

HEALTH AND STRESS

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MENTAL STRESS, BEHAVIOR MOOD, AND HEART ATTACKS

Key Words: time urgency, competitiveness, workaholism, adrenalin addiction, cynicism, gender differences, personality traits, circadian influences, earthquakes and heart attacks, interventional results, the importance of control

The ability of emotions to affect the heart has been known since antiquity. Over 4000 years ago, The Yellow Emperor's Canon of Internal Medicine noted "When man is serene, the pulse of the heart flows and connects, just as pearls are joined together or like a string of red jade, then one can talk about a healthy heart."

Plutarch wrote that when the physician Erasistratos suspected that "love sickness" had stricken Antiochus, the son of King Seleukos of Syria (third century B.C.), he ordered all the women in the court to parade before Antiochus' bed one by one while he took his pulse. He observed that it became very rapid and irregular when the prince's young and beautiful step-mother Stratonike came near. On Erasistratos' recommendation, the 70-year old king divorced his young wife so that Antiochus could marry her, and the prince enjoyed a speedy recovery.

The Roman physician Celsus also noted that "fear and anger and any other state of the mind may often be apt to excite the pulse". Similarly, William Harvey, the British physician who discovered how blood circulates through the body noted in 1628 that "Every affection of the mind that is attended with either pain or pleasure, hope or fear, is the cause of an agitation whose influence extends to the heart." Prior to this, Shakespeare had written in *Romeo and Juliet* about "a faint cold fear that thrills through my veins...that almost freezes up the heat of life."

John Hunter, who elevated surgery from a mechanical trade to an experimental science in the 17th century, was one of the first physicians to recognize that stress could actually cause heart disease. He suffered from angina, and being a keen observer, complained "My heart is in the hands of any rascal who chooses to annoy and tease me." This turned out to be an accurate prophecy: an argument with a colleague during a Faculty meeting precipitated his sudden death from a heart attack. It was described as follows: "In silent rage and in the next room he gave a deep groan and fell down dead."

Napoleon's physician, Corvisart wrote that heart disease was due to "the passions of the mind", among which he included anger, madness, fear, jealousy, terror, love, despair, joy, avarice, stupidity, and ambition.

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Paul J. Rosch, M.D., F.A.C.P.

Editor-in-Chief

e-mail: stress124@earthlink.net

home page: www.stress.org

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Coronary Prone Behavior

Towards the end of the last century, von Dusch, a German physician, called attention to excessive involvement in work and the stress of time urgency in his heart attack patients. The astute clinician, Sir William Osler, later cited "the high pressure at which men live and the habit of working the machine to its capacity". He viewed the coronary prone person not as "neurotic or delicate", but more apt to be "robust, vigorous in mind and body, the keen and ambitious man, the indicator of whose engines are always set at 'full speed ahead'."

In the 1930's, Flanders Dunbar, who introduced the term "psychosomatic" into American medicine, characterized such individuals as being authoritarian with an intense drive to achieve unrealistic goals. Other psychiatrists with strong interests in mind-body relationships suggested that coronary heart disease patients tended to have strongly aggressive behaviors, fierce ambition, and a compulsiveness to achieve power and prestige. More recently, other traits such as anger, hostility, and cynicism have been incriminated. Chronic depression as well as anxiety have also been reported to be associated with an increased risk for coronary disease and death. How can the above relationships be explained and what mechanisms of action might be involved?

A monumental advance in proving a link between personality and coronary heart disease was made in the 1950's with the formulation of the Type A coronary prone behavior pattern by Friedman and Rosenman. They defined it as "an action-emotion complex that can be observed in any person who is aggressively involved in a chronic, incessant struggle to achieve more and more in less and less time, and if required to do so, against the opposing efforts of other things and other persons."

Type A's constantly strive for recognition, and are very competitive, even when playing games with children. Although hostility and aggression are common, they are often suppressed. However, they do demonstrate certain characteristics, including impatience, restlessness, hyperalertness, increased tenseness of facial musculature, fidgeting, and a constant sense of time urgency. There is usually such a deep commitment to work activities that other aspects of personal life are relatively neglected.

