By the end of this lesson, you will be able to:

- Define strain and describe its effects.
- Explain the general adaptation syndrome.
- Identify various common long-term outcomes associated with stress and strain.

* Image 1: Charlie Balch @ sxc.hu
As you'll recall, one of the basic foundations of this course is the process model of stress and its four parts: the stressors, our perceptions of stressors, strain - our response to those stressors, and outcomes. In this lesson, we are going to look more closely at strain and the effects, symptoms, behaviors, and long-term outcomes it can cause.
Strain can also be referred to as the stress response. Some people also call it the fight or flight response. Basically, it’s what happens to us physically, emotionally, and cognitively when we perceive something as stressful. The stress response is a natural and necessary function for survival. It enables the body to prepare for direct physical action when needed. However, the stress response can generate harm when it is experienced too often or too intensely, or when we have no outlet for our stress. Hence, the term, strain.
Another way to describe strain is to think of it as a "general adaptation syndrome". In this view, when you perceive something as stressful, such as being late for class, having to give a speech, an argument with your roommate, or a bad hair day, your body begins to adapt to deal with this stressor. The general adaptation syndrome is a natural and normal reaction and has three basic phases:

The first phase is alarm reaction. You've just perceived the stress, and your body goes into a state of heightened awareness. All of your systems, including neural, hormonal, cognitive, and musculoskeletal, start to prepare to deal with the stressor. This leads you to the next phase, resistance.

In the resistance phase, your ability to respond to the stressor or threat is at its peak. Your body is ready to put forth full muscular effort, your mind is focused, your cardiovascular system increases its output, and you're ready to deal with whatever life throws at you! But, this can't last forever, so eventually, you head into exhaustion, the third phase.

Exhaustion is when your resources drop below normal and your resistance ability starts to wane. This might happen naturally after you've dealt with a stressor, or it might occur because you've been in the resistance phase for too long and your body just needs to recover. Exhaustion might also kick in more often if you are a person who is more likely to perceive things as stressful. Either way, it's good to remember that exhaustion is the price we pay for resistance.

In today's world, there are people who run around in the resistance phase practically all day, every day - until they collapse! You might know people like this; they continually run at high gear, constantly behaving as if life is an emergency. This takes its toll on their systems, and eventually they head into exhaustion, because they never really allow their bodies to recover. Then, because their resources have been depleted, they become vulnerable to all sorts of physical and mental effects. Let's take a closer look at these effects of strain.


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* Image 1: Sarah Keene
Once our bodies detect stress, the stress response or strain is set in motion. The brain becomes more aware and even functions at a higher level. Sometimes, perception of something unusual, such as a loud noise, may cause strain to begin even before the brain ascertains the actual situation. The part of the brain that perceives a stimulation or situation as stressful is the cerebral cortex. The limbic system then comes into play, arousing your emotions. The hypothalamus becomes stimulated, which in turn activates the thyroid gland, the adrenal glands, the pituitary gland, and the sympathetic nervous system.

You can think of the sympathetic nervous system as the drama queen of your body; when it becomes stimulated, your body becomes ready for action! All of this stimulation and activation then causes a kaleidoscope of effects within your body as it prepares to fight or flee, even if hitting something or running away are not viable options at the moment!
If you're getting ready to fight something or to run from it, you're going to need increased output from your cardiovascular system: your heart and lungs. So, when you perceive stress, your heart rate naturally increases to increase blood flow to your muscles. Your stroke volume - the amount of blood pumped by each beat of your heart - also increases. Thus, your heart not only beats faster, but it also beats more forcefully. These two effects contribute to a rise in your blood pressure - the amount of resistance in your arteries. Your body also dumps more fats - cholesterol, and triglycerides and sugars - glucose - into your circulatory system, just in case you need a ready-supply of energy. Your breathing rate also increases, just in case your muscles need more oxygen for metabolism.

All of these effects are fabulous if you're going to fight off a would-be attacker or a bear. However, these effects happen when we perceive other stressors, too, such as, sitting in horrible traffic, taking a pop-quiz, being offended by another's comment, or not being able to sleep because your roommate is noisy. In these situations, you may not get to expend any of your pent-up cardiorespiratory resources! Then, what happens? Well, this is why excess stress is considered a risk factor for heart disease. We'll get to that in more detail later.

