SweetWater Health™
Beat Healthy™

Stress and Heart Rate Variability

What Kind of Stress Are We Talking About?

All sorts of things can cause stress, from physical exertion to a bad day at work. There's "good" stress (like receiving a big promotion), and there's "bad" stress (like having a traffic accident). For the purposes of this discussion, "stress" means bad stress.

Stress is not caused exclusively by what happens to us; sometimes our thoughts and emotions are more culpable in producing stress than anything external. Stress—however it is produced—can cause massive physical changes in the body. Human beings evolved in an environment where failure to respond instantly to a threat often resulted in death. When we perceive a threat, the body floods with stress hormones like adrenalin that accelerate the body's ability to respond rapidly. Heart rate and breathing increase, muscles tense, we sweat more, and non-essential functions shut down as the body goes into "fight or flight" mode to deal with the danger.

In the developed world, we are less likely to encounter threats that merit this sort of response—but our bodies don't know this. When you experience a fender-bender or your supervisor says something you perceive as negative, your body tends to flip into fight or flight mode with all its attendant bodily changes, reacting as though you just encountered a hungry cave bear.

The problem is that prolonged high rates of stress are hard on the body.

The Cost of Stress

Clinical studies have shown time and again that stress is a major cause of a range of diseases from cardiovascular disease to depression to substance abuse. About 50% of Americans say that stress negatively impacts their personal and professional lives.[1] Stress causes 54% of Americans to fight with people close to them.[2] Workplace stress in the United States costs more than $300 billion each year in health care, missed work, employee turnover, legal costs, workers' compensation, and insurance.[3]

Workers who report they are stressed incur health care costs 46% higher than other employees.[4] Seven out of 10 deaths each year among Americans are from chronic diseases such as heart disease—in which stress is a contributing factor.[5]

The statistics are endless. There can be little doubt that stress is a leading health issue and costs the economy many billions of dollars every year.

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[1] American Psychological Association, 2007.
[2] Ibid.
[3] American Institute of Stress, http://www.stress.org/topic-workplace.htm
[4] Steven L. Sauter, chief of the Organizational Science and Human Factors Branch of the National Institute for Occupational Safety and Health.
[5] Center for Disease Control, 2011

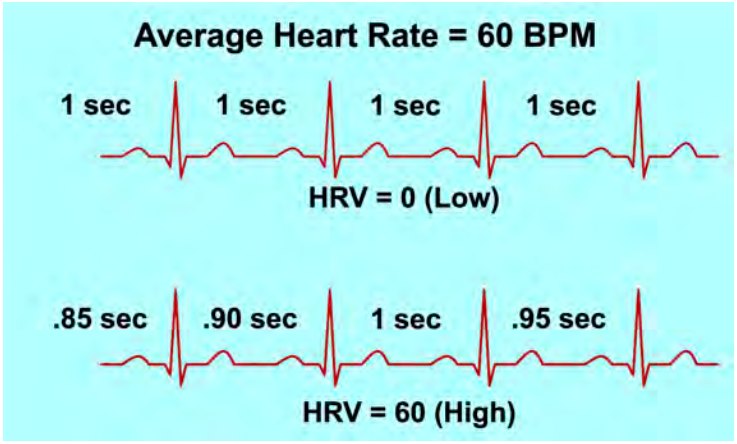
But stress is manageable—not entirely avoidable, but manageable. To manage stress, you first have to know when you are experiencing stress, and second, understand how to control it.

Monitoring Stress through Heart Rate Variability

About 25 years of clinical research have shown that one of the most reliable indicators of stress is heart rate variability (HRV). HRV is the variation in the time interval between one heartbeat and the next.

When we think of our heart rate, we generally think of a number between 60 and 90 beats per minute. This number represents the range for the average heart rate. In fact, your heart rate changes from beat to beat. When you inhale your heart rate speeds up and when you exhale it slows down. So rather than referring to a fixed pulse of, say, 60, the heart rate will actually vary between, say, 55 and 65. HRV is a measure of this naturally occurring irregularity in the heart rate. Nearly a quarter-century of clinical research has shown that when HRV levels are high, a person experiences low levels of stress and greater resiliency. When HRV levels are low, this is an indication of greater stress and lower resiliency (see Figure 1).

Figure 1. The higher the HRV, the greater your resilience and the lower your stress.



Source: SweetWater Health, LLC

The heart continually oscillates between acceleration and deceleration in a tug-of-war within the autonomic nervous system, controlled by two “pacemakers” in the heart that create the heart’s rhythms.

Our thoughts, emotions, and experiences of the external world are tightly connected to the functioning of our nervous system, heart rhythm and breathing (see Figure 2). The more flexible we are, the more capable we are of dealing with life’s inevitable stressors. This flexibility is reflected in our nervous system and can be measured, using HRV as an indicator.