Type A should not be viewed as a personality trait, but rather a reaction in a particularly predisposed person to a situation which is perceived as a challenge. Detection and quantification are best accomplished by a structured interview conducted by an investigator who has been specially trained to provoke characteristic behaviors and traits. As will be seen, these include various manifestations of increased motor activity, speed, impatience, and telltale vocal maneuvers.

Type A behavior has been correlated with a significant increase in myocardial infarctions and deaths due to heart disease. Arteriography and ultrasound studies show it is also associated with more severe and more rapid progression of atherosclerosis. After critically reviewing all of the evidence, a distinguished panel of scientists assembled by the National Heart, Lung and Blood Institute concluded in 1981 that the Type A pattern is a risk factor for coronary heart disease "over and above that imposed by age, serum cholesterol, systolic blood pressure and smoking and appears to be of the same order of magnitude as the relative risk associated with any of these factors." (Continued on Page 3)

Some Type A Traits

There has been considerable controversy over which components of Type A are the most damaging. Part of the problem here is the difficulty in measuring such things as hostility, time urgency, and competitiveness. It should be emphasized that Type A is a complex overt behavioral syndrome that is best evaluated by observation of certain characteristics. Some of these include: a tendency to pursue several lines of thought or activity simultaneously; increased muscular activities in the form of gestures, motions and facial activities such as grimaces, gritting and grinding of the teeth or tensing jaw muscles; frequent clenching of the fist or pounding with a fist to emphasize a point; tapping the feet, leg shaking, or playing with a pencil in some rhythmic fashion; persistent vigilance and a tendency to act impulsively or have hyperactive responsiveness; irregular or unusual breathing and speech patterns with frequent sighing.

Type A's are usually poor listeners and will often nod or mutter agreement or have a short burst of laughter to obliquely indicate to the speaker that the point being made has already been anticipated. They also frequently finish a sentence or interrupt it, usually in some dramatic fashion. When speaking, they use certain vocal stylistics to provide emphasis such as inhaling more air than needed and then releasing it in an explosive fashion in the middle or end of a sentence. A dramatic effect is also achieved by varying the pitch, speed or volume of speech, or alternating rapid bursts of words with long pauses of hesitation, to indicate intensive thought.

A variety of self-report questionnaires have been devised to detect or rate Type A behavior. However, Type A's are often unaware of their abnormal or exaggerated traits and tendencies, or will deny them. Accurate evaluation can only be obtained by someone trained to elicit the above traits by standardized provocative techniques in a proper setting. It is very difficult to detect Type A behavior in individuals who are sick, depressed, or anxious, as is often the case in hospitalized or clinic patients.

Rosenman and Friedman demonstrated that compared to Type B's, Type A's tended to have higher serum cholesterol and triglycerides, quicker blood clotting, elevated levels of ACTH, as well as a greater increase in secretion of stress related hormones like adrenaline when they were challenged. When such changes are persistent or repeatedly evoked, it is not difficult to understand how they could contribute to accelerated atherosclerosis and coronary heart disease. Although no accepted animal model of Type A exists, there is experimental evidence that cardiovascular damage can result from being subjected to chronic emotional stress. Such animals do show physiologic, endocrine and sympathetic nervous system changes similar to those described above for Type A.

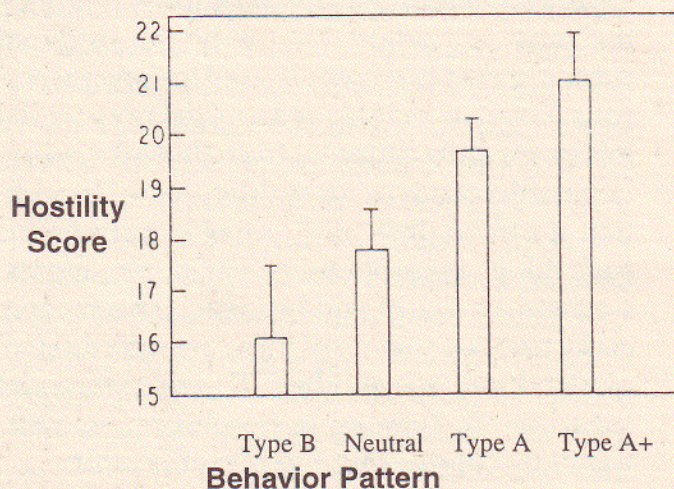
As suggested elsewhere, I believe that Type A's may become addicted to their own adrenaline "highs". As a consequence, they will unconsciously seek ways to induce them by creating challenges where none need exist. Desktops are left in disarray or assignments are not fully completed before undertaking another so that there will be some time pressure to get everything in order and finish the job. On automobile trips, there is a little self imposed task to reach a destination or pass certain check points along the way within a specified time, even when there is no deadline. Type A's tend to do everything more rapidly, like reading, walking, or eating, which is why it has been referred to as "The Hurry Sickness."

