

PHYSIOLOGY OF ANXIETY

Anxiety is probably the most basic of all emotions. Not only is it experienced by all humans, but anxiety responses have been found in all species of animals right down to the sea slug. Anxiety experiences vary tremendously in their severity from mild uneasiness to extreme terror and panic. They can also vary tremendously in their length from a brief, almost fleeting flash, to a constant, all day affair. While anxiety, by its nature and definition, is an unpleasant sensation, it is not in the least dangerous. It is this last point which forms the basis of this article. The aim of the next few pages is to teach you about the components (physical and mental) of anxiety in order that (1) you realize that many of the feelings which you now experience are the result of anxiety and (2) you learn that these feelings are not harmful or dangerous.

Definition of Anxiety

While an actual definition of anxiety which covers all aspects is very difficult to provide (indeed whole books have been written on the subject), everyone knows the feeling which we call anxiety. There is not a person who has not experienced some degree of anxiety whether it is the feeling upon entering a school room just before an exam, or the feeling when one wakes in the middle of the night, certain that they heard a strange sound outside. What is less known, however, is that sensations such as extreme dizziness, spots and blurring of the eyes, numbness and tingling, stiff almost paralyzed muscles, and feelings of breathlessness extending to choking or smothering can also be a part of anxiety. When these sensations occur and people do not understand why, then anxiety can increase to levels of panic since people imagine that they must have some disease.

Fight/Flight Response

Anxiety is a response to danger or threat. Scientifically, immediate or short term anxiety is termed the fight/flight response. It is so named because all of its effects are aimed toward either fighting or fleeing the danger. Thus, the number one purpose for anxiety is to protect the organism. When our ancestors lived in caves, it was vital that when faced with some danger, an automatic response would take over causing us to take immediate action (attack or run). Even in today's hectic world this is a necessary mechanism. Just imagine if you were crossing a street when suddenly a car sped toward you blasting its horn. If you experienced absolutely no anxiety, you would be killed. However, more probably, your fight/flight response would take over and you would run out of the way to be safe. The moral of this story is a simple one--the purpose of anxiety is to protect the organism, not to harm it. It would be totally ridiculous for nature to develop a mechanism whose purpose is to protect an organism and yet, in doing so, harms it.

Anxiety manifests itself through three separate systems and it is important to identify these systems since each one can be primary in

any individual person. The three systems are: the mental system (which includes the actual feelings of nervousness, anxiety and panic and also includes thoughts such as "there is something wrong"); the physical system (which includes all the physical symptoms such as dizziness, sweating, palpitations, chest pain, and breathlessness); the behavioral system (which includes the actual activities such as pacing, foot tapping and avoidance). In panic attacks the physical system becomes the most important since it is these symptoms which are most easily mistaken as indicating some serious disease.

Systems of Anxiety

The best way to think of all of the systems of the fight/flight response (anxiety) is to remember that all are aimed at getting the organism prepared for immediate action and that their purpose is to protect the organism.

Physical System

a. Nervous and Chemical Effects

When some sort of danger is perceived or anticipated, the brain sends messages to a section of your nerves called the autonomic nervous system. The autonomic nervous system has two subsections or branches called the sympathetic nervous system and the parasympathetic nervous system. It is these two branches of the nervous system which are directly involved in controlling the body's energy levels and preparation for action. Very simply put, the sympathetic nervous system is the fight/flight system which releases energy and gets the body "primed" for action while the parasympathetic nervous system is the restoring system which returns the body to a normal state.

One important point is that the sympathetic nervous system tends to be largely an all or none system. That is, when it is activated, all of its parts respond. In other words, either all symptoms are experienced or no symptoms are experienced; it is rare for changes to occur in one part of the body alone. This may explain why most panic attacks involve many symptoms and not just one or two.

One of the major effects of the sympathetic nervous system is that it releases two chemicals called adrenalin and noradrenalin from the adrenal glands on the kidneys. These chemicals, in turn, are used as messengers by the sympathetic nervous system to continue activity so that once activity in the sympathetic nervous system begins, it often continues and increases for some time. However, it is very important to note that sympathetic nervous system activity is stopped in two ways. First, the chemical messengers adrenalin and noradrenalin are eventually destroyed by other chemicals in the body. Second, the parasympathetic nervous system (which generally has opposing effects to the sympathetic nervous system) becomes activated and restores a relaxed feeling. It is very important to realize that eventually the body will "have enough" of the fight/flight response and will activate the parasympathetic nervous system to restore a relaxed feeling. In other words, anxiety cannot continue forever, nor spiral to ever increasing and possibly damaging levels. The parasympathetic nervous system is an inbuilt protector which stops the sympathetic nervous system getting carried away. Another important point is that the chemical messengers, adrenalin and noradrenalin take some time to be

destroyed. Thus, even after the danger has passed and your sympathetic nervous system has stopped responding, you are likely to feel keyed up or apprehensive for some time because the chemicals are still floating around in your system. You must remind yourself that this is perfectly natural and harmless. In fact, this is an adaptive function because, in the wilds, danger often has a habit of returning and it is useful for the organism to be prepared to activate the fight/flight response.

