PHYSIOLOGY OF FEAR

Fight-flight system

Because mistaken, negative thoughts contribute to panic and anxiety, and because the negative thoughts often are to do with believing that the physical symptoms of fear and anxiety are harmful, it is very important to have an accurate understanding of the physical symptoms of panic. This information will help you realize that the physical symptoms are not a sign of something seriously wrong.

Scientifically, immediate or short-term anxiety is named the fight-flight response. It is so named because all of its effects are aimed toward either fighting or fleeing from danger. Thus, the number one purpose of panic is to protect us from danger. When our ancestors lived in caves, it was vital that when faced with 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. What actually happens is that your fight-flight response takes over and you would run out of the way. The moral of this story is a simple one -- **the purpose of panic is to protect us, not to harm us**.

When danger is detected, 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 ready for action (fighting or fleeing) whereas the parasympathetic nervous system is the restoring system which returns the body to a normal state. Activation of the sympathetic nervous system is believed to cause most panic attack symptoms.

An important point is that the sympathetic nervous system tends to be an all-or-none system. When it is activated, all of its parts respond. This may explain why most panic attacks involve many physical symptoms and not just one or two. In addition, the sympathetic nervous system responds immediately, as soon as danger is close at hand (e.g., think of the rush that you experience when you think another car is about to hit you). That is why the physical symptoms of panic attacks can occur almost instantaneously, within seconds.

The sympathetic nervous system releases two chemicals called adrenalin and noradrenalin. These chemicals, in turn, are used as messengers to continue sympathetic nervous system activity, so that once activity begins, it often continues and increases for some time. However, it is very important to know 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. 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, **panic 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 fully destroyed. Thus, even after your sympathetic nervous system has stopped responding, you are likely to feel keyed up or on edge 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, there is a purpose to this -- in the wilds, danger often has a habit of returning. So, it is useful for us to remain in a keyed up state so that we can quickly re-activate the fight-flight response if danger returns.

Physical Effects of Fight-Flight System

Each physical effect of the fight-flight system is intended to prepare you to fight of flee, or in other words, to protect you. The **fight-flight system affects our hearts, blood flow, breathing, sweating, pupils, muscles, and digestive system**, as well as other parts of our body. For example, activity in the sympathetic nervous system increases heart rate and strength of the heartbeat. This helps speed up the blood flow, thus improving delivery of oxygen to the tissues and removal of waste products from the tissues. Oxygen is needed by the muscle tissues as a source of energy for fighting or fleeing. This is why a racing or pounding heart is typically experienced during periods of high anxiety or panic. Also, there is a change in the blood flow. Basically, blood is taken away from the places where it is not needed (by a tightening of the blood vessels) and goes 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, thinking back to our ancestral cave days, the extremities are the most likely place to be attacked and injured, and having less blood flow there means we are less likely to bleed to death. As a result, the skin looks pale and feels cold, especially around the hands and feet. The blood goes to the large muscles, such as the thighs, heart, and biceps, which need the oxygen for fighting or fleeing.

Another effect is for breathing to become faster and deeper, because the body needs more oxygen to be able to fight or flee. However, as described in more detail in the next chapter, sometimes breathing can become unbalanced, and cause harmless but unpleasant symptoms such as breathlessness, choking or smothering feelings, and pains or tightness in the chest. Also, blood supply to the head may be decreased. While this is only a small amount and is not at all dangerous, it produces unpleasant (but harmless) symptoms including dizziness, blurred vision, confusion, feeling of unreality (or, feeling as if you are in a dream state), and hot flushes.

