Exclusive Interview with Lennart Levi MD, PhD on Occupational Stress
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Stress

Dr. Paul J. Rosch
Interview with
Dr. Lennart Levi

Paul J. Rosch, M.D., FACP

Lennart Levi, M.D., PhD
Numerous surveys show that occupational stress is far and away the leading source of stress for adults and that it has progressively increased over the last four decades. There is no one more qualified to discuss the sources of this growing pandemic, as well as its adverse health and fiscal effects than my good friend Lennart Levi, MD, PhD, Emeritus Professor of Psychosocial Medicine at the world renowned Karolinska Institute in Stockholm. Lennart has been the recipient of numerous honors and accolades, including the lifetime achievement award from the American Psychological Association and NIOSH (National Institute of Occupational Safety and Health), the Royal Swedish Medal of Merit and the Hans Selye Award at our 1993 International Congress on Stress. More recently, an annual 100,000 SEK Skandia Lennart Levi Prize was established to celebrate his 80th birthday and to "reward research, education and dissemination of information to promote human health, development, productivity, creativity and/or well-being."

Lennart has written and/or contributed to numerous books and over 300 scientific publications. He has also left a legacy of distinguished students and colleagues to carry on and extend his ground-breaking research, which led to a renaissance of interest in stress in the 1970s. We will discuss this and other aspects of his long and illustrious career, but I would like to begin this interview by inquiring about what stimulated his interest in job stress. This apparently began even before he received his medical education, and as will be seen, soon became a lifelong preoccupation.
PJR: I have often wondered if your interest in stress was kindled in medical school, since, although the two are not mutually exclusive, you had decided early on to pursue a research career in academic medicine rather than becoming a practicing physician, I also recall that when you received the Hans Selye Award at our 1993 International Congress on Stress in Switzerland, you mentioned that you had been particularly impressed by Selye's magnum opus *Stress*, which was published in 1950. I suspect this was probably prior to your entering medical school, so perhaps you were interested in stress prior to that. At the time, most of the literature dealing with the health effects of emotional and psychosocial stress came from research on experimental animals. Although there were anecdotal reports, there were few scientific studies in humans. Could you tell us more about what stimulated your interest in stress, and particularly job stress, how you came to found the Laboratory/Department/Institute of Stress Research at the Karolinska Institute, and some of the individuals who influenced or assisted you in this endeavor? I believe this began in 1959 with the collaboration and support of the departments of Medicine and Psychiatry.

LL: You are right – my interest started early in life, in fact even before I entered medical school. I was inspired by two events. The first occurred during my compulsory military service in the Swedish Army. One of the other conscripts living close to me reacted intensely to the stress of military discipline to which he was totally unaccustomed. After three sleepless nights he became psychotic - and was very close to succeeding in committing suicide. It made a deep impression on me that a seemingly normal young man exposed to just a few days of unpleasant but in no way extreme military training could switch from normality to psychosis and suicidal behavior.

A few months later, I spent half a year studying psychology, before entering medical school in 1951. Soon after, I read and was deeply influenced by Hans Selye's magnum opus "Stress", published the year before. My subsequent studies in anatomy and physiology convinced me that the human brain was an integrated part of the human organism and in no way isolated from the rest of the human body. In 1959 when I was an intern in the Department of Internal Medicine at the Karolinska University Hospital, I prepared a small plate reading "Laboratory for Clinical Stress Research" and attached it to the door of my office. This was encouraged by two of my mentors, Dr. Henrik Lagerlöf, Professor of Internal Medicine, and Dr. Börje Cronholm, Professor of Psychiatry. Both of them regarded this initiative as the beginning of a bridge between their clinics and disciplines. Other crucially important mentors were Dr. Åke Swensson, Professor of Occupational Medicine, who encouraged me to apply experimental methods to everyday life situations, and Dr. Ulf von Euler, Professor of Physiology, who taught me about the physiological and biochemical parameters of the response to stress, and later received the 1970 Nobel Prize in Physiology or Medicine. But at the time it was virtually impossible to get any grants for stress research. And the great majority of Swedish professors at medical faculties were either indifferent or actively opposed to the stress concept and its implementation in medical practice.
It was well known that humans had responses similar to those seen in experimental animals when they were exposed to drastic stressors that bordered on torture. Much less was known about how we reacted to the far more subtle stressors encountered on a daily basis. Even less was known about the pathogenic effects of exposures typical of ordinary life, especially in the workplace. Our approach here was to combine epidemiological studies with experimental ones, by making use of changes in working conditions taking place for reasons unrelated to our research projects, or by manipulating such conditions experimentally. The latter approach necessitated close collaboration with our social partners in the labor market. Eventually, both management and labor started to see the potential importance of the entire problem area, for better or for worse. As a result, in 1975 the President of the Swedish Confederation of Professional Employees wrote an official proposal to the Swedish Government about the creation of a Chair for Psychosocial Medicine, suggesting me as its first holder. Since there was no response, he reiterated this the following year, and the Government circulated the proposal widely to appropriate authorities and organizations to solicit their comments and opinions. Because the great majority of responses were favorable, both the Swedish Medical Research Council and the Office of the Chancellor of the Swedish Universities proposed such a Chair with top priority. For reasons unknown to me, the Government refused, but the Parliament took a most unusual step by overruling the Government, which then appointed me Professor of Psychosocial Medicine in 1978. The Government noted this political manifestation across party lines and also appointed a commission to study our future place in the national organization. The Commission, with representatives from five Ministries, intended to fuse our Stress Research unit with another Institute for Environmental Health, 10 times larger than ours. Again, the Social Partners on the labor market jointly expressed their dissatisfaction and demanded a detached, autonomous organization for our activities. The Government gave in and such an authority was created in 1980, the National Institute for Psychosocial Factors and Health, with me as its first Director, and with the Stress Research Laboratory remaining as a separate unit under my leadership within the Karolinska Institute.