- Image 1: Markus Hanser @ sxc.hu
As we've already discussed, your muscles tense and get ready for action when you perceive stress. For many of us, this is an unconscious reaction. What can happen, though, is that we might experience some side effects that are not all that pleasant. One of the muscles that often gets tense is the masseter muscle, which is the muscle inside your cheek. It opens and closes your jaw. Intense or prolonged contraction of the masseter muscle can cause significant jaw pain. As other parts of the body move into resistance, overall muscle tension may result. Long term, this can lead to back and neck problems, as well as headaches.
We don't always think of this, but the GI system can be significantly affected by perceptions of stress. For one thing, as your body gears up for potential action, it tries to access all sources of energy. Thus, your stomach and intestinal activity will usually increase in order to speed digestion of needed nutrients. Your stomach may also increase its acid production. These actions, while once again beneficial if you actually need that energy, can also cause feelings of heartburn, indigestion, nausea, and, in some cases, even diarrhea. None of these effects sound particularly delightful.

Stress can affect your immune response in a couple of different ways; remember how your body craves immediate sources of energy when you’ve perceived stress? Well, in addition to fat and sugar, your body also dumps protein into your circulatory system as another source of energy. This means that less protein is available for a vital immune system function: the production of antibodies. Antibodies are actually specialized protein molecules that attack and destroy foreign invaders, like viruses and bacteria. If you’re using all your extra protein for energy, you might not have enough for adequate antibody production, which would lower your immune response.

Another way that stress can impact your immunity is by altering your sleep patterns. Have you ever felt stressed and not slept well? There could be a biological reason for this. While you perceive stress and your body engages in the stress response, your adrenal glands release a stress hormone called cortisol. Cortisol has many functions and effects. One of its functions is to help regulate your sleeping and waking cycles. Generally, cortisol levels rise in the morning to help you wake up and fall in the evening to promote sleep. When you are stressed, your cortisol levels may remain unusually elevated even at night, disrupting your sleep and causing insomnia. And, when you don’t get enough sleep, your immune system takes a hit.

We should also mention that during times of stress, it’s common for people to not pay as much attention to their diet as they normally would. So, if you’re perceiving stress, you might not be eating a wide variety of food and you might end up lacking a few nutrients that play key roles in your immune function.

As you can see, there are a variety of ways that stress can affect your immune system and give bacteria, viruses and germs, in general, an opportunity to make you sick!
There are a few other aspects of strain or the stress response that we need to mention. Headaches are commonly associated with stress. Some headaches might be due to increased muscle tension, and others might be tension headaches. Tension headaches are headaches that usually appear with increasing fatigue. So, if stress interrupts your sleep patterns, you might be more fatigued, and this could contribute to tension headaches. Some studies have also indicated that stress can trigger migraine headaches, as well.

Fuzzy thinking and memory problems are other common complaints associated with stress, and there’s a good reason for this. Remember our discussion of cortisol? Well, in addition to interrupting your sleep, cortisol can affect your thinking processes and memory. Cortisol causes glucose to be diverted to your muscles when you’re feeling strain. This means that less glucose is available for your brain. When your brain is deprived of glucose, it can have trouble recalling memories, thinking straight, and concentrating. This is why it might be good to do a relaxation exercise or two before a big exam or presentation!

Other symptoms associated with stress that some people have reported include heightened emotions, trembling, loss of appetite, dizziness, dry mouth, and even chest pain. Even a few of the symptoms we’ve discussed would cause significant inconvenience in your life, not to mention long-term health issues!
As you've probably already experienced in your own life, not all of the effects of strain are physical. In fact, some of the most easily observable effects of the stress response are emotional and psychological. Think about it; how do you usually react when you feel stress? Some of the common reactions reported by students include:

- Irritability: Do you get short-tempered? Yell at your family & friends?
- Impatience: Are you more easily frustrated?
- Anger: Have you ever said or done something in a flash of anger that you later regretted?
- Fear: Is there really anything to be afraid of? Have you ever stopped to consider the rationality of your fears?
- Anxiety: Do you worry excessively when you're stressed? Do you "make mountains out of molehills"?
- Sadness: Do you feel overwhelmed and somewhat helpless?
- Preoccupation with Self: Some people say they feel like they can't be bothered with the concerns of others when they're feeling stressed. . . . Is that true for you?
- Guilt and Shame: This is very common if you are perceiving stress related to something you did or didn't do, or something you feel you could have done better. The crucial question here is: is the guilt appropriate, realistic, and proportional to the incident? Too often, as with some of the other reactions, guilt and shame spiral out of control and we suffer all the more because of it.)

