

The American Institute of Stress

HEALTH AND STRESS

Your source for science-based stress management information

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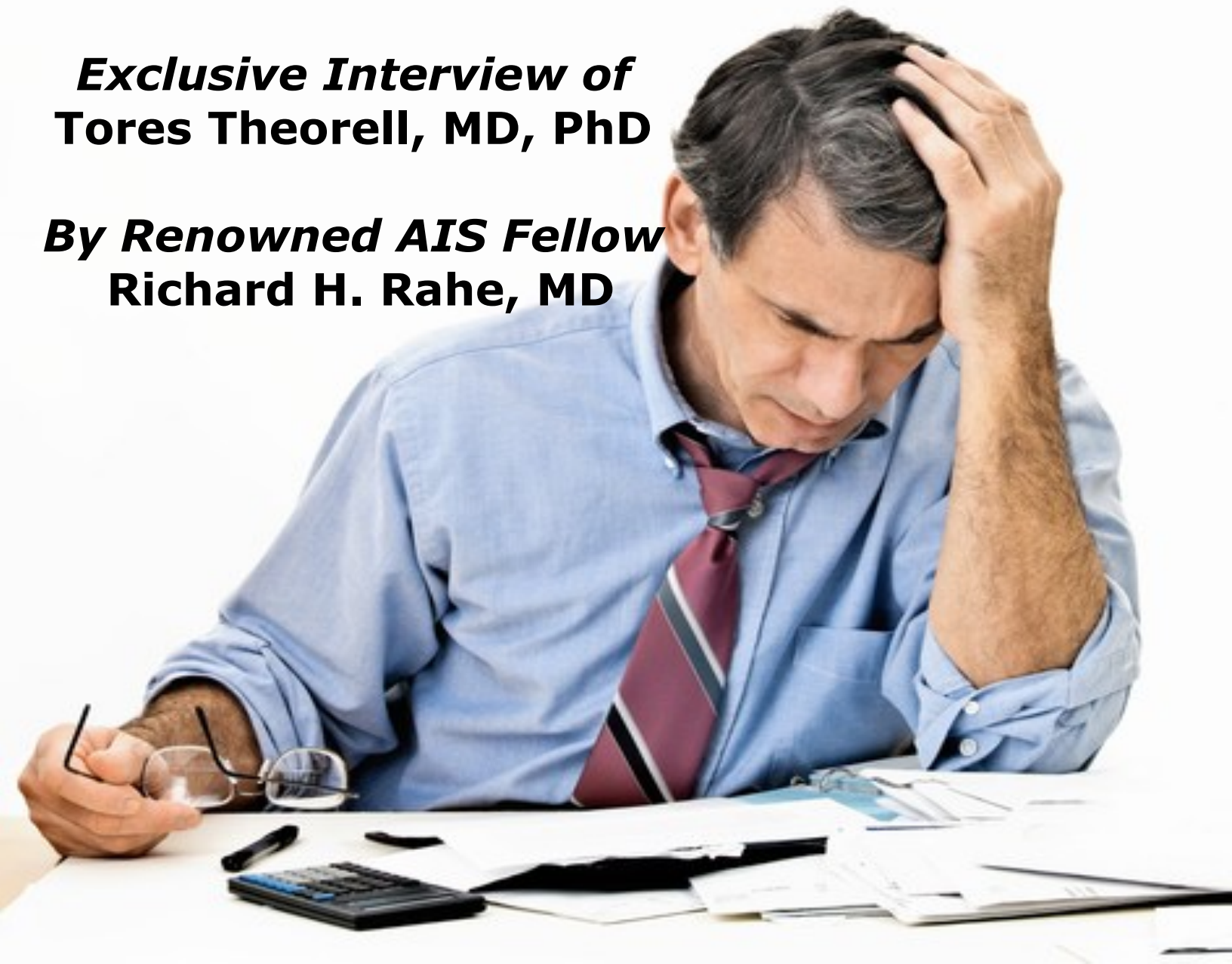
May 2013

Workplace Stress

Causes & Consequences

***Exclusive Interview of
Tores Theorell, MD, PhD***

***By Renowned AIS Fellow
Richard H. Rahe, MD***





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AIS provides a diverse and inclusive environment that fosters intellectual discovery, creates and transmits innovative knowledge, improves human health, and provides leadership to the world on stress related topics.

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HEALTH AND STRESS

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editor's note



Paul J. Rosch, MD, FACP
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Numerous surveys confirm that job stress is far and away the leading source of stress for adults and that it has increased significantly in recent years. But how significant or meaningful are such surveys? How accurately do they measure job stress or predict its adverse health consequences?

The validity and value of any survey depends on how, when and where it is conducted, who is sponsoring it, what questions are asked, how they are phrased, the demographic group being targeted, and a host of other factors that can be manipulated to achieve specific results. For example, an afternoon survey to home telephones sponsored by a female deodorant manufacturer concluded that housewives were under much more stress than CEOs. Surveys initiated by unions or associations can also be skewed to obtain better benefits and/or higher wages for their members.

The proof of the pudding is in the eating. What scientists want is proof that high levels of job stress increase the likelihood of future stress related illnesses. This requires defining job stress as well as a method to rate its severity

that can be standardized so that data from different studies can be compared. As will be demonstrated, no one has done more to achieve this goal than Tores Theorell, Professor Emeritus of Psychosocial Medicine at the Karolinska Institute and Scientific Consultant to Stockholm University's Stress Research Institute.

His father, Hugo, had been awarded the 1955 Nobel Prize in Medicine and his two older brothers were also physicians, so his choice of a career in medicine is not surprising. However his interest in stress research was different, and somewhat unique at the time. It was stimulated due to the influence of Dr. Richard Rahe, one of our Hans Selye Award recipients, best known for his role in developing and periodically updating the Holmes and Rahe Social Readjustment Rating Scale. This has been the gold standard for ranking the stress of various life change events and demonstrating their ability to predict future illness for almost five decades.