PJR: I recall that in 1970, you were instrumental in having the World Health Organization (WHO) and the University of Uppsala, Sweden, co-sponsor a series of five interdisciplinary, intersectoral and international symposia on "Society, Stress and Disease", and you edited these proceedings in five major volumes, published by the Oxford University Press (1971-1987). And because of the achievements of your Stress Research group, it was designated the first World Health Organization Collaborating Centre for Research and Training in psychosocial factors and health in 1973. You continued to be a consultant not only to WHO, but also the International Labor Organization (ILO) and other United Nations (UN) specialized agencies, and served as Chairman of the Section on Occupational Psychiatry of the World Psychiatric Association from 1982 to 2005, as well as President of the International Stress Management Association. All of these activities, especially the international symposia, brought you in close contact with
leading stress researchers all over the world too numerous to list. I have written about many of these mutual friends in previous Newsletters, and since they will be familiar to our readers, would appreciate it if you could comment briefly on a few such as David Hamburg, Stewart Wolf, Richard Rahe, Ulf von Euler, René Dubos and Töres Theorell, who succeeded you at Karolinska. On another note, several years ago, I had dinner with Alvin Toffler, another of our Founding Trustees, who emphasized that subjecting individuals to too much change in too short a time was a major source of stress. With respect to job stress, he indicated that he had visited you and was impressed and influenced by your views, and wondered if you recalled this meeting.

LL: As you correctly surmised, the WHO-sponsored series of five international symposia in Stockholm facilitated my collaboration with stress researchers all over the world. Hans Selye took a very active part in most of these and helped me by contacting researchers who studied stress in human as well as animal models. One of the most active participants in these symposia was Dr. David A. Hamburg, Professor of Psychiatry and Chair of the Department of Psychiatry at Stanford University in California. When he was appointed President of the Institute of Medicine, National Academy of Sciences, he asked me to write a chapter on "Psychosocial factors and health" for the U.S. Surgeon-General’s 1979 report on health promotion and disease prevention. As you know, his daughter Peggy Hamburg is now FDA Commissioner. I later took an active part in related activities of the American Sociological Association under its President Mathilda White Riley, as well as the American Psychological Association’s series of major stress conferences.

Another very influential participant of our 1970 Symposium was Stewart Wolf, a pioneer of psychosomatic medicine but also a marvelously cultured person, who chaired our session on “Experimental, clinical and epidemiological evidence concerning specific diseases provoked by psychosocial stressors”. He became a close friend and inspired many of our activities during many decades. One of the difficulties early on in our field was the need to measure “the slings and arrows of outrageous fortune”, i.e., the stressors. Here, Richard Rahe made a crucially important contribution together with Thomas Holmes. Their "Social Readjustment Rating Scale" inspired my collaborator and successor Töres Theorell, to eventually develop his and Robert Karasek’s "Demand/Control/Support Model". I got to know Ulf von Euler in the early 50s, when he was my teacher of physiology. Jointly with clinical physiologist Gunnar Ström and endocrinologist Carl Gemzell, we were able to show that every-day stimuli like viewing emotionally arousing movies for one hour had a significant effect in a broad range of hormones in human subjects. Microbiologist René Dubos was the opening speaker of our fourth Symposium, addressing “Man adapting to working conditions”, exploring the impact of environmental and social factors on the welfare of humans. I first met him in the context of the UN Conference on the Human Environment, held in Stockholm in 1972. He is the person who coined the phrase “Think globally, act locally.” My own contribution (together with Gösta Carrestam) was about the stress of urbanization and life in mega-cities. In the late 60s, I was visited and interviewed by futurist Alvin Toffler, who subsequently included the increasing occupational stress burden in his 1970 best seller, "Future Shock".
PJR: I suspect that these WHO symposia, your other publications, and the conferences and studies you did with ILO, UNICEF, UNESCO and other agencies must have stimulated considerable interest in job stress in Europe.