The fight-flight response increases sweating. Sweating cools the body to prevent it from overheating, and thus allows us to continue fighting or fleeing from danger without collapsing from heat. Also, the pupils widen to let in more light. This helps us to scan the environment for whatever is dangerous. At the same time, it may cause symptoms such as blurred vision, spots in front of the eyes, or sensitivity to bright lights. There is a decrease in salivation, resulting in a dry mouth. In fact, the whole digestive system is decreased, so that energy that is usually required for food digestion can be redirected to the muscles that are needed to fight or flee. This often causes nausea, heavy feelings in the stomach, and sometimes diarrhea as material that could "weigh us down" while attempting to fight or flee is evacuated from the body. Also, many of the muscle groups tense up in preparation for fight or flight and this results in feelings of tension, sometimes extending to actual aches and pains as well as trembling and shaking.

Finally, because the fight-flight response produces a general activation of the whole body, and because this takes a lot of energy, people generally feel tired, drained, and washed out afterwards. All of these effects are summarized below.

The Physiology of Fear

Physical Change	Actual Purpose	Symptom
Increased heart rate and strength of heart beat	Speed up delivery of oxygen and removal of carbon dioxide	Racing or pounding heart
Redirection of blood flow away from skin, toes and fingers, and towards big muscles	Provide the big muscles with energy for fight or flight; lose less blood if attacked	Pale and cold, especially in hands and feet
Increased rate and depth of breathing	Provide more oxygen for muscles as energy for fight or flight	Fast breathing. Also, dizzy, light headed, short of breath, hot or cold, sweaty, chest discomfort, visual changes, if the increased oxygen is not metabolized
Increased activity in sweat glands	Cool body to prevent exhaustion from over heating; more likely to slip away from predator	Perspiration

Table continued

Physical Change	Actual Purpose	Symptom
Pupils dilate	Increase visual field to scan for danger	Eyes sensitive to light
Suppression of digestive system	Direct all energy towards fight and flight; Keep you from feeling hungry	Dry mouth, nausea, stomach cramps, diarrhea
Increased muscle activation	Preparation for fight or flight	Muscle tension, muscle cramps, aches, trembling, shaking

Mistaken Beliefs about Panic Symptoms

When physical symptoms, such as shortness of breath, occur without an obvious explanation (i.e., without a near car accident, or without being attacked by someone), we tend to search inwardly for an explanation and in so doing, sometimes the normal symptoms of fear are misunderstood as a serious physical or mental problem. As discussed before, such mistaken beliefs can result in a vicious fear of fear cycle. **Common myths and mistaken beliefs about the physical symptoms of fear include beliefs about going crazy, losing control, nervous collapse, heart attack, and fainting**.

Going Crazy

Many people believe that the physical symptoms of fear or panic mean they are going crazy. They are most likely referring to the 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 (such as rapid shifting from one topic to the next), sometimes extending to speech that does not make any sense, delusions or strange beliefs and hallucinations. Examples of the strange beliefs might be the receiving of messages from outer space, and examples of hallucinations might be the hearing of conversations when there is no-one around.

Schizophrenia generally begins very gradually and not suddenly such as during a panic attack. Also, because it runs in families and has a strong genetic base, 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 usually show some mild symptoms for most of their lives (such as unusual thoughts or little concern over personal hygiene). Thus, if this has not been noticed yet in you, then the chances are that you will not become schizophrenic. This is

especially true if you are over 25 years of age because 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 told you if you have schizophrenia.

Losing Control

Some people believe they are going to lose control when they panic. They usually mean that they will become totally paralyzed and not able to move, or that they will not know what they are doing and will run around wild, hurting people or yelling out obscenities and embarrassing themselves. Or, they may not know what to expect but may just experience an overwhelming feeling that something bad is going to happen.

From our earlier discussion, we know where this feeling comes from. During panic attacks, the entire body is ready for action and there is an overwhelming desire to escape (we called this the fight-flight response). However, the fight-flight response is not aimed at hurting people who are not a threat, and it will not produce paralysis. Rather, the entire response is designed to get you away from potential danger. There has never been a recorded case of someone going "wild" during a panic. Even though panic attacks can make you feel somewhat confused and unreal, you are still able to think and function. In fact, you are probably able to think faster, and you are actually physically stronger and your reflexes are quicker. The same kind of thing happens when people are in real emergencies – think of mothers and fathers who accomplish amazing things (such as lifting extremely heavy objects) and overcome their own intense fears in order to save their children.