I had long intended to devote a Newsletter to Tores, who has participated in our Montreux Congresses, but realized that Dr. Rahe could conduct a much more meaningful and comprehensive interview, since he and Tores have been close professional and personal friends for well over forty years. Richard kindly accepted my offer and the results of their combined efforts certainly justified this decision. Since Tores is very precise, likes to support his statements with tables, graphs and references, and had so much to offer, the final manuscript I received would require several Newsletters or e-magazines.

As a result, it has been necessary to delete certain portions and edit others for this issue. However, everything will be retained in the version to be posted permanently along with other interviews on our web site at www.stress.org/interviews.

The Causes And Consequences Of Job Stress



Dr. Richard Rahe

An Exclusive Interview With Tores Theorell, MD, PhD

By Richard H. Rahe, MD.



Dr. Tores Theorell

RR: Hello Tores! Thanks for accepting this invitation to be interviewed as a standout scientific investigator in the field of Stress and Disease. You are aware of Dr. Rosch's monthly newsletters dealing with the effects of stress on health that also include interviews with pioneers who contributed to our understanding of these complex inter-relationships. His most recent subject was your mentor, Lennart Levi, who preceded you at Karolinska. Lennart is a leading authority on occupational stress, and he wanted to interview you as a follow-up on this legacy. However, because of our long and close association, he invited me to do this and I gladly accepted.

Let me begin with my recollections as to how we met. I had worked for several years as a medical student and resident physician with Thomas Holmes, M.D., reviewing his prior life

stress and illness studies and later proposing new paths to explore. Dr. Holmes told me that by following this course of action I would become a "third generation" Cornell University School of Medicine researcher following the school's tradition for such studies.

Prior to coming to the Department of Psychiatry at the University of Washington Medical School, he had trained under Harold G. Wolff, M.D., Professor and Chairman of the Department of Neurology at Cornell Medical School in Manhattan, who was considered a "first generation" researcher because of his seminal studies on stress related headache and hypertension. Stewart Wolf, M.D., William Grace, M.D. David Graham, M.D. and Lawrence Hinkle, M.D. were other "second generation" Cornell researchers in your group. When I readily agreed to become a "third generation" Cornell re-

searcher Dr. Holmes insisted that I remember that one important responsibility was to later recruit and train a "fourth generation" Cornell researcher. You have enabled me to fulfill this obligation.

As you may recall, I later conducted several studies measuring subjects' recent life changes magnitudes, constructing a series of Life Change Units (LCU) and using them to predict subjects' vulnerabilities for developing illnesses or accidents over the following year. I greatly expanded these studies at the U.S. Navy's Medical Neuropsychiatric Research Unit – where I completed the 2 years of active duty required of

...your father had been awarded the Nobel Prize Medicine for his biochemical achievements...

recently graduated U. S. physicians during the Vietnam conflict.

I subsequently met many of the Cornell "second generation" researchers at the annual meetings of the American Psychosomatic Society. Dr. Stewart Wolf was particularly interested in my Navy studies of recent life change measurements for Navy officers and enlisted men who developed a myocardial infarction. He was highly respected here and abroad, and was influential in my receiving a National Institute of Medicine Special Fellowship to continue my study of stress and heart disease at the Karolinska Institute's Seraphimer

Hospital in Stockholm, Sweden.

Dr. Wolf was well acquainted with Professor Gunnar Biörck, a cardiologist and the chief medical officer at this hospital. Shortly after my arrival in Stockholm, you entered the office I had been assigned to and introduced yourself. I soon learned that you were raised in a medical family, that your father had been awarded the Nobel Prize Medicine for his biochemical achievements, and that your two older brothers had chosen medical careers. Is this why you decided to follow in their footsteps?

TT: *Of course my father (and my two older brothers who became physicians) had a prominent role in my early life. My father certainly influenced my choice of career, although he never did so by telling me that I should become a doctor. When I had finished high school with fine grades that made it possible for me to enter medical school, I felt that this training might, in a way, "postpone" later real choices in life, since the diverse possibilities for a medical doctor were enormous – ranging from psychiatry, surgery and general practice, to basic science research and forensic medicine.*

When I had finished these studies I was employed by Gunnar Biörck and he initially had the idea that I should "continue" on my father's path, which meant doing biochemical research within internal medicine (Prof. Biörck had done his dissertation in biochemistry with my father as his supervisor). I did not feel comfortable with that and I realized that this construction was unrealistic – I would have had to focus 150% on biochemistry and I wanted to focus instead on internal medicine (which by

the way also meant 150%). After some months I told him that biochemistry was not my cup of tea, but that I had become very interested in psychosomatic medicine after reading Stewart Wolf's edition of Harold Wolff's famous book Stress and Disease. Gunnar Björck was also quite interested in psychosomatic medicine, and it so happened that Richard Rahe was scheduled to spend two years with us. So Björck simply said that I should work for you.

This is how stress and psychosomatic medicine started for me. Personally I believe that this was exactly the right moment for this kind of junction. There was a beginning interest in "soft questions" in internal medicine but we had to translate those into numbers and statistics in order to be accepted by our colleagues. LCUs (Life Change Units) were perfect. To return to my father, he was a wise man so he never criticized my choice of scientific topic but of course he was a true biochemist. When I was a child, I remember him saying that those who have to prove anything by means of statistics are "not really serious scientists". As you know, I have been rather heavy on statistics in most of my scientific endeavors.

RR: Tores, I clearly remember that you were somewhat shy about asking to work with me. However, you soon began suggesting some studies of cardiac patients who were receiving ongoing follow-up care at the hospital. We first agreed to pursue the question: "Do patients recovering from a heart attack remember more life change events over the year or two prior to their attack, compared to life events that occurred a few years earlier in time because recent

memory is better than remote recall?"