LL: Yes, but somewhat later. Within the European Union (EU), the first initiative came in 1993 during the Belgian Presidency, from the Belgian Minister of Labor, Ms. Miet Smet. She invited all European stakeholders to an EU Conference and asked me to be one of the keynote speakers. The deliberations made clear that there was a significant and increasing awareness of the relevance of work-related stress to workers’ health and well-being, the productivity and profitability of enterprises and the well-being of societies. One year later, Dutch psychologist Michiel Kompier and I were invited to write a book about "Stress at Work in small and medium-sized companies", and in 1996, in collaboration with Danish economist Per Lunde-Jensen, another book on the business case for action against work-related stress. In the meantime, EU asked its Advisory Committee on Safety, Hygiene and Health Protection at Work to analyze what could and should be done to counteract work-related stress in the EU Member States. As a result, I was invited (together with my wife Inger) to prepare an EU "Guidance on Work-Related Stress – Spice of Life, or Kiss of Death?" It was published in 2000, in English, French, German, Italian and Spanish. In 2001, the European Office of the World Health Organization concluded "mental health problems and stress-related disorders are the biggest overall cause of early death in Europe." And based on the Guidance, the European Social Partners on the Labor Market signed a Framework Agreement on Work-Related Stress in 2004 designed to improve working conditions for hundreds of millions of employees in the EU Member States.
PJR: I suspect there will be an emphasis on depression, since this is the most common debilitating mental disease. WHO predicts that by 2020, depression will be the second leading cause of disability throughout the world, trailing only coronary heart disease, to which it also contributes.

LL: In 2008, an EU and WHO-sponsored High-Level Conference adopted a European Pact for Mental Health and Wellbeing, stating, inter alia that "mental disorders are on the rise in the EU. Today, almost 50 million citizens (about 11 per cent of the population) are estimated to experience mental disorders. Depression is already the most prevalent health problem in many EU Member States." It was further recognized that "mental health is a human right. It enables citizens to enjoy wellbeing, quality of life and health. It promotes learning, working, and participation in society (and is also) a key resource for the success of the EU as a knowledge-based society and economy."

A call for specific and coordinated actions was formulated in these five priority areas:

1. Prevention of depression and suicide;
2. Mental health in youth and education;
3. Mental health in workplace settings;
4. Mental health in older people, and
5. Combating stigma and social exclusion.

And there are numerous efforts to implement these recommendations. The European Commission has recently started implementing the European Pact for Mental Health in a series of Conferences, most of which I had the pleasure to participate in: They include promotion of mental health and wellbeing of children and adolescents (Stockholm, 2009); Prevention of suicide and depression (Budapest, 2009); Older people's mental health and wellbeing (Madrid, 2010); Promoting social inclusion and combating stigma (Lisbon, 2010); and Promoting...
mental health and wellbeing in workplaces (Berlin, 2011). In 2011, the Council of the European Union similarly recognized that "the determinants of mental health and wellbeing, such as social exclusion, poverty, unemployment, poor housing, and bad working conditions, problems in education, child abuse, neglect and maltreatment, gender inequality as well as risk factors such as alcohol and drug abuse are multifactorial and can often be found outside health systems, and that therefore improving mental health and wellbeing in the population requires innovative partnerships between the health sector and other sectors, such as social affairs, housing, employment, and education." A basis for such a partnership is found in the EU Treaty of Lisbon, according to which "a high level of human health protection shall be ensured in the definition and implementation of all Union policies and activities."