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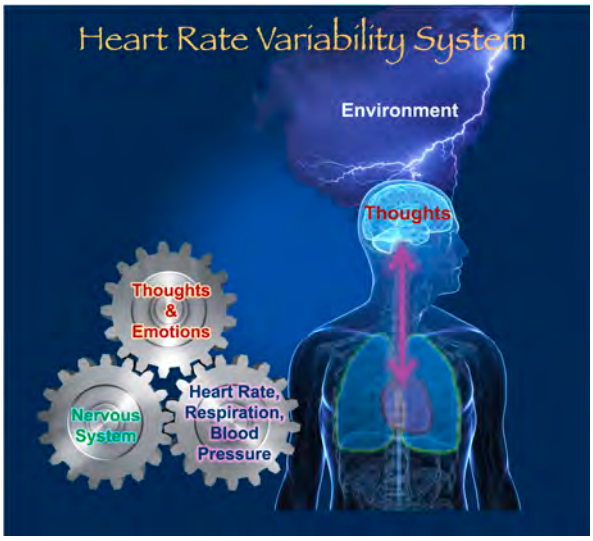
Figure 2: Our thoughts, emotions, and external experiences are tightly coupled to our heart rhythm, emotions and thoughts.



Source: SweetWater Health, LLC, 2011

You don't have to go to a clinic or a hospital to monitor your HRV. HRV can be monitored using a heart rate monitor and software that can translate input from the monitor into HRV levels. A range of inexpensive monitors is available for the consumer in the form of chest straps, ear clips, finger clips, and even "smart" clothing. Monitoring can be done on a personal computer—but even better, monitoring can be done using a smartphone with an HRV monitoring app such as SweetBeat™ from SweetWater Health™. A wireless mobile monitoring system provides real-time data on your HRV everywhere you go.

Managing Stress through HRV

Once you have information about your stress levels—when you're stressed, how much you are stressed, etc.—you can learn tools to control it. A number of stress-reduction resources are available. Many of them are free or inexpensive, and don't require prescriptions or psychotherapy. Simple deep breathing exercises will show an immediate drop in HRV, and you can do them almost anywhere.

The key concept to grasp is that stress is not created by external events; stress is your body's reaction to events, thoughts, or emotions. Understanding this concept allows you to take control of how you respond and behave.

Some people prefer physical relaxation or exercise. Some practice yoga, qi gong or other mental and physical exercises to control stress. There is no "right" way to manage stress; it depends on what you feel comfortable doing, and what is convenient for you. (Obviously, you can't interrupt a heated discussion with an uncooperative neighbor to assume the downward-facing-dog yoga position. But you can take a couple of deep breaths.)

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A number of stress-reduction resources are available. Many of them are free or inexpensive, and don't require prescriptions or psychotherapy. You can even affect your HRV levels with good nutrition and regular exercise.

By monitoring your HRV on a regular basis, you can see what activities lower your HRV levels. This gives you options; for example, if your HRV goes down significantly during the weekday morning rush to get ready, you can change your behavior. Get up a little earlier to give yourself more time, make lunches for the kids the night before so that you have time to eat breakfast and glance at the paper, and make sure that everything you need for the day is sitting by the front door. Do what works for your own life and situation.

SweetBeat and Stress Reduction

SweetBeat is a mobile app from SweetWater Health™, LLC that uses a patented[6] algorithm to process the input from a heart monitor to measure HRV. SweetBeat's user interface shows your HRV and predicted stress level in real time. By recording your stress level during a session, you can learn to discern true, measured balance from your "everyday" way of feeling.

When you can see stress levels from moment to moment, you can also change what you are doing or thinking to reduce stress. Conscious breathing exercises balance the tug-of-war in the nervous system, and therefore you will see an immediate rise in HRV. Whatever stress reduction method you employ, when you monitor HRV, you have real-time biofeedback, enabling you to take charge of reducing stress.

SweetBeat also allows you to upload your sessions to a secure database, where your data feeds into a personal calendar. You can see throughout a given day, week, or month exactly when your stress levels are highest, allowing you to be proactive in addressing stress-creation. For example, if your recorded sessions show that commute time is always highly stressful, you might choose to play relaxing music during the drive instead of listening to the news on the radio.

The SweetWater Health web site (http://www.sweetwaterhrv.com) offers links to our health partners, who offer a variety of approaches to stress reduction ranging from fitness to meditation and coherence training.

HRV's Other Applications

HRV can be used as an indicator for many other purposes beyond stress reduction. It can be used in fitness training and recovery, providing feedback on when to lighten up and when to push harder. It can be used to gauge how well you are connecting with others. It can also be used to remotely monitor the health and wellbeing of a family member who may be ill or elderly.

In the near future, SweetWater Health plans to introduce additional versions of SweetBeat tailored to these and other needs.

[6] Patent pending.

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