To explore this question you interviewed a group of 54 post-infarction patients who had been followed for several years. They were asked to list their life changing events over the 2 to 3 year period prior to their heart attack as well as during the subsequent 2 to 3 years. The 27 patients who had their infarction 2 years prior to the interview showed a significant buildup of LCUs during the year immediately prior to the event, with significantly lower LCU levels over the next 2 years, as shown in Figure 1 below. The 27 patients who were hospitalized for their heart attacks and had had no evidence or history or a

This study was an important milestone since it demonstrated the validity of being able to recall life change events prior to a heart attack several years after it occurred.

previous infarction reported a similar continuous buildup of life change events during the preceding 12 months. This study was an important milestone since it demonstrated the validity of being able to recall life change events prior to a heart attack several years after it occurred. It had been widely assumed that recollection of LCUs over the previous year was superior and provided the only accurate information.

(see Figure 1 next page)

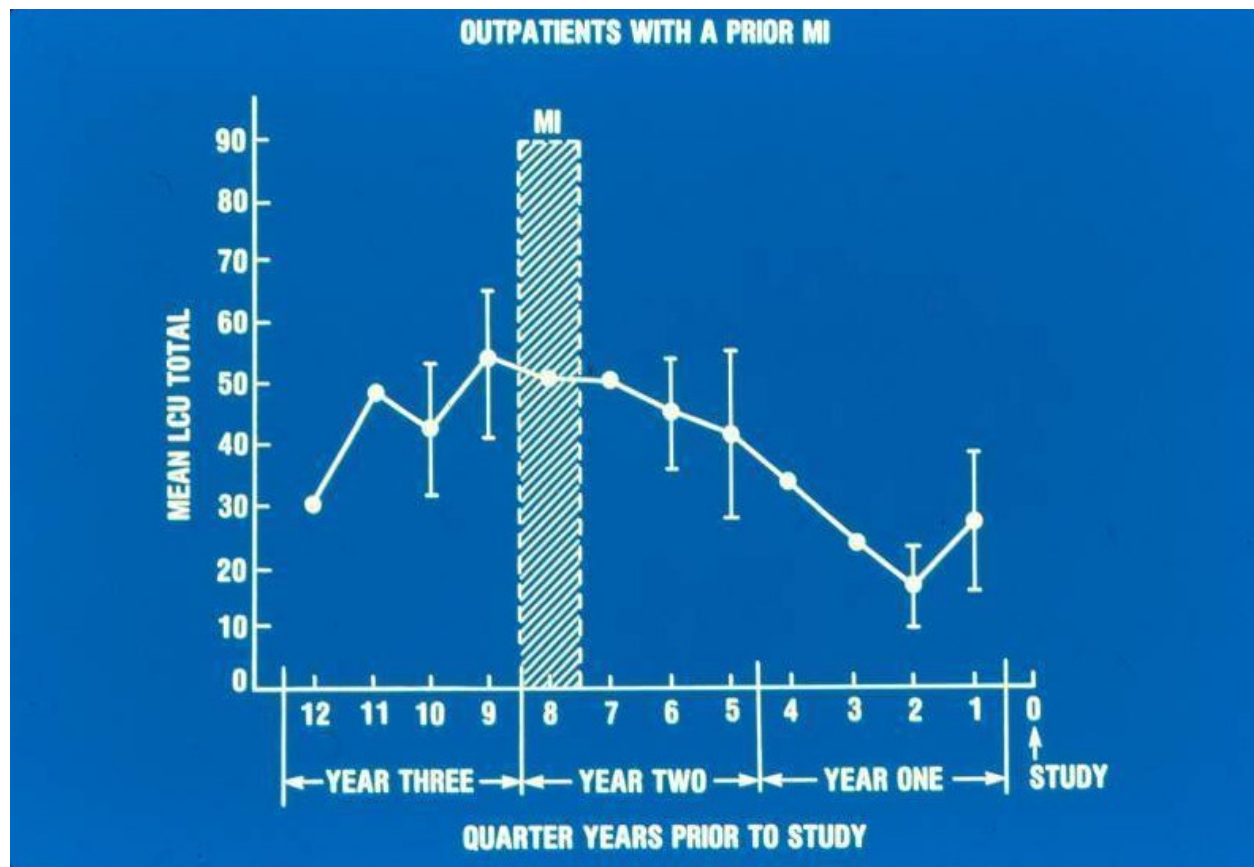


Figure 1

TT: *In addition, we did something that was quite original and has not been published, in detail, in a scientific journal. We compared three pre-infarction years of life change scores from 20 patients to the same three years of life change scores provided by their spouses. Spouses had been instructed to use their own recollections and not ask for their husbands' input when completing their own lists.*

Once gathered, we calculated correlation coefficients between husband and wife recent life changes LCU scores. We found the highest coefficient, 0.69, for the year immediately prior to the husband's heart attack. Coefficients for the second and third years prior to infarction were 0.57 and 0.56. We were impressed by these unexpected high values, as husbands may well not tell their wives about some recent life change events they were not happy about experiencing.

RR: Tores, I did reference the study

you just mentioned supporting the validity of spouse reports concerning a husband's recent life changes in a publication of an investigation I carried out with Evy Lind, MSW. She identified 39 males listed in Stockholm's most recent yearly registry for males dying outside of a hospital later determined as being caused by a heart attack. Spouses of these men, and one child, (83% of the requested individuals) agreed to provide a listing of the victim's pre-death life changes from our survey instrument for the three years prior to the victim's death.

Of this sample, 14 had a previous history of coronary disease while the other 25 men who died suddenly had no such records or symptoms. For the 14 victims with prior coronary disease, life changes total for the year prior to death (210 LCU) was twice the magnitude as LCU totals for the second (110 LCU) and third (95 LCU) pre-death years ($p < 0.01$) as shown in Figure 2 on the next page.

