the emotions were not naturally designed to be destructive, but may become so under certain circumstances.

The amygdala is not only the hub of fear responses – it is also involved in other negative emotional experiences we have - particularly anger – so frequent and persistent activation of this part of our limbic system would not seem to be in our best interests. Yet it is also the close to the centre of our positive drives, too, so exercising these will actually help to restore some emotional balance.

Coping with fear includes the calming effects of distracting your mind with beautiful music or deliberately thinking of nice, safe situations and relationships, but it also includes the Drive system just as much as the Calm system. If we are not using that natural energising effect our basic emotional drives to achieve things that we find satisfying this energy seems to spread out into non-specific fears and restlessness. If we are discontented and irritable we are not exercising the Calm emotional system. The general idea is to keep the Fear system that we know we can't do without in a place that is clearly secondary to the other two emotional systems.

Exposure to fearful stimuli while thinking positively about yourself and your goals is one of the most successful methods used to overcome adverse effects of fear, Phobias, which are highly developed fears to specific situations, are often treated by exposure. There was a best-selling book some years ago called *Feel the Fear and Do it Anyway* which illustrates this point. And an old saying is: 'I used to think I ran away because I was frightened, but now I know I was frightened because I ran away.' There is a widespread opinion amongst clinicians that cognitive behaviour therapy is better than psychoanalysis for overcoming undue sensitivity to fear.

We can learn not to be fearful. Much fear has been learned and so can be unlearned, whereby people find a way to change their reactions to the fear response, not the basic feeling of fear itself. In social situations, sharing one's experience of fear with others can be a very reassuring for all concerned.

The benefits of compassion and love in dealing with any disorder or imbalance of our emotions is something we will talk about in much more detail later in the course. There is a lot of evidence that people brought up in a nurturing environment have a greater ability to regulate their emotions generally and not be overcome by any particular feeling.

Most people also experience the thrill of fear to some extent. Many people like watching horror films and enjoy roller coaster rides. Even just meeting a stranger makes you more nervous than if it was someone you know, but yet there is also something exciting about it. Trying new things you've never done before can make the difference between a dull day and a really enjoyable one.

Later we will be talking about our wonderful sense of awe and the way it arose from fear. We have evolved emotional states that, instead of being centred on fear and dread, grew into feelings of reverence, devotion and pleasure.

Appreciating the vital role of fear and respecting it as one of most powerfully important emotions lies at the heart of our experience of it and our ability to fit it into the mix of all our emotions in the most successful way.

Experiencing fear is the ability our brain has to focus on details which might ensure our survival whilst also taking account of the context in which these details occur. It's a delicate balance – to ensure that we don't have too little fear - which could mean we die – or too much fear – which means we are not living very comfortably either.

In the next session we will consider other aspects of fear including its effect on our relational space and its role in honing the sharp intellect that we have today.