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From left to right: Fredy Alt, Mayor of Montreux, Dr. Claude Rossel, Executive Vice President, Biotonus Clinic, Dr. Ray H. Rosenman, Recipient of The Hans Selye Award, and Dr. Paul J. Rosch, President of The American Institute of Stress.

The Stress Reduction Effects Of Music

This year's Congress featured the stress reduction music of the classical composer Peter Hübner. "Music has charms to soothe the savage breast", wrote William Congreve a few hundred years ago, but the powerful emotional and stress reduction properties of music have been appreciated since antiquity. Saul summoned the young David to play soothing music on his lyre, and certain repetitive sounds, rhythms, chants, have long been employed in many religions to promote a meditative state. Exactly how these effects are mediated is not known. Yogic teachings assert that we all act covertly in resonance with some constant inner background rhythm, or music, which modulates all our moods.

Resonance is a phenomenon produced when a body is fed energy in tune with its own frequency. Common examples are the increased arc achieved when a small impulse is applied at just the proper time to a child on a swing, or when a tuning fork starts to vibrate in response to striking another with a similar frequency. Such resonant vibrations can be demonstrated in mechanical, acoustical and electrical systems.

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ALSO INCLUDED IN THIS ISSUE

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

Music, Mathematics and Medicine

Early Greek physicians used music to cure melancholy and other ailments. It is no coincidence that Apollo, one of the most powerful figures in Greek mythology, was the God of both medicine and music. Over 2500 years ago, Pythagorus advocated daily singing and playing of an instrument as a cathartic to cleanse the emotions of worry, sorrow, fear, and anger. Pythagorus had observed that vibrating strings produced harmonious tones when the ratios of the length of the strings were whole numbers ranging from 1 to 4. These ratios were applied to lengths of a string on an instrument called a canon, and the Pythagorean scale was arranged so that the frequency intervals were represented by ratios of the integral powers of the numbers 2 and 3.

Thus, the interval of an octave was rooted in the ratio 2:1, the fifth in 3:2, the fourth in 4:3, and that of the whole tone, 9:8. These ratios also applied to harmonics in other instruments. Pythagorus believed that the earth itself was in motion, and was also well aware of the periodic numeral relationship of the heavenly bodies. The presumed ratios of distances between the sun, moon and planets appeared to be governed by similar mathematical musical rules. The celestial spheres of the planets were thought to produce a harmony called "the music of the spheres". Peter Hübner's compositions are based on Pythagorean principles.

Pythagorus and Plato

Pythagorus proved that any triangle whose sides had a 3:4:5 ratio was a right angled triangle. He is best known for the Pythagorean theorem that the square of the hypotenuse of a right angled triangle is always equal to sum of the squares of the other two sides. Based on observations gained from music, mathematics, and astronomy, he concluded that all of nature was governed by mathematical laws of harmonious proportion. He had many followers who also believed that everything in the cosmos could be reduced to number relationships ("all things are numbers"). This later provided the basis for Euclidean geometry to predict distances. The famous philosopher, Plato, was also profoundly influenced. In *Timaeus*, his description of the origin and nature of the universe, he wrote that the soul of the world was structured by the same musical ratios Pythagorus had described. For the Pythagoreans, as well as for Plato, music represented a branch of mathematics as well as an art. This tradition flourished throughout antiquity, and was a crucial influence in the development of music in medieval Europe.

From the Pythagorean perspective, diseases essentially reflected some disruption of basic and natural harmonious relationships in the body. Therefore, the ability to restore balance, proportion and symmetry could correct "dis-ease", and promote health. Pythagorus presumed that if it were possible to learn more about the harmonies that prevailed in the microcosm of music, it might be possible to program these into our spiritual and physical beings to instill better balance internally. He established a medical training center based on the mathematics of the microcosm of music, and devoted himself to the use of music therapy for various medical disorders. He also founded schools to study the mathematical laws that governed the cosmos, and might foster a more harmonious relationship between man and the universe. Unfortunately, since his students practiced both secrecy and communalism, no reliable contemporary records survive. However, Plato, Aristotle and other followers, continued his quest to find an order in Nature mimicking the mathematics of music.