A related way to systematize promotion of health and well-being has been proposed by Professor Sir Michael Marmot, (U.K.) who advocates "giving every child the best start in life; enabling all children, young people and adults to maximize their capabilities and have control over their lives; creating fair employment and good work for all; ensuring a healthy standard of living for all; creating and developing sustainable places and communities; and strengthening the role and impact of ill-health prevention." He has promoted and implemented these activities with the assistance of his national government, the European Union and the World Health Organization, which culminated in last year's Rio Political Declaration. And another mutual friend from the U.K., Professor Cary Cooper, succeeded in convincing the country’s former Labour government to commission a major research program on "Mental Capital and Wellbeing". Its final 2008 report provides a remarkable menu of social action to improve well-being and prevent ill-health on a national level. Thus, there is no shortage of conferences, declarations, recommendations and even guidelines as to what needs to be done and how to achieve these goals. But, as an old Chinese proverb reads, "words do not cook rice." There is a very considerable gap between what we know, and what we implement – the science-policy gap!

PJR: Getting back to job stress, we already have the rudiments to measure its degree and identify its causes in Karasek and Theorell's "Demand/Control Support" and Siegrist's Effort/Reward models, both of which were featured at our Annual Montrex Congresses. Are either of these or other approaches being utilized to reduce stress in the workplace and other settings?

LL: There are a wealth of research findings, most of which are based on one of three major theoretical models. The Demand-Control-Support Model combines three dimensions: "demands" in various social settings (should be optimal, instead of maximal, or minimal). "Control" i.e. the opportunities to manage one's personal living and working conditions (should not be too restricted). "Support", i.e. one's access to social capital (should also not be too restricted). Optimal demands combined with high control and high support spell favorable and probably salutogenic living and working conditions. The Effort-Reward-Imbalance Model is based on the "effort" we invest in life and work. In an understaffed or badly organized workplace, effort is likely to be high, but this also occurs if we get over-involved. If a high effort is not rewarded (in terms of salary, praise, tenure and/or promotion), stress is likely to
be excessive. If stress remains sustained with insufficient opportunities for "recharging our batteries", the risk for dysfunction and eventually structural damage to organs and organ systems increases, as demonstrated by another of my successors at the Stress Research Institute, Professor Torbjörn Åkerstedt.

There is no doubt whatsoever that poverty kills. But so does social inequality. All major components of these three models can be modified and improved through both political and individual action, from the cradle to the grave. According to UNICEF, the true measure of a nation's standing is how well it attends to its children – their health and safety, their material security, their education and socialization, and their sense of being loved, valued and included in the families and societies into which they were born. During working age, we ought to have a meaningful and gainful employment, referred to by ILO as "Decent Work". And towards the end of our life cycle, we should reach retirement age with preserved health, be allowed and encouraged tochoose freely between continued but adjusted gainful employment and meaningful leisure, and to continued participation and inclusion in our societies, and, of course, have access to adequate care.

PJR: We both owe a great debt of gratitude to Hans Selye, as do all who are interested in the health effects of stress. However, despite several very popular books in which he attempted to extrapolate his theories based on studies in rats to humans, it is important to emphasize that he never actually examined or treated a patient. Others also tried to demonstrate how Selye's theories applied to people, although, as you pointed out previously, the acute and life threatening stressors his experimental animals were exposed to are quite different from the subtle threats most of us are subjected to on a daily basis. He often reminded me that theories need not be correct, only facts need to. Some theories are meritorious for their heuristic value because they encourage others to discover new facts that lead to better theories. In many respects, this applied to Selye. There is little doubt that his findings in animals were accurate, as others have confirmed them. However, it was a different story for humans. He referred many patients to me who believed their symptoms were stress related based on his books or their physician's diagnosis. It was often difficult to convince them they were not in danger of developing the terminal "Stage of Exhaustion" of the General Adaptation Syndrome, and in a few cases, there was a non-stress related organic basis for their complaints.

On the other hand, Selye was a very stimulating and inspiring influence and encouraged others to develop their own facts and theories, even if they were incongruent with his own. I believe you first met him in 1965, when he delivered a lecture to your
fledgling Stress Research group on "Pluricausal Diseases". He encouraged the publication of an English version of your book *Stress: Sources, Management and Prevention* and the following year wrote the Foreword to this. He also vigorously endorsed your insistence on the need for an integrated, interdisciplinary, intersectoral approach to stress research. He similarly supported Aaron Antonovsky's salutogenic paradigm in humans, which was quite different than Selye's focus on pathologic changes in organs. In regard to Hans Selye, you once wrote:

Dr. Selye often pointed out that the Bible’s formulation "love thy neighbor as thyself" was to ask too much. Instead, he proposed his own formulation "earn thy neighbor's love". He referred to this as altruistic egoism. He definitely did earn my love through his never failing kindness, support, profound knowledge and willingness to help. He was a macrobiologist, who often pointed out that there were so many producers of bricks, but so few architects. The castle he constructed may need some modification and reconstruction but is still an everlasting contribution to science and humanity.