b. Cardiovascular Effects

Activity in the sympathetic nervous system produces an increase in heart rate and the strength of the heartbeat. This is vital to preparation for activity since it helps speed up the blood flow, thus improving delivery of oxygen to the tissues and removal of waste products from the tissues. In addition to increased activity in the heart, there is also a change in the blood flow. Basically, blood is redirected away from the places where it is not needed (by a tightening of the blood vessels) and toward the places where it is needed more (by an expansion of the blood vessels). For example, blood is taken away from the skin, fingers, and toes. This is useful because if the organism is attacked and cut in some way, it is less likely to bleed to death. Hence, during anxiety the skin looks pale and feels cold and fingers and toes become cold and sometimes experience numbness and tingling. In addition, the blood is moved to the large muscles such as the thighs and biceps which helps the body prepare for action.

c. Respiratory Effects

The fight/flight response is associated with an increase in the speed and depth of breathing. This has obvious importance for the defense of the organism since the tissues need to get more oxygen in order to prepare for action. The feelings produced by this increase in breathing, however, can include breathlessness, choking or smothering feelings, and even pains or tightness in the chest. Importantly, a side effect of increased breathing, especially if no actual activity occurs, is that blood supply to the head is actually decreased. While this is only a small amount and is not at all dangerous, it produces a collection of unpleasant (but harmless) symptoms including dizziness, blurred vision, confusion, unreality, and hot flushes.

d. Sweat Gland Effects

Activation of the fight/flight response produces an increase in sweating. This has important adaptive functions such as making the skin more slippery so that it is harder for a predator to grab, and cooling the body to stop it from overheating.

e. Other Physical Effects

A number of other effects are produced by activation of the sympathetic nervous system, none of which are in any way harmful. For example, the pupils widen to let in more light which may result in blurred vision, spots in front of the eyes, etc. There is a decrease in salivation, resulting in a dry mouth. There is decreased activity in the digestive system which often produces nausea, a heavy feeling in the stomach and even constipation. Finally, many of the muscle groups tense up in preparation for fight or flight and this results in

subjective feelings of tension, sometimes extending to actual aches and pains as well as trembling and shaking.

Overall, the fight/flight response results in a general activation of the whole bodily metabolism. Thus, one often feels hot and flushed and, because this process takes a lot of energy, afterwards the person generally feels tired, drained, and washed out.

Behavioral System

As mentioned before, the fight/flight response prepares the body for action--either to attack or to run. Thus, it is no surprise that the overwhelming urges associated with this response are those of aggression and a desire to escape wherever you are. When this is not possible (due to social constraints), the urges will often be shown through such behaviors as foot tapping, pacing or snapping at people. Overall, the feelings produced are those of being trapped and needing to escape.

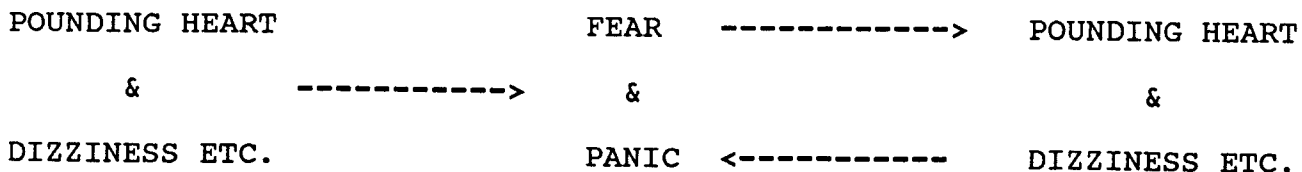
Mental System

The number one effect of the fight/flight response is to alert the organism to the possible existence of danger. Thus, one of the major effects is an immediate and automatic shift in attention to search the surroundings for potential threat. In other words it is very difficult to concentrate on daily tasks when one is anxious. Therefore, people who are anxious often complain that they are easily distracted from daily chores, that they cannot concentrate, and that they have trouble with their memory. This is a normal and important part of the fight/flight response since its purpose is to stop you from attending to your ongoing chores and to permit you to scan your surroundings for possible danger. Sometimes, an obvious threat cannot be found. Unfortunately, most humans cannot accept having no explanation for something. Therefore, in many cases, when people cannot find an explanation for their sensations, they turn their search upon themselves. In other words "if nothing out there is making me feel anxious, there must be something wrong with me". In this case, the brain invents an explanation such as "I must be dying, losing control, or going crazy". As we have now seen, nothing could be further from the truth since the purpose of the fight/flight response is to protect the organism not harm it. Nevertheless, these are understandable thoughts.