Is There a Basic Rhythm in Nature?

As reported in prior Newsletters, interest in this has been rekindled in recent years. Intensive research in Japan has centered on "1/f" fluctuation, a phenomenon found in certain natural rhythms, such as birds chirping, soft breezes, and murmuring streams. Soothing effects become more powerful as the oscillations fall. A prominent Tokyo physics professor believes this frequency underlies all human physiology, including heart beats and alpha brain waves. A few years ago, a stress reduction compact disc was the first "designer" music ever to make the Billboard chart. According to its promoters, its New Age sound activated brain wave frequencies that promoted "emotional synchronicity". At a previous Congress, a series of compositions were presented based on the creation of sounds, tones, and rhythms designed to promote a cellular resonance consistent with chakra and meridian concepts of energy field balancing. This was associated with an increase in high amplitude alpha brain wave activity, which allegedly enabled the listener to achieve a meditative state more rapidly.

Music is a very basic part of our existence. It starts before we are born, with the rhythm of our mother's beating heart. Life on earth evolved in a world governed by rhythmic changes that followed mathematically predictable planetary movements, recurrent rhythms of darkness and light, and seasonal changes. Our mood, behavior, and crucial neuroendocrine and physiologic activities are all influenced by a variety of circadian and other biological rhythms of primitive origin. Our musical impulses are inextricably intertwined with these primordial movements and feelings. Music reproduces these far more intimately and accurately than is possible with any other medium of human communication.

Environmental electromagnetic pulsations remained constant for hundreds of thousands of years, but changed dramatically only during the present century. Artificial light, shift work, jet travel across time zones, and a markedly accelerated pace of daily activities have also contributed to our current disrupted, and often discordant, rhythms and lifestyles.

The Use of Music as Medicine

There is considerable evidence that some of these influences can contribute to various illnesses, and that music may be beneficial in restoring natural rhythms that promote health. One hundred years ago, music was used for the treatment of various neuroses, insomnia, circulatory and blood pressure problems, respiratory and cardiac difficulties. Music therapy began as a formalized discipline after World War II, when its beneficial effects on emotionally disturbed and convalescent shell shocked patients were noted. The National Association for Music Therapy was founded in 1950, and the American Association for Music Therapy in 1971, and there are now well over 5,000 music therapists in the United States. A few years ago, the Senate Committee on Aging held hearings on the beneficial use of music therapy to consider funding for helping the elderly recover from various illnesses. Among those called upon was the well known neurologist, Oliver Sacks. He testified that music was not a luxury, but more of a necessity, "that may be required to help patients express their emotions and feelings".

Music has been used to facilitate anesthesia during pregnancy and labor, reduce the stress and discomfort of surgical and dental procedures, relieve anxiety and depression in coronary care units, and promote recovery following a heart attack. Numerous reports confirm the value of music as an aid in treating headaches, digestive complaints and other disorders that appear to have a strong emotional component, to ease pain, calm anxiety, and lift the spirits of those who are terminally or chronically ill. In many instances, these anecdotal observations are supported by psychological research demonstrating improvement in anxiety or depression scores. There is also objective evidence of lowering stress levels as assessed by changes in galvanic skin response or hormonal secretion. Music enhances biofeedback procedures to reduce test and performance anxiety. It can also improve the efficacy of most stress reduction strategies, particularly those that utilize other subtle energies such as photic stimulation, massage, touch, and aromatherapy.

Psychophysiological Effects of Music

Music can elicit a wide variety of physiological and emotional responses, including changes in heart and respiratory rate, blood pressure, gastrointestinal motility and secretion, skin temperature, electrodermal reactivity, pupil size, muscle tension, brain wave activity, and immune system function. Some researchers believed that there are certain physiologic activities that responded reflexively to music. The heart normally beats between 70 and 80 times per minute, and it has been observed that pulse rate tends to synchronize with a musical tempo, speeding up as it increases, and decelerating as it slows down. Slow and soft chamber music tends to blunt reactivity to stress, while fast, loud, vocal and/or brass instruments increase arousal. Marches and martial music have traditionally been used because of their stimulating effects, which are based on these properties. One survey revealed that for some people, music is more exciting and thrilling than anything else, including sex. This is probably due to the release of endorphins, since naloxone, which blocks endorphin euphoria and analgesia, also diminishes the emotional response to music.