That was 20 years ago at one of our Montreux Congresses on Stress in Switzerland, and I wondered if your views had changed since then.

**LL:** I vividly remember Selye referring to most researchers and scientists as producers of "separate bricks". He emphasized that it was not enough to have all the necessary bricks to build a cathedral. The bricks must be placed in complex patterns relative to each other. "Otherwise, you end up with a heap of bricks." But, as you indicated, Selye's General Adaptation Syndrome or his stress research in animals cannot explain the concepts of salutogenesis and "Sense of Coherence". Real life is more complicated for humans. We see this in health responses to natural and man-made disasters. The former would include avalanches, droughts, earthquakes, floods, hurricanes, typhoons, mudslides, tsunamis, and volcanic eruptions. The latter comprise accidents in communities and work sites, nuclear leaks and meltdowns, oil spills from ships and wells, terrorist attacks, transportation accidents, war and civil destruction acts, unemployment, homelessness, poverty or nuclear waste disposal. For example, as co-chair of a WHO expert mission to Chernobyl in 1990, I had the opportunity to study some of the effects on public health and wellbeing of the large-scale nuclear accident occurring there four years earlier. According to our analysis, the effects were mediated through seven types of mechanisms that can be summarized as follows:

- Socio-psychological (the population’s perception of risk, partly based on the information – and disinformation – available)
- Socio-cultural (evacuation and result-
It is not uncommon for authorities to consider only one or a few of such pathogenic pathways and neglect the remaining, equally or more important ones. The complexity of challenges in real life necessitates a holistic, systems approach, difficult to achieve in post-industrial countries traditionally based on vertical "silo" approaches. Public health has been defined as "the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, public and private organizations, communities and individuals." In social systems characterized by the "verticalitis" just mentioned, this is easier said than done.

Getting back to Selye, towards the second half of his career he became almost a homo universalis, with his M.D., Ph.D. and D.Sci. degrees and his enormous knowledge and integrative abilities. As you have detailed elsewhere, he worked 12 hours a day, seven days a week. He produced some 1,300 scientific papers, scores of books and countless lectures. His response to my question as to how on earth he could manage such enormous productivity, he answered: "When is a hunting dog happy? -- When he is allowed to hunt." That may be true, but when and how his "prey" is utilized and appreciated may be more important for humans. Many discoveries and much knowledge are never applied, or are applied with a very considerable delay due to concerns about costs. This is starting to change. The British Government very recently asked the London School of Economics to calculate the cost-benefit ratio for a number of investments and outcomes based on available evidence. The results reveal that for every GBP (British Pound Sterling) invested, the total returns are as follows:

- Workplace health promotion GBP = 9.7
- Screening of alcohol abuse GBP = 11.8
- School-based interventions to reduce bullying GBP = 14.4
- Suicide prevention training course to all General Practitioners GBP = 44.0
- Prevention of conduct disorders through social and emotional learning programs GBP = 83.7.

Even half of these saving opportunities should impress the Ministers of Finance and decision makers of most countries! Our major task now is to communicate this information to these individuals and...
to convince them to act accordingly. By evaluating the results and learning from experience, the decision making loop will become self-corrective. As noted previously, great strides in narrowing this wide "science-policy gap" are being implemented in the UK by Professors Michael Marmot and Cary Cooper, and by economists and elected officials in France and other EU countries. While this trend is encouraging, more research is indeed needed because the social determinants of our health are changing so rapidly. Nevertheless this must be complemented by implementation of what is, indeed, already known from existing evidence!

PJR: I find it intriguing that your interest in occupational stress was triggered during your compulsory service in the Swedish Army, when a young fellow conscript developed suicidal behavior and other symptoms suggestive of PTSD because he could not cope with the sudden stress of military discipline to which he was totally unaccustomed. This is reminiscent of Alvin Toffler's assertion that a major source of psycho-social stress was subjecting people to too much change in too short a time. It is unfortunate that greater attention was not paid to your observation, since PTSD has become a very costly health disaster due to an inability to objectively confirm the diagnosis and treatment with drugs that are not only ineffective, but also worsen the quality of life and contribute to suicidal behaviors. As emphasized in recent Newsletters, this is what happens when disorders become political footballs and their diagnosis and treatment are dictated by powerful drug companies rather than solid scientific evidence. The current emphasis on statin therapy for coronary heart disease is another example in my opinion.