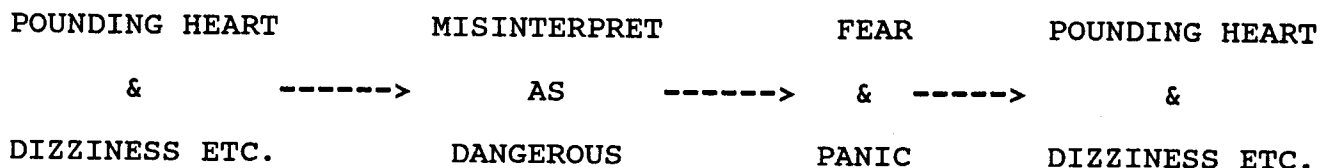
Panic Attacks

Up until now, we have looked at the features and components of general anxiety or the fight/flight response. However, you may be wondering how does all this apply to panic attacks? After all, why should the fight/flight response be activated during panic attacks since there is apparently nothing to be frightened of?

Following extensive research, it appears that what people with panic attacks are frightened of (i.e., what causes the panic) are the actual physical sensations of the fight/flight response. Thus, panic attacks can be seen as a set of unexpected physical symptoms and then a response of panic or fear of the symptoms such as illustrated below:



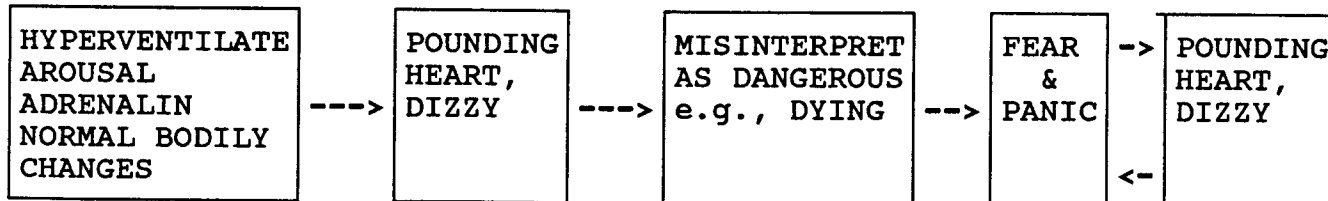
The second part of this model is easy to understand. As discussed earlier, the fight/flight response (of which the physical symptoms are a part) causes the brain to search for danger. When the brain cannot find any obvious danger, it turns its search inward and invents a danger such as "I am dying, losing control, etc.". This is illustrated below:



The first part of the model is harder to understand. Why do you experience the physical symptoms of the fight/flight response, if you are not frightened to begin with? There are many ways these symptoms can be produced, not just through fear. For example, it may be that you have become generally stressed for some reason in your life and this stress results in an increase in production of adrenalin and other chemicals which from time to time produce symptoms. This increased adrenalin could presumably be maintained chemically in the body even after the stressor has long gone. Another possibility is that you tend to breathe a little too fast (subtle hyperventilation) due to a learned habit and this also can produce symptoms. Because the overbreathing is very slight, you easily become used to this level of breathing and do not notice that you are hyperventilating. A third possibility is that you are experiencing normal changes in your body (which everyone experiences but most don't notice) and, because you are constantly monitoring and keeping a check on your body, you notice these sensations far more strongly than most people.

Even if we are not exactly certain why you experience the initial symptoms, we can assure you that they are a part of the fight/flight response and therefore are harmless.

Thus, our final model of panic attacks (simplified) looks like this:



Obviously, then, once you truly believe (100%) that the physical sensations are not dangerous, then the fear and panic will no longer occur and you will eventually no longer experience panic attacks. Of course, once you have had a number of panic attacks and you have misinterpreted the symptoms many times, this misinterpretation becomes

quite automatic and it becomes very difficult to consciously convince yourself during a panic attack that the symptoms are harmless.