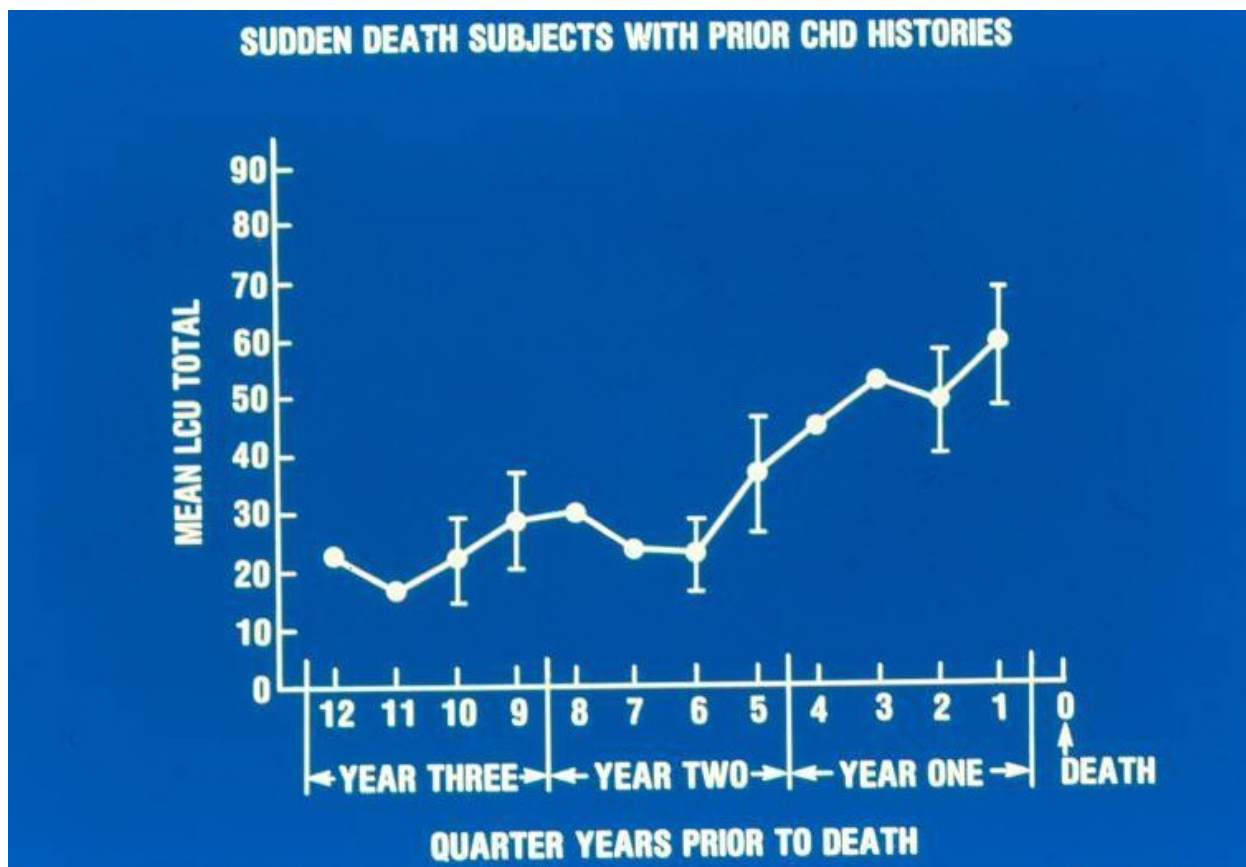


Figure 2

For the 25 victims without prior heart disease histories, life changes magnitude for the year prior to death (230 LCU, of which 160 LCU occurred over the final six months) was three to four times higher than magnitudes for the second (70 LCU) and third year's (60 LCU) totals ($p < 0.001$) as illustrated in Figure 3 below.

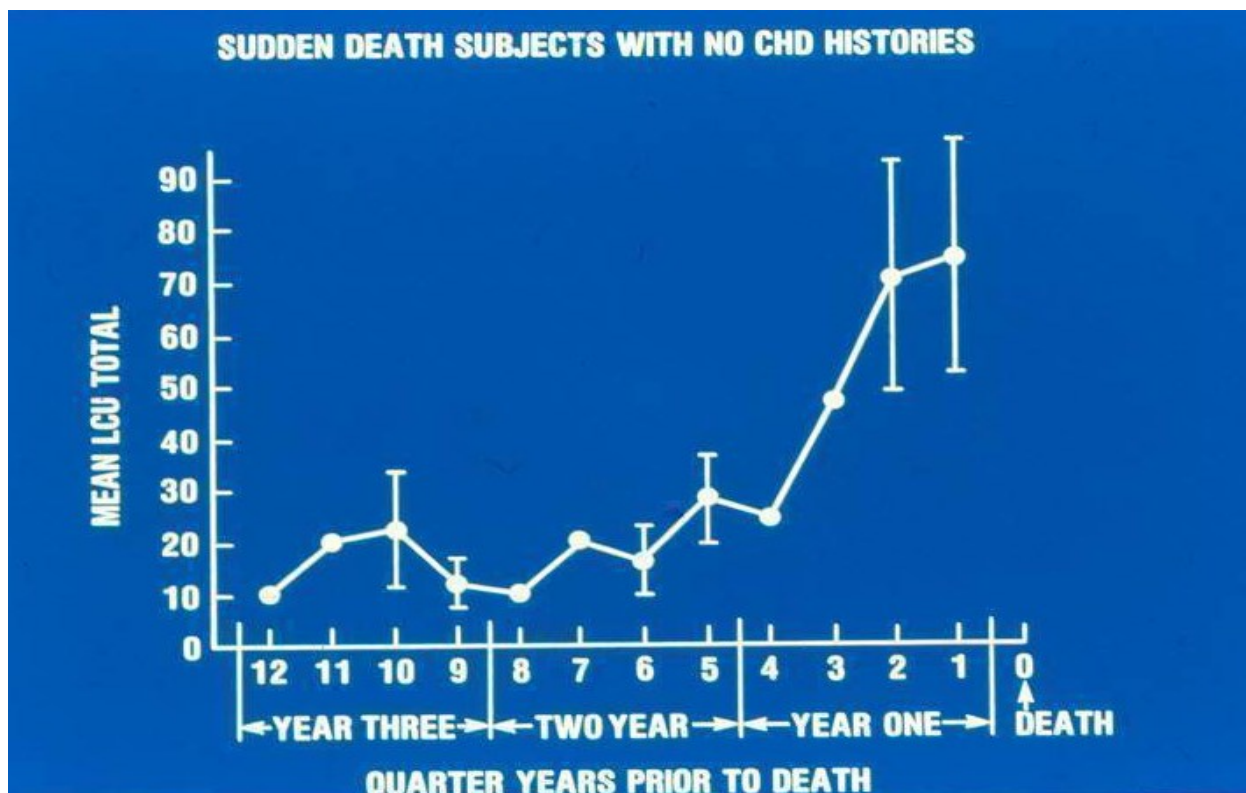


Figure 3

editor's notes:

Spouses, significant others and close relatives or friends may provide more reliable and accurate information about antecedent life change events and stressors that may have contributed to a myocardial infarction than the victim. As emphasized in prior Newsletters, this is particularly true for coronary prone Type A behavior, a powerful risk factor for heart attacks. Many such individuals are unaware of their dangerous traits or will deny them, in contrast to their spouses, as Rosenman and Friedman noted in their original reports. Stress is also the most common cause of sudden death due to ventricular fibrillation. This can occur in healthy young individuals with no evidence of coronary disease following a sudden or severe stressful event. Severe stress can also cause a myocardial infarction due to increased norepinephrine secretion at nerve endings in heart muscle in animals and patients without coronary

TT: *The most original contribution to my medical thesis was my longitudinal study of 21 male patients who had suffered a myocardial infarction two years previously. Two of the subjects had retired following their heart attack but the remainder were still were working, the vast majority full-time. These subjects were followed on a weekly basis and a standardized life event interview was performed on a constant weekday.*

Urine was collected for the assessment of catecholamine output during the workday (from waking up to coming home from work). The study allowed us to calculate the correlation be-

tween life change units (LCU) during a seven-day period and the urinary adrenaline and noradrenaline output during the last day of that period.

The adrenaline results were intriguing. One-third of the subjects showed a strong relationship between life change units per week and adrenaline output and another third showed a moderate relationship. There was no significant association in the remainder. A crude conclusion from analysis of the data was that a 100% increase in life change units during a week, corresponded on average to a 50% increase in urinary excretion of adrenaline, although there were large variations between individuals.

Following this, Dr. Theorell provided a lengthy Table showing the linear regressions for each of the subjects, a Figure showing the correlation with adrenaline output, a case history with illustrations. Dr. Rahe also supplied a case history with illustrative material and demonstrated how stress caused a rise in serum cholesterol. Because of space limitations, this material could not be included here, but as previously indicated, will be readily available on our web site.

RR: Tores, I recall that after you completed your thesis work you achieved positive working relationships with two very highly regarded stress researchers – Stewart Wolf, M.D. and Lennart Levi, M.D., PhD. Tell me how these associations came about and how they helped shape your budding research career.

TT: *The opponent of my doctoral thesis was Stewart Wolf who was a good friend of Gunnar Björck. It was of course a fantastic experience to have such an eminent opponent. Stewart Wolf became genuinely interested in my work and invited me to become a post-doctoral fellow with him in the Medical Branch of the University of Texas in Galveston. I accepted, and when I was in the United States working with Wolf, Lennart Levi contacted me and offered me a position at the Stress Research Laboratory (which was part of the Karolinska Institute). I had already collaborated with Lennart using his laboratory for my catecholamine analyses used in my thesis work. Therefore, to continue my research work with him seemed a natural progression.*

However, the months (almost a year) I first spent with the legendary Stewart Wolf in Galveston were very important in later shaping my career. He offered me the possibility to analyze data from a large sample of myocardial infarction patients he had gathered while serving as Chairman of the Department of Internal Medicine at the University of Oklahoma Medical School. These patients had been followed individually for up to ten years. Among other cardiac tests that he had carried out were ballistocardiographic recordings, performed every other month, coupled with interview data covering these patients' ongoing life events.

Ballistocardiography is a method for recording contractile patterns of the heart. The patient is placed on a recording table and sagittal bodily accelerations are recorded. As you recall, I collaborated once again with you and we published our findings in the Journal of Human Stress (Theorell T and Rahe RH 1:18-24, 1975).

A Summary from the Journal of Human Stress

Of 36 men and women who had experienced a documented myocardial infarction, half of them ultimately died from their disease over a 6 years of follow-up while the other half survived, providing longitudinal recent life changes and ballistocardiographic data. The 18 patients who had died indicated in their interview data a significant buildup in life changes that peaked approximately one year prior to death. During this time frame their serial ballistocardiograms showed a significant buildup in average forces of contraction which peaked approximately six months prior to death. The 18 post-infarction patients who had survived six years of follow-up showed neither a buildup in life changes nor an increase in the ballistocardiographic index of cardiac contraction force. These findings of a life changes peak preceding ballistocardiographic evidence of an "overworked" heart were discussed in terms of their possible medical significance. (see also: Theorell, T., Lind, E., Fröberg, J., Karlsson, C-G., and Levi, L. A longitudinal study of 21 subjects with coronary heart disease: life changes, catecholamines and related biochemical variables. Psychosom Med 34(6):505-516, 1972, which will be discussed in the website version)