In 1978 you were able to inspire your country's Parliament to overrule the Government's decision to defer creating a Chair for Psychosocial Medicine. You similarly succeeded in inspiring partners in the labor market to convince your Government to create a small but autonomous National Institute for Psychosocial Factors and Health in 1980. And you successfully galvanized these groups again when you were to retire from your Chair in 1995 and the Karolinska Institute proposed changing its content from "psychosocial medicine" to "molecular biology". That points to a political career. It is therefore quite fitting that you were elected to the Swedish Parliament in 2006 as a member of the Centre Party, which describes itself as "a green social liberal party". Although you did "retire" from your Karolinska leadership posts in 1995, and from Parliament in 2010, you still serve as an active senior adviser to the Stress Research Institute as well as to your party.

We have both been blessed with wives that tolerated our professional activities, even though they often prevented spending time with them, and Inger has actively contributed to some of your projects. They were also concerned that our excessive work activities might have adverse health effects and that we needed to take time out to relax. On one of your visits, my late wife, Marguerite, explained that she was able to accomplish this as well as spending
more time together by playing golf. Inger, who was also an ardent golfer, thought this might be a good idea, and I recall presenting you with one of my favorite golf clubs, but not sure if this helped.

I also recall meeting you for the first time when Stewart Wolf brought you to our home, and have equally pleasant memories of the time we were able to spend together at conferences in Switzerland, Russia and Hawaii. I particularly remember the surprise birthday party our mutual friend Konstantin Sudakov arranged for me in Moscow, and I will be interviewing Konstantin in a future Newsletter. Most of all, I am grateful for your warm friendship over the years and your strong support of the American Institute of Stress. I look forward to your continued cooperation and advice as we transition over to new leadership that will greatly expand our ability to provide accurate and up to date information on all stress related issues. Starting from our earliest days, we have served as an ombudsman in this domain by identifying those stress related services and products that are authentic and promising, as opposed to others promoted by charlatans and misguided zealots. This has become even more important in recent years because of the skyrocketing increased interest in stress that has generated a flood of misinformation that can be confusing to consumers as well as health professionals. Our goal is to separate the wheat from the chaff and your achievements have been of inestimable value in helping us accomplish this.

As Selye said, "I cannot and should not be cured of my stress, but merely taught to enjoy it."

LL: I have never been an admirer of Karl Marx, but I do like one of his formulations: "All that philosophers have done is interpret the world in different ways. It is our job to change it.” Or, rather, to try to improve it. To make it happen. This, of course, turned out to be very, very difficult – but not entirely impossible. With regard to the stress field, my priority has always been to try to adjust the "shoe" (living and working conditions) to the "foot" (the human being), and not just the other way round. And, yes, you kindly donated one of your best golf clubs to me, and, indeed, I got a Green Card and started playing. But I soon found out the truth in British playwright Noel Coward's claim that “work is much more fun than fun”.

As Selye said, "I cannot and should not be cured of my stress, but merely taught to enjoy it." Our wives obviously recognized this, as well as other factors that promote a happy and fulfilling life. When Sigmund Freud was asked what were the ingredients of a good and successful life, his answer was "lieben und arbeiten" (to love and to work) - to love others and work for a common good. Both of us have done this to the best of our abilities. And, of course, if you love your work, as we do, that is an added bonus. In that regard, I look forward to being of assistance as the American Institute of Stress transitions over to new leadership that will expand its services while preserving the high standards and reputation for accuracy it has deservedly achieved for well over three decades.
There is much more that could be said about Lennart Levi's other achievements and the more than 4,000 lectures and seminars he has delivered all around the world dealing with problems and solutions in Occupational, Public and Mental Health. He has been able to explain these complex issues in an easy to understand fashion in accord with Albert Einstein's advice that "Everything should be made as simple as possible, but not simpler." I would like to share some of these with you. As he noted with regard to stress "My priority has always been to try to adjust the "shoe" (living and working conditions) to the "foot" (the human being), and not just the other way round."

He illustrated this with the following diagram:

To make things fit, one either has to change or cut the shoe, or remove part of the foot. Similarly, jobs often have characteristics that may not fit everyone. Rather than strictly confining and crushing workers, it may be preferable to revise the degree of their responsibility and/or the demands of their assignment to give them more control. This also applies to those with talents they have not been able to fully utilize.