We could probably discuss more effects, but this is a pretty good start. As you have probably deduced, none of these reactions are exceedingly positive. In fact, most of them end up causing even more stress. Think about it; you're stressed about an exam; you react by becoming impatient and short-tempered; your roommate does something that irritates you; you yell at the roommate, causing an argument; this causes more distress ... and on and on and on. There are many better options for coping and handling stress, as discussed in other lessons.
Sometimes, in an effort to cope with perceived stress, or maybe in attempts to reduce strain or escape from it, people engage in various not-so-positive behaviors. For instance, have you ever known someone who under stress:

- Drinks more alcohol?
- Smokes cigarettes?
- Watches more TV or plays more video games or spends a lot more time on his or her computer?
- Gambles?
- Goes on a spending spree that they maybe can't afford?
- Becomes really angry or violent?

If you've always reacted to stress with a less-than-positive response, you've probably noticed that your outcomes haven't always been that great. Most of the behaviors listed above only lead to more stress, rather than less. If you'd like to solve your stress issues, rather than continue to experience outcomes you're less than happy about, you're in the right place!
One thing to note is that some people get so used to symptoms of strain that they no longer recognize them as signs of stress - or indicators that change might be needed. Sometimes a simple review of physical, mental, emotional and behavioral signs can be a valuable exercise.

One of the keys to successfully managing stress is knowing yourself, recognizing your signs and symptoms of strain, and then taking action to address them.
The last phase in the process model of stress is long-term outcomes. These are physical diseases, psychological conditions, academic challenges, and organizational & societal impacts that can occur if stress is allowed to continue unchecked over a period of time. In other words, they have been commonly associated with stress, especially stress that is particularly intense, unresolved, or ongoing. These long-term outcomes don’t necessarily have to occur, but they often do when we fail to prevent or manage our stress.
Some stress experts claim that possibly up to 85% of all health complaints have a stress-related component. This is far from a complete list, but again stress can affect your health and in general, contributes to illness in four basic ways:

- Long-term wear and tear from excessive stress makes the body more susceptible to breaking down
- Acute emotional distress can precipitate physical ailments, such as headaches, IBS, or muscle tension
- High stress can aggravate an existing illness
- Stress can result in behaviors that can lead to health issues, like smoking, excessive drinking, and unhealthy eating.
Chronic or very intense stress may be a factor in feelings of depression. Most of us feel sad at times, and feeling depressed for a while after a significant loss or trauma is a normal reaction. However, for some, these feelings become overwhelming, last for long periods of time, and begin to interfere with daily life; these may be signs of clinical depression.

Major clinical depression involves intense feelings of sadness that last most of the day for two or more weeks. According to the National Institute of Mental Health, other symptoms of depression may include:

- Difficulty concentrating, remembering details, and making decisions
- Fatigue and decreased energy
- Feelings of guilt, worthlessness, and/or helplessness
- Feelings of hopelessness and/or pessimism
- Insomnia, early-morning wakefulness, or excessive sleeping
- Irritability, restlessness
- Loss of interest in activities or hobbies once pleasurable
- Overeating or appetite loss
- Persistent aches or pains, headaches, cramps, or digestive problems that do not ease even with treatment
- Persistent sad, anxious, or “empty” feelings
- Thoughts of suicide or suicide attempts

As you can see, these symptoms indicate a situation that is much more serious than temporary sadness. Clinical depression shouldn’t be taken lightly. In the 2010 College Student Health Survey, 19.5% of students reported being depressed at some point within their lifetime. Depression tends to affect more women than men and may not manifest the same symptoms in any two people. An important thing to remember is that there’s no shame in asking for help if you need it. The key to diagnosing depression is open and honest communication with your loved ones and medical professionals. The good news about depression is that it can be treated and it is possible to live a healthy, productive, and happy life.