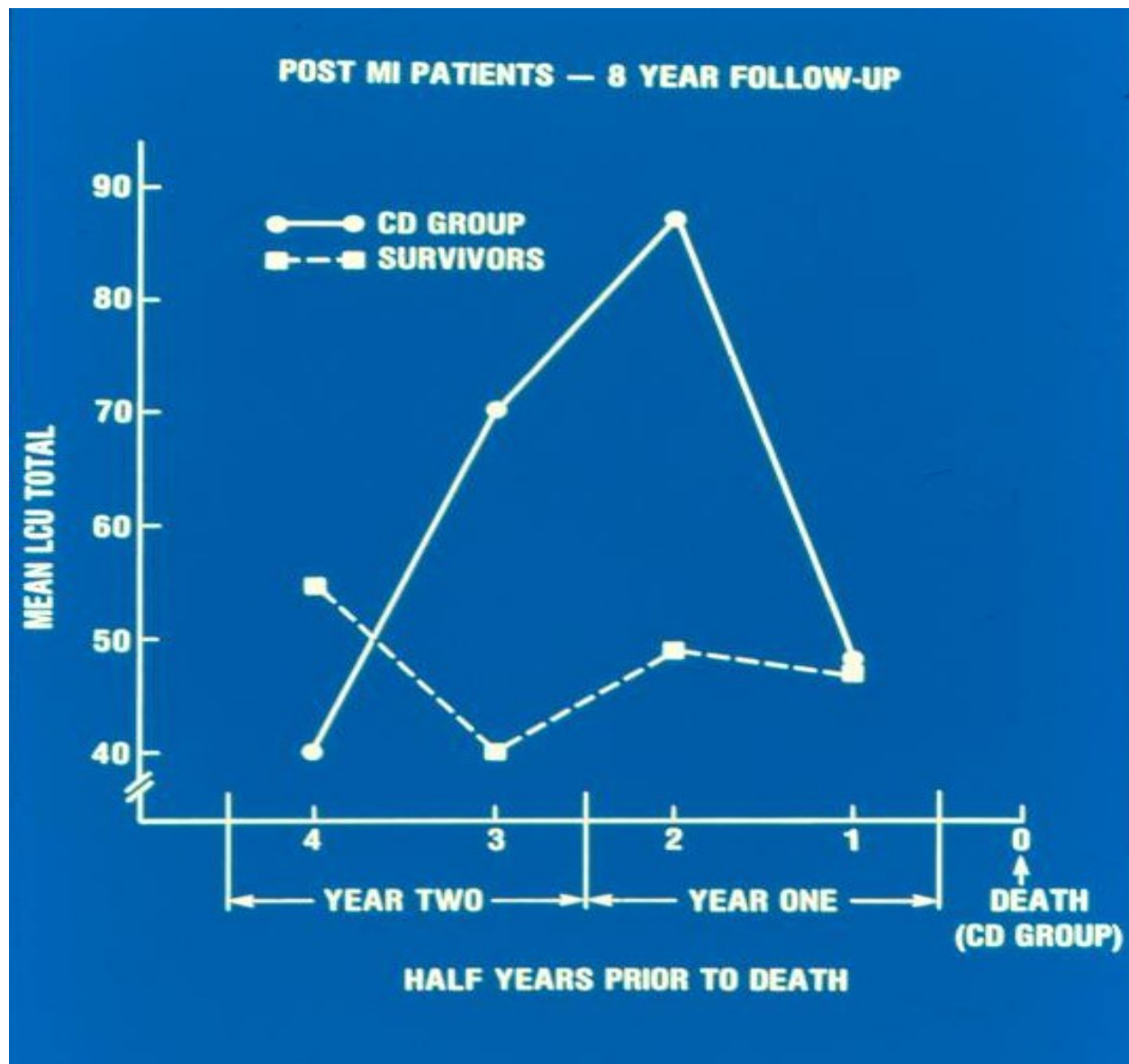


Figure 4

As can be seen above in Figure 4, these observations indicated that there was a typical time sequence preceding coronary death in these patients: first a build-up of critical life change events followed by an increase in cardiac contraction force, leading to increased metabolic demands and oxygen needs in these patients with narrowed coronary vessels. Another article from the same study singled out those patients who lacked life changes events data. In this study there was a control group without coronary heart disease.

Here it was shown that patients who died during the study showed poor contractility, and during the 6 months preceding death the contractility increased significantly. (Tores Theorell, Dan Blunk and Stewart Wolf, J Lab Clin Med 86:46-56, 1975).

Stewart Wolf was one of the most important researchers in psychosomatic medicine at the time and he organized a series of visits for me with a number of prominent psychosomatic researchers including George Engel, Lawrence Hinkle, Arthur Schmale, Ray

Rosenman and George Kaplan. During that year I also visited you and your family in San Diego.

RR: I remember your visit well. We worked on preparing the publication you mentioned above. Now tell me how your career progressed working with Lennart Levi.

TT: *When I came back to Sweden and started working in Lennart's laboratory I combined this effort with clinical work in Biörck's department of medicine. I did not want to leave clinical medicine entirely, so I still participated as a "real doctor" and even took call at the hospital. The department had purchased a ballistocardiograph allowing me to continue studies of variations in contractility for patients with heart disease. Several studies were carried out using ballistocardiographic assessments during stress interviews, following in Stewart Wolf's tradition. In addition to the contractile patterns variations in blood pressure, peripheral circulation, ECG and plasma growth hormone were also studied.*

The adult twin brothers that were discordant with regard to coronary heart disease, which you had previously studied, were evaluated during stress interviews using all these assessments. One pair member always showed far more advanced coronary heart disease than the other twin brother. Even among the other monozygotic twin pairs in the study, we found a few interesting dissimilarities between the members of a twin pair, although similarities in cardiovascular reaction patterns among these twin pairs were also very prevalent.

In Lennart Levi's laboratory I conducted epidemiological studies using life

changes measurements as my main perspective. One investigation was a prospective study of life changes in relation to myocardial infarction risk. Subjects were 8000 building construction workers who were examined in public hospitalization and death registers, two years after they had completed the life change event questionnaire. We asked whether specified life changes had occurred during the past year and if such events were related to subsequent illness risk. Although it was not possible to examine for a recent build-up of life changes as we had in earlier studies, we could determine topics of particular relevance for specific illnesses. For instance, critical changes at work (such as increased responsibility and conflicts) were found to be associated with increased risk for developing a myocardial infarction over the following two years. (Theorell, T., Flodérus-Myrhed, B.: "Workload" and risk of myocardial infarction - a prospective psychosocial analysis. Int J Epidemiol 6 (1):17-21, 1977.)

RR: You now had academic degrees and advanced training in research, but you continued to extend your academic training into new disciplines. Tell me about these transitions.

TT: *As I was involved with these field experiments examining subjects' metabolic and hormonal changes in light of various life adversities such as voluntary starving and changes in shift work schedules, I felt I needed further training in epidemiology. Therefore, I chose studies in the Department of Social Medicine at the Huddinge Hospital (that is part of the Karolinska Institute academically). There, the dynamic professor*

Erik Allander had recruited statisticians well trained in mathematics. In addition, there was an emphasis on philosophy and the development of illness concepts.