Most physicians readily acknowledge the important role stress can play in the etiology and pathogenesis of numerous disorders, but would have difficulty in providing a definition of stress that everyone would accept. The term stress, as it is currently used, was coined by Hans Selye, who struggled with this problem his entire life without finding a solution. His initial description of this nonspecific response to any demand for change that he called "biologic stress" was published as a 74-line letter to the editor of *Nature* in 1936 entitled "A Syndrome Produced by Diverse Nocuous Agents". But the editor insisted that the word "stress" had to be deleted since it was commonly used to mean nervous strain. As a result, the word stress never appeared and "Alarm Reaction" was substituted to describe this response, which he viewed as a coordinated mobilization of the body's defense mechanisms. Selye later defined stress as "the rate of wear and tear on the organism", a good description of biological aging, but not very useful for scientists. And, towards the end of his life, when asked what he meant by stress his response was "Everyone knows what stress is – but nobody really knows."

So exactly what do we mean when we refer to excessive job stress? Lord Kelvin, the 19th century mathematician-physicist who developed the absolute or Kelvin temperature scale wrote, "To measure is to know", and "If you cannot measure it, you cannot improve it." But if you can't define something, how can you possibly measure it?

Numerous questionnaires have been developed to measure the severity of job stress based on environmental hazards, conflicts with
customers and coworkers, discrimination based on gender, race, religion, age, etc., but there is no clear correlation with adverse health consequences. We are frequently asked to provide lists of the ten most and ten least stressful jobs but most of these are of little value since they are based on self-report from non-representative samples. In some instances, they are instigated by unions or organizations to obtain higher wages or better benefits for their members. The link between job stress and heart attacks is so well acknowledged, that in New York and other municipalities, any policeman who suffers a heart attack is automatically assumed to have a work related injury and is compensated accordingly, even if it occurs on vacation while gambling in Las Vegas or fly fishing in a placid lake. And the dangers of being a police officer in a crime ridden and violent inner city ghetto is a lot different than those of one in a rural Wyoming village. Some people are attracted to police work because of the excitement and thrill of possible danger, and if you ask them what is the most stressful aspect of their job, it is apt to be "all the paper work." As Lennart has emphasized, job stress is entirely based on the person/environment fit. Some Type A’s thrive in the pressure cooker of life in the fast lane, with constant time urgency, constantly multitasking and having numerous responsibilities - provided they feel in control. They would be severely stressed by a dull and dead end job that consisted solely of transferring something from one conveyer belt to another, over which they had no control. However, this might be perfect for someone who shuns responsibility, simply seeks a job that is well within his or her capabilities, poses no challenges, and can completely forget work as soon as their shift is over. Social support is also a powerful stress buster.

The best method of measuring stress and demonstrating its link to cardiovascular and other diseases is the Karasek and Theorell demand/control/support model. Siegrist's effort/reward approach has also been successful in predicting future illness. While these are too complex to discuss into detail here, they can be succinctly illustrated as follows:
As to advice on how to reduce stress by “fitting the job to the worker”, there is no simple formula that applies to everyone, since we all have different needs, goals and personalities. And employers can’t keep changing job descriptions and duties to accommodate these and continue to operate efficiently. But what they can do is to recognize the ingredients of a good job and to determine if any of these can be incorporated to improve the quality of life and job satisfaction. Such efforts are apt to be cost effective since they also increase productivity and profitability. Lennart uses the following slide to explain what some of these major components include:

**A GOOD JOB PROVIDES:**

- Purpose and direction;
- Regular daily activity;
- Identity and self-respect;
- Companions and friends;
- Material benefits, salary.

(cf Marie Jahoda)

To celebrate his 60th birthday, Lennart's colleagues and students prepared a book containing selected articles from his four decades of research. These illustrated his wide range of interests and discoveries, and his knowledge of endocrine, biochemical and physiological responses to stress that confirmed his clinical observations on gender differences and the stress of long-term unemployment. I still have my graciously inscribed dog-eared copy that also shows the stunning sideburns he was sporting at the time as seen below.

Of course, that was well over two decades ago, and he has now published over 300 papers, book chapters and books and is still going strong. I mention this since we are contemplating reviving our International Congress on Stress in 2014. This will have a focus on job stress and we look forward to Lennart Chairing this segment and bringing us up to date on the latest advances in this area.
The link between occupational stress and coronary heart disease has long been appreciated, but proving this has been difficult because of an inability to objectively define job stress, much less measure it accurately. While excessive work demands are obviously important, Type A behavior, obesity, diabetes and the standard Framingham risk factors of hypertension, smoking and cholesterol, are also considered to be risk factors, although some of the latter may merely be markers based on the MRFIT study. [1] There are also risk factors that cannot be avoided, such as being male, growing older and heredity. Despite all these confounding influences, significant advances in proving that job stress can cause heart attacks and coronary disease have been made over the past four decades. As previously indicated, a major impetus has been Lennart Levi's seminal research and the development of the demand/control model developed by Robert Karasek and Tores Theorell, Lennart Levi's successor at Karolinska.