In Summary

Anxiety is scientifically known as the fight/flight response since its primary purpose is to activate the organism and protect it from harm. Associated with this response are a number of physical, behavioral, and mental changes. Importantly, once the danger has gone, many of these changes (especially the physical ones) can continue, almost with a mind of their own, due to learning and other longer term bodily changes. When the physical symptoms occur in the absence of an obvious explanation, people often misinterpret the normal fight/flight symptoms as indicating a serious physical or mental problem. In this case, the sensations themselves can often become threatening and can begin the whole fight/flight response over.

MYTHS AND MISINTERPRETATIONS

Going Crazy

Many people, when they experience the physical symptoms of the fight/flight response, believe they are "going crazy". Within this belief, they are most likely referring to a severe mental disorder known as schizophrenia. Let us look at schizophrenia to see how likely this is.

Schizophrenia is a major disorder characterized by such severe symptoms as disjointed thoughts and speech, sometimes extending to babbling, delusions or strange beliefs (for example, that they are receiving messages from outer space), and hallucinations (for example, that there are voices in their head). Furthermore, schizophrenia appears to be largely a genetically based disorder, running strongly in families.

Schizophrenia generally begins very gradually and not suddenly (such as during a panic attack). Additionally, because it runs in families, only a certain proportion of people can become schizophrenic and, in other people, no amount of stress will cause the disorder. A third important point is that people who become schizophrenic will usually show some mild symptoms for most of their lives (such as unusual thoughts, flowery speech, etc.). Thus, if this has not been noticed in you yet, then the chances are you will not become schizophrenic. This is especially true if you are over 25 since schizophrenia generally first appears in the late teens to early 20's. Finally, if you have been through interviews with a psychologist or psychiatrist, then you can be fairly certain that they would have known if you were likely to become schizophrenic.

Losing Control

Some people during a panic attack believe they are going to "lose control". Presumably, they mean that they will either become totally paralyzed and not be able to move, or that they will not know what they are doing and will run around wildly killing people or yelling out obscenities and embarrassing themselves. Alternatively, they may not know what to expect but may just experience an overwhelming feeling of "impending doom".

From our earlier discussion, we now know where this feeling comes from. During anxiety the entire body is prepared for action and there is an overwhelming desire to escape. However, the fight/flight response is not aimed at hurting other people (who are not a threat) and it will not produce paralysis. Rather, the entire response is simply aimed at getting the organism away. In addition, there has never been a recorded case of someone "going wild" during a panic attack. Even though the fight/flight response makes you feel somewhat confused, unreal, and distracted, you are still able to think and function normally. Simply think of how often other people even notice that you are having a panic attack.

Nervous Collapse

Many people are frightened about what might happen to them as a result of their symptoms, perhaps because of some belief that their nerves might become exhausted and they may collapse. As discussed earlier, the fight/flight response is produced chiefly through activity in the sympathetic nervous system which is counteracted by the parasympathetic nervous system. The parasympathetic nervous system is, in a sense, a safeguard to protect against the possibility that the sympathetic nervous system may become "worn out". Nerves are not like electrical wires and anxiety cannot wear out, damage or use up nerves. The absolute worst that could happen during a panic attack is that an individual could pass out at which point the sympathetic nervous system would stop its activity and the person would regain consciousness within a few seconds. However, actually passing out as a result of the fight/flight response is extremely rare, and if it does occur, it is adaptive since it is a way of stopping the sympathetic nervous system from going "out of control".

Heart Attacks

Many people misinterpret the symptoms of the fight/flight response and believe they must be dying of a heart attack. This is probably because many people do not have enough knowledge about heart attacks. Let us look at the facts of heart disease and see how this differs from panic attacks.

The major symptoms of heart disease are breathlessness and chest pain as well as occasional palpitations and fainting. The symptoms in heart disease are generally directly related to effort. That is, the harder you exercise, the worse the symptoms and the less you exercise, the better. The symptoms will usually go away fairly quickly with rest. This is very different to the symptoms associated with panic attacks which often occur at rest and seem to have a mind of their own. Certainly, panic symptoms can occur during exercise or can be made worse during exercise, but they are different to the symptoms of a heart attack since they can occur equally often at rest. Of most importance, heart disease will almost always produce major electrical changes in the heart which are picked up very obviously by the EKG. In panic attacks the only change which shows up on the EKG is a slight increase in heart rate. Thus, if you have had an EKG and the doctor has given you the all clear, you can safely assume you do not have heart disease. Also, if your symptoms occur any time and not only upon exertion, this is additional evidence against a heart attack.