Sometimes, the strong urge to escape is misunderstood as losing control. That is, "because I do everything I can to get help, then I really must be crazy." For example, a patient at our clinic was driving to a job interview -- she panicked, changed direction, and headed for her husband's office instead. She believed this was a loss of control. On the contrary, she was in complete control as she was doing whatever was necessary to not be alone. Given her fears (which were that she might permanently lose touch with reality) getting to her husband was a natural thing for her to do. Most people would do the same if they believed they were about to slip into a state of permanent unreality. So, the behavior was controlled... the problem was her beliefs about permanent unreality.

Nervous Collapse

Many people believe that their nerves might become exhausted and they may collapse. As discussed earlier, panic is based on activity in the sympathetic nervous system, which is then 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. Another concern is that repeated panic and anxiety increase the chances of future nervous collapse. However, again, anxiety does not physically wear out nerves. On the

contrary, there is even some evidence to suggest that by repeated experiences of stress and anxiety you may toughen or strengthen your nervous system. For example, in times of severe national crisis or disaster such as war, the incidence of psychological problems do not increase, but instead there seems to be a toughening up to deal with the stress.

Heart Attacks

Many people misunderstand the symptoms of panic as signs of heart attack. This is probably because they lack 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. The symptoms usually go away fairly quickly with rest. This is very different from the symptoms of panic attacks, which often occur at rest and seem to have a mind of their own. Certainly, panic symptoms can happen and even intensify during exercise. However, this is different from the symptoms of a heart attack because panic symptoms occur equally often at rest. Of most importance, heart disease will almost always produce major electrical changes in the heart which are detected by an electrocardiogram (EKG) recording. In panic attacks, the only change that shows up on an EKG is an increase in heart rate. In and of itself, increased heart rate is not at all dangerous, unless it reaches extremely high rates, such as over 180 beats per minute, which far exceed the rates that occur during panic attacks. A typical heart rate during a strong panic attack is around 120 to 130 beats per minute. Vigorous physical exercise increases heart rate to around 150 to 180 beats per minute. Usual heart rate when resting is anywhere from 60 to 85 beats per minute. Thus, if you have had an EKG and the doctor has given you the all clear, you can safely assume that heart disease is not the cause of your attacks.

Another belief is that repeated panic attacks increase the risk of heart attacks or other dangerous physical conditions later on. Although there is evidence that long lasting stress and strain increase the risk of cardiovascular or cerebral diseases as we get older, chronic stress and strain is very different from panic attacks. As you know by now, panic attacks are short bursts of adrenalin, similar in many ways to what happens during physical exercise. There is no evidence that panic attacks in themselves are dangerous for your health in the long term. However, long lasting anxiety about panic attacks may increase the risk of later physical problems, although the degree to which risk is increased is not anyway near as big as would be due to poor lifestyle factors (such as a fatty diet, lack of exercise, smoking, and substance abuse). Nevertheless, this fact means that more effort should be put into treatment so that you stop being anxious about panic attacks.

Fainting

Although the *fear* of fainting is common in people with panic and anxiety disorders, actual fainting is very rare. The fear of fainting is usually based on the mistaken belief that symptoms such as dizziness and lightheadedness mean that one is about to faint. In fact, fainting is rare during panic attacks, because the state of panic is incompatible with fainting. That is, the physical tension (sympathetic nervous system activation) of panic attacks is the direct opposite of what happens during fainting. Fainting is most likely in people who have low blood pressure, or who respond to stress with major reductions in blood pressure. As we know, panic attacks increase heart rate and blood pressure. Finally, if one were to faint, consciousness is usually regained within a few seconds, and it is a way for the body to return to a normal level of functioning.

Other common myths or mistaken beliefs about panic symptoms include aneurysm, epilepsy, and death from shock.