Other psychological effects are much more difficult to classify and evaluate. There is often a set response to certain tones, and a tendency to describe high pitched music as happy and playful, whereas lower tones are more sad, somber, and serious. Music can also affect the way you respond to work and exercise. The Muzak Corporation pipes in music specially designed to soothe workers at hours when they are apt to be most tense, and to stimulate them during other times of the day.

Many people report that they don't feel as tired when their workout activities are accompanied by upbeat rock music. Although individuals do not have to be musically inclined to be susceptible to such influences, some have emphasized the necessity of matching music to the psychological state of the patient. Age and gender may affect responses. Teenagers often seem to be addicted to loud rock music, with its repetitive beats, but are turned off by the soothing strains of Mantovani and classical music that their grandparents enjoy.

A New Science of Musical Synthesis

Music can have important influences on creativity, imagery, and changes in the patterns of right and left brain dominance. Recent research suggests that this may affect women more than men. Music is a very complex and sophisticated stimulus that intertwines rhythm, melody and harmony. Superimposed on this are the effects of volume, orchestration, prior experience and entrainment. The intriguing question is whether there are some underlying fundamental mathematical principles that can be utilized to predict responses. Twenty five centuries ago, such efforts would have to be conducted on a trial and error basis. Today, modern technologies allow us to analyze, produce, and reproduce musical processes much more precisely than has ever been thought possible.

New innovative techniques of sound creation made possible by the synthesizer, revolutionary recording and reproduction enhancements, and novel computer control analysis and synthesis technologies, have been coordinated and utilized by Peter Hübner in attempting to develop his medical resonance therapy. This has been utilized for the past five years in hospitals and medical research institutes in Germany, Ukraine, and Belorussia. Scientific evaluation has verified the benefits of applying natural harmony laws of music to medical practice, but more than this is obviously required. According to Aristotle, art on its highest level, is always concerned with the reproduction of inner nature. The artist's job is to take the raw materials inside him and enrich them with consummate capabilities that give them a transcendent meaning. As Beethoven noted, "Music is a higher revelation than philosophy. . . for man, music must strike fire from his mind." Peter Hübner obviously has that creative spark.

Adapted from a presentation by Peter Hübner, Classical Composer, Seventh International Montreux Congress on Stress.

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

When I hear music I fear no danger, I am invulnerable. I see no foe. I am related to the earliest times, and to the latest.

Henry David Thoreau

Is There A New Treatment For Stress And Aging?

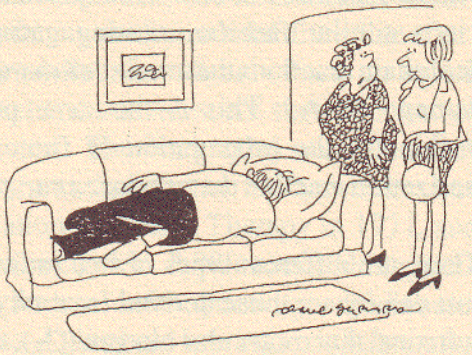
Romania has long been known for its novel anti-aging therapies. It is also no coincidence that biological aging and stress have both been defined as "the rate of wear and tear on the body". Numerous studies confirm that oxidative stress resulting from free radical damage is responsible for the major manifestations of aging. Free radicals are a byproduct of normal metabolic activities, and levels rise under conditions of increased emotional stress. Their damaging effects can be blocked by the administration of potent antioxidants, and this has led to the development in Romania of a specific anti-stress and anti-aging synergistic formula, known as Antagonic-Stress (AS).