Not every individual who is classified Type A will exhibit all of the above traits. Trying to determine which of these might be the most important for predicting different coronary events is complicated for several reasons. The risk factors for an initial myocardial injury are quite different from those for subsequent infarctions or for sudden death. In addition it can be difficult to satisfactorily define such things as competitiveness, anger, aggressiveness, cynicism and hostility. This is especially true since some of these are interrelated, or blend into one another. Trying to measure them can be even more perplexing, as illustrated by considering the role of hostility.

Hostility, Aggression, And Anger

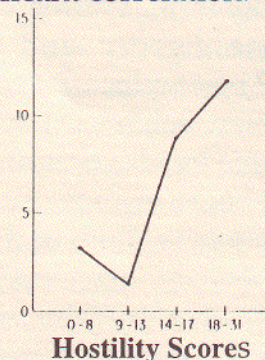
Hostility is a trait characterized by a lack of trust in the basic goodness and honesty of others. Hostile individuals believe that most people are basically selfish, undependable, mean, and cannot be trusted. Anger is an allied emotion that can range from minor irritation, to fury and rage. It is related to hostility because hostile individuals are prone to experience anger more frequently and more intensively. Hostile and angry feelings can be readily communicated through words or actions that others will clearly recognize, but they can also be suppressed and concealed. Aggression is usually related to the individual's degree of hostility and anger, but it is always manifested as an overt antagonistic behavior motivated by the actions of others. There is no clear agreement on the best way to quantify hostility, anger, or aggression. Questionnaires have been developed for each of these but their validity is questionable, and tests purporting to measure the same thing often show disturbingly different results.

As with Type A, personal observation by an investigator trained to provoke and rate specific behaviors is the most accurate measurement technique. This is much too time consuming and expensive for evaluating the large numbers of patients required to obtain statistically significant results. Although Type A questionnaires were not satisfactory, a 50 item hostility measurement scale did seem to show surprising agreement with results obtained with the Type A interview technique as illustrated below.



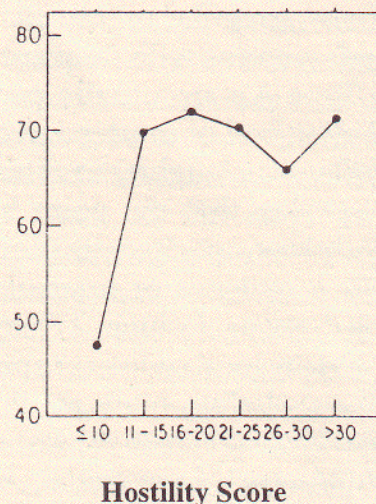
Over 90 per cent of patients with severe coronary atherosclerosis on angiography were classified as Type A by the interview technique, and this hostility scale was also able to demonstrate a significant correlation.

Percent With At Least One Vessel With 75% Or More Atherosclerotic Occlusion



In the study below, hostility ratings of 255 physicians taken while in medical school also predicted the likelihood of a coronary event over the next twenty-five years. Higher hostility scorers had death rates over six times higher than controls with median or below ratings.

Percent Of Coronary Events



Higher hostility scores are associated with increased smoking, blood pressure, LDL ("bad") cholesterol, and platelet clumping, all of which can contribute to heart attacks. A study of 18 to 36 year-old men and women found that those with the highest hostility ratings were over nine times more likely than low end controls to show calcium deposits in their coronary arteries, even at this young age. Patients with high hostility levels are twice as likely to have reblockage following angioplasty than those with low ratings. Some claim that hostility scale scores are as accurate as Type A ratings for predicting coronary events, but, as will be explained, this is erroneous.