During the two years working and teaching there, I met Robert Karasek who had just introduced his demand-control model for studying job stress conditions. He was aware of my interests in the relationship between job conditions and risk of myocardial infarction. We soon began our extensive collaboration, and we started using Swedish cohorts to study the relationship between high psychosocial demands in the presence of low decision latitude at work (a combination which was labeled "job strain"), on one hand, and risk of myocardial infarction on the other hand.

RR: The measures you and Bob Karasek developed for these studies became quite well known and resulted in your eventual collaboration with many other medical and psychological researchers. You also became a candidate for Lennart Levi's position as the Head of the Karolinska's Social Medicine Department. I was invited by you to visit Stockholm to serve as a Medical Thesis Opponent at this time. You had been remarried a few years before, moved to a new home in Stockholm and were raising two fine young sons. These recent life changes coupled with the challenges of competing for the top position at your work made you a candidate for life stress and illness. Can you say a bit about how you fared during this trying time?

TT: *When Karasek and I started collaborating, our joint questions had to do*

with the possible epidemiological association between job strain and myocardial infarction and we also wrote a theoretical paper on possible physiological mechanisms behind such an association. After more than ten years of intensive collaboration, our book Healthy Work came out in 1990 (Basic Books, New York). This has been widely quoted and used in universities in many countries.

Over the years these themes were picked up by many groups of researchers over the world. Several studies (starting with healthy subjects that were questioned about their job conditions) were followed prospectively with regard to their development of a myocardial infarction. Most of these studies showed job strain increasing prior to an infarction along with increasing cardiac risk factors. Ultimately, I have participated in a collaborative effort with several European groups (Kivimäki et al Lancet. 2012 Oct 27;380(9852):1491-7) in an extremely large prospective study comprising 197,000 subjects. Our results showed that job strain is associated with myocardial infarction risk independently of other cardiac risk factors. This association was found for both men and women. The psychosocial work environment is also important for the mental health of employees and the specification of what job factors that are important has become increasingly important. I have become increasingly involved in examining such questions during recent years.

After the two years at the Department of Social Medicine including three months at the Columbia University in New York working with Karasek, I was appointed full Professor of Health Care

in 1981 at Lennart Levi's newly started National Institute for Psychosocial Factors and Health, a researching governmental agency under the Ministry of Health. In 1995 I succeeded Lennart as Director of the Institute and also became a full professor at the Karolinska Institute. I retired in 2006.

After twenty years of marriage my first wife and I separated. My children Tobias and Ebba were in their upper teens and of course this was a difficult period for all of us. I married my present wife in 1987 and in this second marriage I have two sons. Since work continued to be very intensive these years were difficult. I worked very long hours. On a typical working day I started working in my office at 7 AM, arriving home mostly at 6:30 PM and then continuing to work for an hour after the family had gone to bed. Fortunately however, all of us in my family (both the old and the new family) were active in music (I sing and play the violin myself) so we had great joy in making music in various combinations over the years. This has helped (and still helps) us all.

During recent years, I have been doing research on the health effects of various cultural activities. For several generations, in my maternal and paternal backgrounds music has been a very important component. I have been driven by efforts to explore why some music activities may be used in health promotion and to answer the question whether there are real effects or only imagined ones. For instance, in a random control trial study we showed that irritable bowel syndrome patients, who had started singing in a choir over a year, showed better development of

plasma fibrinogen and also tended to have better pain control, perhaps due to development of the hormone motilin (important for bowel function). A control group who attended lectures and discussions did not show these effects. Further, during the first half year of the study the choir group showed higher secretion of testosterone in their saliva, a possible index of improved regenerative activity in the body (Grape, C., Theorell, T., Wikström, B-M., and Ekman, R. Choir singing and fibrinogen. VEGF, cholecystokinin and motilin in IBS patients. Medical Hypotheses. 72; 223-234, 2008. and Grape, C., Wikström, B-M., Ekman, R., Hasson, D. And Theorell, T. Comparison between choir singing and group discussion in irritable bowel syndrome patients over one year: saliva testosterone increases in new choir singers. Psychother. Psychosom. 79: 196-198, 2010).

A recent study dealt with the effect of manager education based upon art experiences. The goal was to make managers more engaged in their employees' health and psychosocial conditions. Other research has shown that the worst manager behavior from the employee health perspective is the passive withdrawn one. Two stress improvement training programs (both lasting for nine months) were compared in a random control trial. One program (Shibboleth) consisted of monthly sessions with poetry reading activating ethical choices interspersed by music selected for the situations. Group discussions and diaries followed each session. The comparison program was a more conventionally designed high quality program (with lectures and discussions) for improved psychosocial

management. For comparability, there was equal time commitment in the two groups. The managers, as well as their subordinates, were followed for 18 months after start and the results showed that both the managers and the employees benefited more from the artistic manager program than from the more conventional program. Psychological health and plasma concentration of dehydroepiandrosterone sulphate (DHEA-s), a hormone with regenerative/reparative and stress protective effects) developed more favorably in the shibboleth/manager group's subordi-

In a more recent publication we have shown that work sites with more cultural activities organized for the employees are protected against unfavorable development of burnout (or rather emotional exhaustion) than other work sites.

nates. (Romanowska, J., Larsson, G., Eriksson, M., Wikström, B-M., Westerlund, H. And Theorell, T. Health effects on leaders and co-workers of an art-based leadership development program. Psychother. Psychosom. 80; 78-87, 2011.)

In a more recent publication we have shown that work sites with more cultural activities organized for the employees are protected against unfavorable development of burnout (or rather emotional exhaustion) than other work sites. Accordingly our results seem to confirm that cultural activities at work may have a protective role for the employees (Theorell T, Osika W,

Leineweber C, Magnusson Hanson LL, Bojner Horwitz E, Westerlund H.: Is cultural activity at work related to mental health in employees? Int Arch Occup Environ Health. 2013 Apr;86 (3):281-8.)