In the laboratory, the administration of AS decreases the incidence of gastric ulcerations and mortality in experimental animals exposed to acute and severe stress. It increases antioxidant superoxide dismutase and lowers lipid levels. AS also shows protective effects in sustained stress situations, such as those produced by chronic socio-sensory deprivation, chronic alcohol addiction and prolonged pain experiments in rats. This is evidenced by a reduction in the characteristic microscopic pigment changes associated with stress and aging, particularly in brain neurons and neuroglia, suggesting shielding at cellular and subcellular levels.

In humans, the synergistic anti-stress and anti-aging properties of AS have been demonstrated in alcohol dependency, neurasthenic-fatigue syndromes, and geriatric cognitive impairment disorders. In chronic alcoholism, there was more emotional stabilization, increased resistance to psychosocial stressors, and a reduction in hepatic and cerebral damage. In the other groups, AS improved stamina and cognitive performance, and psychological and somatic complaints decreased.

The specific anti-stress and anti-aging properties of AS are said to be due to its "antioxidative, anabolic, homeostatic and biological synergistic composition, and on cerebro-, hepato- and myocardioprotective actions". To insure effective absorption, the Antagonic Stress (AS) formulation is administered in the form of two controlled release capsules, one of which dissolves in the stomach, and the other in the small intestine. It is not clear what these formulations consist of, and AS is not currently available in the U.S. Double blind trials are in progress elsewhere to further confirm the role of stress in aging.

Adapted from a presentation by Dan Riga, M.D., Ph.D., Seventh International Montreux Congress on Stress



"He'll never wear out. He has no moving parts."

Stress, Melatonin, And Cancer

Melatonin is secreted by the pineal gland, a small organ deep in the brain, referred to by the 17th century French philosopher, Rene Descartes, as "the seat of the soul". Others have termed it "the third eye", and in eels, lizards, frogs and certain higher forms of fishes, in addition to an organ, it consists of an eye which conveys information on the intensity and duration of light. Melatonin is intimately involved in the sleep-wake cycle and other circadian rhythms. Most people are familiar with this mystical "hormone of darkness" because of its sleep inducing properties, and ability to reverse the symptoms of jet lag. Prior Congresses have featured Dr. Russel Reiter's evaluation of his own and other research studies, which suggest that melatonin has important anti-aging properties in experimental animals. There is also evidence that it might prove useful for the prevention of cancer and atherosclerosis, as well as the treatment of other degenerative disorders, including Parkinson's and Alzheimer's disease. At a previous presentation, it was postulated that this wide range of therapeutic effects suggested that melatonin might have powerful antioxidant properties, and this has now been confirmed by Dr. Reiter.

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It is generally believed that most of the manifestations of aging are due to the unopposed activity of free radicals. A free radical is an uncharged atom or molecule that has an unpaired electron. Free radicals are highly reactive and race around the body in an attempt to replace their missing electron by robbing them from healthy tissues. This can result in the formation of other free radicals, which react in a similar fashion, causing catastrophic chemical chain reactions that erode cell membranes, and damage DNA. This is the same principle responsible for the propagation of fire, and the polymerization reaction that produces various plastics.

There are different types of free radicals, but the most deadly are those derived from oxygen. It is paradoxical that molecular oxygen (O_2), which is essential for life, is also what may kill us. A fire cannot burn, metals will not rust, and we cannot live, unless oxygen is available. However, a small percent of oxygen is not utilized in normal metabolic activities, and is spun off as free radicals. Oxygen derived radicals are the most injurious, and the damage they inflict is referred to as oxidative stress. The three electron (e^-) reduction of oxygen forms the most highly toxic of all the oxygen derived destroyers, the hydroxyl radical (·OH). This reaction proceeds as follows:

$$O_2 \xrightarrow{e^-} O_{2+} \xrightarrow{e^-} H_2O_2 \xrightarrow{e^-} \cdot OH$$

The intermediates are the superoxide anion (O_2+), and hydrogen peroxide (H_2O_2). The (·OH) hydroxyl radical is particularly damaging to DNA, disrupting changes in genetic coding, which, if not prevented or repaired, can cause mutations and contribute to cancerous growth.