(Continued on Page 5)

Depression And Heart Disease

There are also strong links between depression and coronary heart disease. Depressed individuals are more likely to experience various cardiac complaints and conversely, patients with coronary heart disease have significantly higher rates of depression. Researchers would like to find out which comes first, and how the connection can be broken.

Large surveys show that 2.0 to 3.0 percent of the population can be classified as being somewhat depressed, but this jumps to 18 percent in those with heart disease. About one in six people will have at least one episode of major clinical depression at some time in their lives, compared to almost half of cardiac patients. That's not too surprising, since people with coronary complaints or who have suffered a heart attack would obviously be concerned about their future and therefore more prone to depression.

On the other hand, several studies strongly suggest that depression can contribute to coronary heart disease. In one report, approximately 1,500 subjects with no evidence of any cardiovascular problem were followed from 1981 to 1995. Over this 14-year period, the incidence of heart attacks was four times greater in those who had experienced an episode of depression than others. Similar findings were obtained in The Johns Hopkins Precursors Study. This project began about 50 years ago in an effort to determine whether there were certain personality traits, mood disturbances, or behavioral characteristics that might predict the development of hypertension or other disorders in later life. Nearly 1,200 Johns Hopkins medical students were subjected to extensive psychological and physical evaluation, since as future physicians, they could be easily contacted and counted on to provide periodic information on their physical and mental health. Twelve percent reported having at least one episode of clinical depression over the next forty years and a recent analysis revealed that this group had more than twice as many heart attacks as the control group. In some cases, the heart attack occurred more than ten years after the onset of depression.

The depressed group of physicians also reported twice as much symptomatic coronary artery disease. These differences persisted even when smoking, cholesterol, hypertension, diabetes, obesity, family history and other risk factors were taken into consideration. Almost 80 percent received treatment in the form of medication, psychotherapy, or both. However, no difference was found in the incidence of cardiovascular complications between the treated and untreated groups.

In a ten year study of almost 8,000 men and women, men who developed depression were 70 percent more likely to be hospitalized for chest pain, angioplasty, or bypass surgery than non-depressed controls. Depressed women were only 12 percent more likely to have coronary complaints, although this climbed to over 70 percent for very severely depressed women. Similar findings were reported in a National Institute on Aging study of over 3,700 relatively healthy senior citizens. None had evidence of either coronary heart disease or depression and they were examined periodically to evaluate both physical and mental health. Over the next six years there was a total of 933 cardiovascular events, and these were found to be more frequent in participants who had also experienced an episode of depression, but again there were gender differences. After other risk factors were taken into consideration, depressed men were twice as likely to have suffered some coronary event than controls with no history of depression. However, no statistically significant association was found in "the weaker sex".

However, in another study of elderly American females, depression was found to greatly increase the likelihood of death due to coronary heart disease. Researchers tracked the causes of death in over 7,500 women 68 and older who died between 1998 and 1994. Those with a history of depression had a 47 percent increased risk of death from all causes but were 80 percent more likely to die from coronary heart disease compared to non-depressed females. In this study, depression was as great or greater a risk factor as hypertension, smoking, cholesterol, obesity, or diabetes.

(Continued on Page 6)

Conversely, coronary heart disease patients tend to be more depressed than non-depressed controls, particularly following a heart attack. It is estimated that significant depression occurs in almost one out of five heart attack victims. This is important, since in one study, symptoms of major depression after a myocardial infarction were associated with death rates four times higher than those in non-depressed controls over the next six months. Women are twice as likely as men to experience depression after a heart attack, and there are other gender differences. In one report, men who lived alone were more likely to become depressed than their married counterparts. However, the opposite correlation was seen in women. Researchers suggest that marriage provides men with a unique sense of support and "closeness" not available elsewhere. Women are much more apt to find support and comfort in friends or family, so that living alone is not as significant a risk.