We encourage you to seek out mental health resources and counseling services available to you at your college or with your doctor should you experience any of these symptoms.

According to the 2010 College Student Health Survey (Lust, et al., 2010), there appears to be an association between unmanaged stress and various health conditions. Of students who reported that they managed their stress effectively over the last 12 months, there was a 7% lower incidence of acute health conditions, a 7% less incidence of chronic health conditions, a 10% lower incidence of anxiety, and a 9% lower incidence of depression when compared to their peers who reported not managing their stress over that year.

As you can see, the group of students who managed their stress well reported fewer health concerns in every category.
Stress in the workplace has been studied extensively, and much of this research can be applied to other phases of life and situations as well. It's been found, for instance, that when perceptions of stress increase, worker satisfaction often decreases.

Workplace stress research also indicates that increased stress can lead to decreased commitment and productivity, too. Also, people who perceive more stress in their jobs tend to be absent more often than those who perceive less stress. This could be because they are sick more often, or it could be that they aren't showing up because they've become less committed. These effects are likely to occur especially if people feel powerless to change their situations— or if they aren't hopeful that things will someday get better. Have you ever known a fellow student who, during or after an experience of intense academic stress, either stopped trying, got a bit apathetic, or even ended up not trying as hard in his or her work? The result may have been even lower grades than desired. This, then, could have created more stress. One other thing to note is that workers who perceive more stress than others are more likely to leave their jobs. In a poor economy, finding a new job can also be very difficult and force stressed out workers to stay in stressful situations, which only makes it worse. If we apply this to college students, we could say that stressed college students are more likely to change schools, take time off, or even drop out, but with limited opportunities or job options, this could lead to more stress, as well.

Of course, the news doesn't have to be all bad. If coping resources are used to eliminate or interrupt stress or to help reduce strain, many of these effects can be avoided. As we've said before, the key lies in finding which coping resources work best for you—and then putting them to good use. This will be our focus in future lessons.
Since none of us live alone on a tropical island, we need to think about how stress affects our interactions with others in society. Stressed people tend to be more irritable, less patient, more easily aggravated, and less tolerant than less-stressed people. To witness this behavior, all you need to do is drive a car in any city in the US. Before long, you'll probably witness an angry, impatient driver! You might not witness road rage, but reports of those incidents happen frequently.

Heightened perceptions of stress and failure to adequately cope can push our focus to ourselves, with less attention and regard being paid to others. We're less likely to smile at others, more likely to express impatience, more likely to snap, at roommates, friends, and family, and less likely to, in general, be aware of others' needs. In short, we get egocentric and it's not often a pretty picture.

So, there's one more reason to try to more effectively cope with our stress - it's better for society as a whole! Just think...if we all managed our stress, we'd create a happier, healthier world. Now that would be amazing.
Most people react to stress and strain in manners that they've learned and cultivated over a period of years. So, these behaviors become habits or life scripts. As you know, habits are hard to break. Additionally, some people have never even considered that there are other options. A few years ago, a student relayed, "I never even realized that I don’t have to get angry and frustrated when I’m stressed. It’s what I’ve always done, so I never thought about trying to change my reaction." It takes work and commitment to change these patterns, but it can be done. Again, it can begin by checking in with your physical, emotional, behavioral, and mental signs of stress. We'll talk more about healthy alternatives to reacting to stress and strain throughout this course.

- Image 1: Stefan Vogt @ sxc.hu
Congratulations!
You've reached the end of Lesson 3: Strain: the Signs and Symptoms.

Please review the resource links below from this lesson for more information about lesson-related topics.

Next Lesson:
Why not continue with Lesson 4: Coping
It's 33 pages long and will take about 40 minutes

[Continue](/Viewer/Course/Main?LessonId=8&CourseId=3&LocationId=2)

[Informational Site on Irritable Bowel Syndrome](http://www.mayoclinic.com/health/irritable-bowel-syndrome/DS00106)

[UMN Student Mental Health Resources](http://www.mentalhealth.umn.edu)

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