The validity of this approach was again confirmed last July in a landmark *Lancet* article that analyzed the data of 200,000 participants in 13 European studies between 1985 and 2006.[2] This meta-analysis found that employees with high job stress had an almost 25% greater risk of heart attacks compared to those with little or no job stress. As the lead author, Professor Mika Kivimaki of the University College of London commented, "Job strain is composed of two things. One, you have lots of demands, a heavy work load. The other is how much control you have over that. Stress is more common in lower positions than among those who are on the top, who have more authority and control." He was joined by 45 coauthors from Finland, Sweden, Denmark, the Netherlands, Belgium, France and the U.K., some of whom, like Theorell, Siegrist and Marmot, are among the leading authorities on measuring job stress. Information was gathered on participant age, sex, socioeconomic status, lifestyle, and conventional coronary risk factors. Job stress levels were measured at baseline based on responses to questions such as: quantity of work; demands of the job; if there was sufficient time to complete assignments; whether there was adequate decision-making latitude and freedom; or the opportunity to be creative and to learn of new developments that might be pertinent. Coronary disease and heart attack incidence was assessed through national hospital admission and death registries at follow-up, which averaged 7.5 years.

The 23% increased risk of heart attacks due to job stress remained significant when adjusted for age, sex, and socioeconomic status, but was much less than the 40 percent rise reported in other studies.[3] There are several factors that may explain this. The meta-analysis included both published and unpublished studies, and it has been shown that the contribution of job stress to cardiovascular risk is lower in the latter. Job stress or strain was only measured at baseline and coronary heart disease was defined as the first non-fatal or fatal myocardial infarction. Some participants may have had angina or other coronary events that would have progressed to a myocardial infarction had the follow-up period had been longer. In addition, the study period ended prior to the severe financial meltdown in Europe that was accompanied by widespread layoffs, unemployment and concerns about job security that have been shown...
to increase occupational stress. A prior U.K. study with 12 year follow-up found that chronic work stress was associated with higher rates of coronary disease, especially in those under 50, who had 68 percent more risk than those who reported no stress.[4] There is little doubt that the situation is the same or worse in the U.S. Women who reported having little or no authority over decisions or being unable to contribute creativity and skills to their job, were up to 88 percent more likely to experience a heart attack. [3] And a survey by the American Psychological Association found that three out four employees listed work as a significant source of stress, and more than half said their productivity had suffered as a result. [5]

A September 2012 article again confirmed that executives at the top of the ladder with the most control over their jobs are less stressed despite increased responsibilities and demands. [6] Researchers recruited 148 leaders and 65 non-leaders in various professions from a Harvard University executive education program and the military. Participants completed questionnaires that rated their degree of anxiety and salivary levels of the stress hormone cortisol were measured. Leaders had lower levels of cortisol and less anxiety than those who were not in charge, regardless of whether they were at the top of political, military, business or nonprofit organizations. The more powerful the position, the lower the cortisol and anxiety levels. Sir Michael Marmot's Whitehall studies of health in British civil service also revealed that high rank of government officials was directly linked to decreased death rates, especially from cardiovascular disease.[7]

All these studies have attracted widespread media attention that often hypes or distorts their conclusions. For example, in a July 13 Los Angeles Times article that commented on the Lancet meta-analysis entitled "Stressful job? It could be worse", the reporter apparently wanted to make the point that workers should be grateful that they had a job in this sluggish economy. She referred to the 2007 APA survey which allegedly claimed "Job stress is estimated to cost U.S. employers $300 million a year in absenteeism, lost productivity, higher turnover and added medical, legal and insurance fees." What the report actually stated was "Job stress is estimated to cost U.S. industry more than $300 billion a year in absenteeism, turnover, diminished productivity and medical, legal and insurance costs (Rosch, 2001) The citation was to one of our Newsletters (Rosch PJ. Ed. "The quandary of job stress compensation." Health and Stress, 2001; 3:1-4). This figure, which is over a decade old, has been revised upwards twice since then. The reporter also erroneously listed the article as being published in the July issue of Neurology, rather than Lancet. This supports Mark Twain's warning, "If you don't read the newspaper, you are uninformed. If you do read the newspaper, you are misinformed."

References