Depressed individuals may be prone to heart disease because they are apt to smoke more and have other poor health habits. Stress hormone levels tend to be elevated, leading to a state of heightened arousal or anxiety that inhibits responses to significant stimuli such as the need to eat, sleep, or have sex. Depressed people have faster and more irregular heart rates, even when sleeping. They can also show unexpected variations in blood pressure. These observations suggest that there may be a disturbance in homeostatic baroreflex mechanisms during depression.

Baroreflexes regulate blood pressure and heart rate in response to changing demands. Disturbances in these autonomic nervous system responses are associated with an increased incidence of coronary complaints and deaths. In one report, researchers rated the degree of depression in coronary heart disease patients and also measured baroreflex responses. Significantly depressed patients had a 30 percent reduction in baroreflex sensitivity, suggesting a greater risk for future cardiac problems. Such disturbances can be improved by regular exercise, which may partially explain why exercise helps prevent heart attacks.

Type D And Other Personalities

To complicate things further, a Belgian investigator claims that patients with what he terms a "Type D" personality are over three times more likely to suffer a second heart attack than "non-D" types. "Type D" includes some aspects of depression, but is based more on the degree of persistent feelings of worry, anxiety, insecurity, social inhibition, and a lack of assertiveness. These attributes were derived from a battery of psychological tests given to 87 men following recovery from a very severe myocardial infarction. All of these subjects were at significantly increased risk for a subsequent heart attack because they had sustained extensive left ventricular damage. Over the next ten years, 52 percent of patients classified as "Type D" had recurrent heart attacks, in contrast to only 12 percent for controls. "Type D" proponents claim it is a superior approach to understanding psychological influences on heart disease because it rates several personality traits, "rather than a hodgepodge of signs and symptoms associated with the behavioral type A and B, or mood states such as depression or anxiety." However, all this single study showed was that following a severe heart attack, the risk of having another is higher in non-assertive men with chronic anxiety, social isolation, and lack of self-esteem, compared to others having only one of these problems.

If an aggressive striving for dominance predisposes to coronary complications, can being submissive help prevent them? British researchers examined 1,600 healthy men and women aged 55 to 74 who also completed questionnaires designed to identify submissive people who lack confidence and prefer to stay in the background. About 10 percent of the men and 4.5 percent of the women had heart attacks over the next five years. Submissiveness ratings had little influence on a man's risk of heart attack, but women with more submissive personalities were one third less likely to have cardiac problems compared to others in the study. The so-called "hardy" or "Type C" personality characterized by control, commitment, and confidence, is also considered to be more resistant to stress and heart attacks.

Usual And Unusual Emotional Stress

Everyone knows that emotional stress can cause anginal chest pain, but may not be as convinced that it can precipitate a coronary occlusion, myocardial infarction, or sudden death. Heart attacks occur more frequently in the time period from 6 A.M. to noon than any other time of day. Many believe this is associated with getting up to face the stresses of daily life in the workplace, especially since they occur more frequently on Monday than any other day of the week. Waking up is associated with a release of stress-related hormones that increase blood pressure, heart rate, blood viscosity, platelet clumping, and a reduction in clot dissolving capabilities, all of which can contribute to occlusion of coronary vessels and myocardial damage.

One would therefore suspect that sudden and severe stress such as that associated with catastrophic events would be associated with a significant increase in heart attacks. Major earthquakes provide a convenient way to test this premise since they are usually unanticipated can be accurately timed, and affect a limited geographic area where health consequences can be monitored. Studies of earthquakes in Naples, Italy, (1980), Newcastle in New South Wales Australia, (1989), and Hanshin-Awai in Japan (1995) all showed a significant increase in emergency room admissions for acute heart attacks over the next 72 hrs. and cardiac deaths over the next few weeks. The 1989 Loma Prieta earthquake struck San Francisco at 5:04 PM and the 1994 Northridge earthquake hit Los Angeles at 4:31 AM. Both were of similar magnitude, but the Los Angeles quake was associated with more coronary events because it was superimposed on the stresses associated with awakening.

Public speaking can cause electrocardiographic evidence of reduced blood flow to the heart without any symptoms. Such individuals can be over three times more likely to die over the next few years than controls without such changes. Some studies suggest that such mental stress testing may be superior to physical stress for predicting heart attacks. The cardiovascular effects of speaking were first delineated by Dr. James Lynch, and will be updated in his revision of *The Broken Heart*, published 25 years ago.