Oxygen free radicals are neutralized by molecules known as antioxidants which inhibit or prevent oxidative stress. Antioxidants are often used commercially to prevent unwanted color changes in foods high in carbohydrates, or to retard rancidity in fatty foods. These undesirable color or flavor changes result from a reaction of components in foods with oxygen in the air. Antioxidants help prevent these changes by reacting with the oxygen more readily, therefore allowing oranges to retain their color longer, and to preserve various foods, such as vegetable oils, potato chips, bread, cheese, etc. Antioxidants are added to Vaseline and lubricating oils to prevent them from "gumming up". They also delay discoloration and loss of strength and elasticity in rubber and plastics .

To a considerable degree, the aging process in man is not a wearing out, but rather a rusting out, due to free radical oxidative stress. In the body, free radicals are normally opposed by natural antioxidants, particularly superoxide dismutase, but our ability to manufacture these declines as we grow older. Dr. Reiter has now confirmed that natural melatonin is perhaps the most potent and functionally diverse antioxidant yet known. Melatonin directly scavenges the highly toxic (·OH) hydroxyl radical, as well as others that are produced as a result of normal metabolic activities. In addition, it stimulates the production of superoxide dismutase.

When animals are treated with chemicals that cause cancer, such as safrole, DNA is damaged because of the generation of free radicals. In one study, it was shown that melatonin prevented more than 90% of the DNA damage which normally results from exposure to safrole. Another cause of cancer is ionizing radiation, as is seen in some patients with cancers thought to be due to excessive exposure to X-Rays. These damage DNA by generating excess intracellular free radicals. Here again, melatonin easily inhibits up to 70% of the DNA damage usually seen when cells are exposed to toxic levels of ionizing radiation.

These finding have important clinical implications. One immediate possibility might be to consider the administration of melatonin prior to exposure to significant doses of ionizing radiation, as in mammography and other lengthy radiographic procedures. However, it is likely that other applications of this mysterious and magical watchdog may provide even greater health benefits. Currently, increasing numbers of individuals are taking much

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larger than minimal daily requirements of Vitamins C, E, and beta carotene because of their antioxidant properties. Numerous research studies show that such supplementation can retard the development of atherosclerosis, cancer, graying of the hair, cataracts, wrinkled skin, and other macroscopic and microscopic stigmata of aging.

Melatonin is inexpensive and readily available in several forms in health food stores without a prescription. Although it appears to be quite safe, it is not currently approved or recommended for the treatment or prevention of any disorder, and should probably be taken only at night. Furthermore, it is not clear what the optimal dosage should be for any given individual, if there are any contraindications or cross reactions with other medications, and whether there might be adverse consequences from chronic and long term use. Extensive clinical trials now underway may answer many of these questions and satisfy such concerns.

Adapted from a presentation by Russel Reiter, Ph.D., D. Med., Seventh International Montreux Congress on Stress.

(The following is the first stanza of a ditty composed in honor of Dr. Reiter, to be sung to the tune of *Melancholy Baby*.)

"Come to me my melatonin baby,
Antioxidant that helps me sleep.
Anti-cancer, anti-aging maybe,
'You're the Greatest', and you're also cheap!"

SRRS, SRE, RLCQ? Updating The Holmes - Rahe Scale

Almost 30 years ago, Richard H. Rahe, a third year resident in psychiatry, and his professor, Thomas Holmes, conducted the first scaling experiment for a list of commonly experienced life-change events. They were familiar with a large body of literature and anecdotal reports confirming the relationship between social stress and the onset of various illness syndromes. However, it was difficult to examine or prove this scientifically because of the lack of any standardized criteria with respect to how life stresses were being measured. Because of the wide variability in quantification and rating, it was difficult to compare different reports and draw meaningful conclusions. In an attempt to address this deficiency, they devised a list of 43 life-change events that might serve as a foundation for a standardized measurement approach.