I am presently involved in a large project on the development of music interest and pursuits for twins, again using the Swedish twin registry. I have some responsibility for the health parts of the investigation of 8000 individual participants. The twins are asked in detail about music in their environment, about music teaching and hours of training during different parts of their lives. They are exposed to objective musicality tests and there are detailed questions about health development and alexithymia. Modeling the results from this huge study will enable us to draw conclusions about the role of the environment (and of genes) in the development of music activities as well the role of these in health development. The theory is that music activity may help emotional development that reduces risk for alexithymia.

Dick: You and I have kept in contact over the years and I will always be grateful that you jumpstarted my scientific career. I became godfather to your daughter Annika who was born in Sweden, and, despite the fact that she has lived most of her life in California, presently as an English teacher, she has learned Swedish. She and I have exchanged letters in Swedish and last year she visited us in Stockholm with her two children. I look forward to many more years of close association and greatly appreciate this opportunity to express my indebtedness to you.

GET INSIDE OUR HEAD

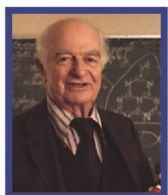
It's Not Our Credentials
That Make AIS So Impressive,
It's the Fellows That Go with Them.



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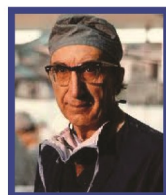
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in conclusion...

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Many thanks to you both for this delightful trip down memory lane and sharing these details about your personal life as well as professional careers. Additional information can be obtained from the complete interview to be posted on our web site, the Lennart Levi October 2012 Newsletter interview and August 2007 Richard Rahe interview. There is also the autobiography of the remarkable Stewart Wolf that I edited and contributed a Foreword to. It is an account of what many consider to be the "Golden Age of Medicine", which discusses all the pioneers in stress research mentioned here as well as other celebrities. I should add that Stewart's widow, Barbara Wolf, assigned the publishing rights for this magnificent work that includes selected articles to The American Institute of Stress. A copy can be obtained at www.stress.org/archives/miscellaneous-resources/ or by clicking the cover image to the right.

Dr. Theorell's current project, which involves studying the stress reduction and health promotion effects of music, is of particular interest. We have explored this in past Newsletters and Congresses over the past two decades, and while many reports are anecdotal or are limited to specific demographic groups, others like Medical Resonance Therapy Music are not. The efficacy of these computer-generated compositions based on Pythagorean mathematical principles is supported by double blind studies in peer-reviewed publications. More recently, several studies presented at last November's King of Organs con-

ference in Saudi Arabia showed that Saron music therapy increases heart rate variability and parasympathetic tone.

Heart rate variability (HRV) is the most sensitive and objective measure of stress levels, and when diminished, is a powerful predictor of sudden death. This was first discovered by Stewart Wolf in the early 1960s when he initiated a ten-year prospective study to identify physiological and behavioral factors that might contribute to sudden death due to cardiac arrhythmia in patients who had suffered a myocardial infarction. It was found that neither age, serum cholesterol, good and bad cholesterol ratios, nor treadmill testing results had any significant prognostic power. The only predictive indicators for mortality were beat-to-beat electrocardiographic changes reflecting diminished HRV, when compared to survivors. This required hours and days of painstaking analysis of 24-hour ambulatory ECG tracings. These preliminary findings were submitted to several medical and cardiology journals, but were rejected by all, with one reviewer commenting, "we have known about heart rate for centuries. The authors' findings concerning variability of heart rate could hardly have significant medical importance". It was not until 30 years later, that Wolf was able to publish the complete results of this study, in a paper entitled, "Oscillatory Functions Affecting Outcome of Coronary Heart Disease: The Hazard of too Much or too Little Stability".

Today, inexpensive hand held de-

vices display HRV in real time. This allows the user to elevate dangerously low HRV levels by altering the duration of inspiration and expiration to increase parasympathetic tone. Immediate feedback makes it possible to determine what respiratory pattern is optimal for each individual. Practicing this pattern for 15-20 minutes several times a week can provide benefits similar to those that may take weeks or months of daily meditation for 30 minutes or more. Specially created and patented Sanoson therapy also increases HRV and parasympathetic tone by varying rhythm, timbre and degree of harmony and other characteristics in a specific sequence. In one study, it was effective in treating essential hypertension, and in another, it relieved depression. (Low HRV is thought to be responsible for increased risk of cardiovascular events in depressed patients.) In both studies, pa-

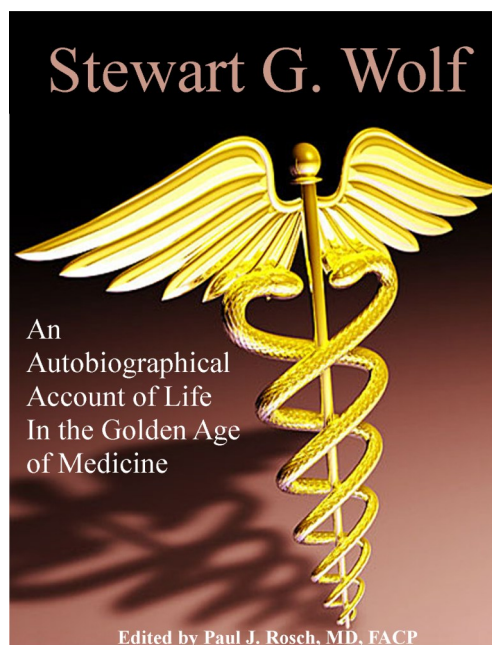
tients were able to stop or reduce their medications.

Sourcetone, which is based on research done at Harvard Medical School, uses an "Emotion Wheel" to determine the patient's mood. It then selects appropriate play lists to "promote desired emotional states such as relaxation, invigoration, stimulation and happiness." So-called melodic-intonation therapy uses singing to help stroke patients relearn language. And a U.K. researcher is looking for other applications, noting "Physiologically, it's perfectly plausible that music would affect not only psychiatric conditions but also endocrine, autonomic and autoimmune disorders."

I mention the above since I would like to revisit this topic in a future Newsletter that will hopefully include the results of Dr. Theorell's current twin studies —so stay tuned!!

To: Our Valued Members
From: AIS on behalf of the
Wolf family.

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