More Questions Than Answers

Severe as well as chronic stress could contribute to coronary events because of increased secretion of hormones that accelerate clotting tendencies and promote other risk factors like an increase in blood pressure and cholesterol. While such mechanisms may also apply to Type A behavior, they are not characteristic of depression, hostility, and some of the other personality traits and behaviors that appear to be linked to coronary heart disease. Both hostility and depression share other biochemical abnormalities such as increased cortisol and low serotonin levels, but the relevance of this is not clear.

An even greater problem is in defining and quantifying hostility. The most widely used instrument is derived from a series of responses to the MMPI, a 566 item self report questionnaire developed in 1937 to detect depression, schizophrenic tendencies, introversion etc. It quickly became the gold standard for psychologic testing and has been administered to huge numbers of students, job applicants and employees since then. Cook and Medley selected responses to 50 items in an effort to distinguish between teachers who might have good or poor rapport with their students and called it an Ho or hostility scale. Williams and co-workers subsequently narrowed this down to 27 items that they believed reflected the toxic components of Type A. Their results do not compare well with behavioral ratings of hostility and correlate more with all cause mortality than coronary deaths. As Dr. Ray Rosenman pointed out at our last Congress, the reason for this is that people with high Ho scores tend to have adverse health behaviors such as increased smoking and alcohol abuse, obesity, less physical activity and poor adherence to medical regimens. He believes Williams' group is not measuring hostility, but competitiveness and a deep but masked feeling of insecurity and fear of failure.

The \$64,000 question is whether any of the above information can be used to reduce the incidence of coronary events. What advice would you give to someone at risk?

Are There Any Answers? Dance Like No One Is Looking - And Do It Now!

If Type A behavior, hostility, depression, and emotional stress contribute to heart attacks, can correcting such disturbances help to minimize or prevent them? Unfortunately, although anecdotal reports abound, there are no good studies to support this. So what can be done? Although stress is difficult to define, all of our clinical and laboratory research confirms that the perception of not having any control is always distressful. From a practical perspective, that's really what stress is all about. Therefore, anything that can be done to improve your sense of control over daily activities should provide stress reduction and health promotion benefits. Easier said than done. The following was contained in an e-mail from a friend in Hawaii who regularly sends me jokes and other flotsam and jetsam that surface on the Internet from time to time. I have not been able to determine its origin, but it contains the following valuable advice.

"We convince ourselves that life will be better after we get married, have a baby, then another. Then we are frustrated that the kids aren't old enough and we'll be more content when they are. After that we're frustrated that we have teenagers to deal with. We will certainly be happy when they are out of that stage. We tell ourselves that our life will be complete when our spouse gets his or her act together, when we get a nicer car, are able to go on a nice vacation, when we retire. The truth is.....There is no better time to be happy than right now.

If not now, when? Your life will always be filled with challenges. It is best to admit this to yourself and decide to be happy anyway. As A. D. Souza noted, 'For a long time it had seemed to me that life was about to begin, real life. But there was always some obstacle in the way, something to be gotten through first, some unfinished business, time still to be served, a debt to be paid. Then life would begin. At last it dawned on me that these obstacles were my life. This perspective has helped me to see that there is no way to happiness. Happiness is the way.

So, treasure every moment that you have; and treasure it more because you shared it with someone special - special enough to spend your time ... and remember that time waits for no one. Stop waiting until you finish school, until you go back to school, until you lose ten pounds, until you gain ten pounds, until you have kids, until your kids leave the house, until you start work, until you retire, until you get married, until you get divorced, until Friday night, until Sunday morning, until you get a new car or home, until your car or home is paid off, until spring, until summer, until fall, until winter, until you are off welfare, until the first or fifteenth, until your song comes on, until you've had a drink, until you've sobered up, until you die to decide that there is no better time to be happy than right now.

Happiness is a journey, not a destination. Thought for the day: Work like you will never ever need money again; love like you have never been hurt; **and dance like no one is looking!**"

Paul J. Rosch, M.D., F.A.C.P.
Editor-in-Chief

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