The original list was called the Social Readjustment Rating Scale, or SRRS. The instrument which collected a person's recent life changes was the Schedule of Recent Experience, or SRE. The SRRS and the SRE were often confused. After a decade of research with the SRE in the military, Rahe expanded the instrument to include 86 life-change events and called it the Recent Life Changes Questionnaire, or RLCQ. Along with others, he scaled the original and new instrument using a military population with obvious age and sex limitations. Now, fifteen years after this scaling, both instruments have again been re-scaled, using raters carefully selected to closely approximate the original Holmes and Rahe sample. In his presentation, Dr. Rahe reviewed how proportionate scaling can arrive at a social consensus. The original 43 life-change events values scaled in 1964 were compared to those obtained in 1978, as well as the latest 1994 version. The 1994 LCU values for the RLCQ's 86 events were reviewed and the significance of these differences were discussed.

It is apparent from this data that the psychosocial adjustment required to accommodate to the original list of life change events has increased in a steady and significant fashion, and at an approximate rate of 1.5% per year. The conclusion from this research, is that on the average, life is now 44% more difficult than in 1964. Most of us who are old enough, can readily confirm this.

Adapted from a presentation by Richard H. Rahe, M.D., Seventh International Montreux Congress on Stress.

Most of the change we think we see in life
Is due to truths being in and out of favor.

Robert Frost

The universe is change; our life is what our thoughts make it.

Marcus Aurelius Antoninus

The basic fact of today is the tremendous pace of change in human life.

Jawaharlal Nehru

Book Reviews • Meetings and Items of Interest

Book Review

***Addictive Behaviors in Women*, Ronald R. Watson ed., The Humana Press, Inc., 1994, Totowa, NJ, 526 pgs., $69.50**

Scientists have long suspected that men and women think and behave differently, and sophisticated imaging studies now confirm this. PET scans reveal that men have greater blood flow to the "temporal-limbic system" which is involved in primitive fighting responses, while women show higher activity in the "cingulate gyrus", a more highly developed region of the brain that modulates the expression and appreciation of emotion. While men have larger brains, women have more neurons, and more connections between the left and right hemispheres. A new type of MRI procedure demonstrates that when certain tasks are performed, males activate a 1/2" portion of tissue near the left temple, while in females, both sides of the brain register activity, again suggesting greater right and left brain communication capabilities. Women tend to have different obsessions and cravings. They covet chocolate, while men are more apt to long for meat and high fat, high protein foods. While there are certain neurotransmitter and hormonal influences that may be relevant, whether gender differences are due more to nature or nurture is not clear.

Type A behavior was originally described as an action-emotion complex that included aggressiveness, competitiveness, time urgency, and other traits that at the time, best came under the heading of "maleness". However, these characteristics are becoming increasingly common in females, especially those who must compete in a male dominated work force. Cigarette smoking was almost unheard of in women in the early part of this century and alcoholism was relatively uncommon. However, the incidence of these and other addictive disorders have steadily escalated, and alcoholism and substance abuse are now prevalent and pernicious problems.

This comprehensive volume addresses these and other relevant issues in 19 chapters featuring almost 50 authorities, the majority of whom are women. While the major focus is on alcoholism, much of this research is pertinent to other addictive disorders. Allied subjects such as "love addiction" and sexuality issues of chemically dependent women are also reviewed, with emphasis on their contribution to the growing incidence of AIDS. References are complete and current in this succinct and authoritative presentation. It should be particularly valuable for those interested in hormonal factors that may underlie gender differences, as well as addictive tendencies.

Meetings and Items of Interest

May 22-25 The First Annual International Congress on Alternative & Complementary Medicine, Hyatt Regency Crystal City, Arlington, VA, call (301) 652-3072

June 23-26 ISSSEEM Fifth Annual Conference, "Integrating the Science and Art of Energy Medicine, Boulder, CO, call (303) 278-2228

July 3-7 Sixteenth Cape Cod Institute, Behavioral Medicine Applications, Speakers: H. Benson, A. Domar and A. Webster, call Dr. Gilbert Levin for more info at (718) 430-2307

July 17-21 Sixteenth Cape Cod Institute, Psychotherapy and Spirituality 6, Speakers: Agosin Group, call Dr. Gilbert Levin for more info at (718) 430-2307

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