

Beware of Medical (and Scientific) Fads

by Daniel J. Schneck

Claudius Galenus of Pergamon (131–201 A.D.), a Greek physician to the Roman emperor Marcus Aurelius, developed his Ebb and Flow Theory of the human cardiovascular system around the middle of the second century. It took over 1500 years to discover that he was wrong! In 1913, riding the wave of Louis Pasteur's (1822–1895) Germ Theory of Disease, the Thompson-McFadden Commission of the United States Public Health Service issued a "definitive" report that came to the following unequivocal scientific conclusion: "Pellagra is in all probability a specific infectious disease communicable from person to person by means at present unknown." It only took about a decade for Joseph Goldberger (1874–1929) to show that, in fact, pellagra is not caused by an infection, but rather by a dietary deficiency of niacin (nicotinic acid), part of the vitamin B complex. It seems we are getting better... or are we?

One would think that the above two examples, and many others like them (e.g., the caloric and ether theories in physics), amply illustrate the dangers of group dynamics in forcing skeptics to conform to mostly speculative scientific fads. But, alas, this tends not to be the case, at least not when it comes to the current craze that thrives under the umbrella term "work-related musculoskeletal disorders (WMSDs)." The use of this moniker dates back to the work of Bernardino Ramazzini (1633–1714), who, in 1700, published his observations of the relationship of disease to employment activities in a book entitled *De Morbis Artificum Diatriba* [Diseases of Workers]. More than 300 years later—with but a mere smattering of hard scientific evidence to verify suggested cause/effect relationships, and being presumably smart enough to know better—we nevertheless still cling to Ramazzini's original assertion, i.e., that work-related ergonomic risk factors contribute in a first-order sense to compromising musculoskeletal health. This is yet another example of how we humans tend to be superficial in assessing any given situation (it takes on the order of just 7 seconds to form a first impression of somebody), opting instead to take the easy way out: jumping to conclusions based on unsubstantiated circumstantial evidence. Writers of detective novels make a great deal of money exploiting this affectation. Quite regrettably, even in real life, all too many innocent victims are falsely accused, sentenced to prison terms, even executed, based on scanty evidence that

is subsequently (too late, for some) found to be flawed.

According to Ramazzini (and a concept that is still in vogue today), exposure to certain work-related "risk factors" is qualitatively associated with (not rigorously, scientifically proven to be a cause of) musculoskeletal diseases. The major risk factors are 1) "excessive" force of exertion (biomechanical overload, especially in weight lifting), 2) repetition of movements, 3) "unnatural" or awkward body postures (especially working with the arms overhead, and kneeling), 4) duration of exposure to the suspected risk, 5) excessive vibration, 6) environmental extremes (such as working in "unusually" hot or cold conditions or being exposed to hygienic "dangers"), 7) working continuously, without taking adequate periodic breaks, and 8) being subjected to mechanical "stress concentrations" (disproportionately greater loading of one region of the musculoskeletal system relative to another).

The operative words above are "qualitative" and "associated."

issues of causation, provide little or nothing in the way of understanding. They are neither injury/disorder-specific enough, nor rigorously/precisely/operationally defined enough to provide any meaningful insight into cause/effect relationships. That is why the word "association" is often used, rather than "causation." Association may or may not have anything to do with causation.

Still, as we continue to cling tenaciously to the notion that there are these work-related risk factors, the literature on the subject is proliferating at an incredible rate, helped along by two significant and often-quoted government reports: the 1997 NIOSH Publication No. 97-141, "Musculoskeletal Disorders and Workplace Factors," and the 2001 NAS piece, "Musculoskeletal Disorders and the Workplace." Be that as it may, consider the following: The average day is 24 hours long, one-third of which we are (or should be) sleeping. That leaves 16 waking hours, half (or more) of which typical working adults spend on the job. Thus, since we are at

to be among the things one does anyway as a routine activity that is just a part of everyday living, like climbing up and down stairs, using one's hands, walking, or lifting things (including sometimes-heavy grandchildren!). Indeed, following a logic identical to that developed above, one can very easily show that there is a better than 50–50 chance that the affliction is not work-related but, rather, is correlated with the natural aging process, other typical activities of daily living, hereditary issues, and lifestyle (especially alcohol, drug, and tobacco abuse, and obesity). I call aging, smoking, and obesity a nonwork-related primary trifecta of musculoskeletal risk factors, inherent dangers that might even have been mitigated by work activities, rather than exacerbated by them—exactly the opposite of what ergonomists claim, which, in fact, is the very basis of such healthy interventions as exercise physiology and rehabilitation medicine! There is a very interesting one-to-one correspondence between what, on the one hand, ergonomists cite as a "work-related risk factor" and what, on the other hand, exercise physiologists claim is a "healthy use of the body." I tend to side with the latter.

Speaking of 50–50 chances and medical fads, I am reminded of an editorial that is germane to this very topic. It appeared in the March 16, 2003, edition of *The New York Times Magazine* Desk section. Written by Lisa Sanders, M.D., the editorial was entitled, "Medicine's Progress, One Setback at a Time." In it, Dr. Sanders recalls entering medical school some 10 years earlier, and hearing the Dean declare in an opening white-coat ceremony, "Half of what we teach you here is wrong—unfortunately, we don't know which half!" Based on my own experiences in this profession, I am inclined to think that the Dean may have been somewhat conservative in his estimate, and that the actual percentage is considerably higher! This point of view is reinforced by Drs. Mark Hyman and Mark Liponis in their book, *Ultra-Prevention* (New York: Scribner, 2003). In discussing "The Myths of Modern Medicine," they start right out with "Myth 1: Your Doctor Knows Best" and "Myth 2: If You Have a Diagnosis, You Know What's Wrong with You." Without coming right out and saying so, they imply, and I agree, that there is a huge gap between the concepts of "reasonable degree of medical certainty," which goes to the issue of diagnosis and treatment, and "rea-

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Indeed, to date, there are no strict, individual-specific, dose-response criteria that quantify what exactly constitutes, for that person, excessive, overload, repetitive, unnatural, awkward, long duration exposure, extreme, unusual, dangerous, or disproportionate, in a sense that threatens that individual's health and well being. The very few attempts to develop such criteria tend to be anecdotal, rather than based on rigorous, carefully controlled, randomized, double-blind investigations, or strict, statistically meaningful, unbiased, longitudinal (prospective) studies. Moreover, there are no universally accepted operational definitions for what, exactly, one means when one talks about repetitive strain injury, cumulative trauma disorders, wear-and-tear afflictions, overuse damage, or degenerative conditions. Indeed, these are not scientific terms, and when used in relation to

work for better than 50% of our adult waking hours, is there not, statistically speaking, a better than 50–50 chance that any type of affliction, be it musculoskeletal, cardiovascular, psychological, infectious, etc., can, by a straightforward analysis, be shown to be positively correlated (i.e., associated) with work activities? Why, then, are we not all suing our employers for "work-related risk factors" that are, indeed, responsible for anything and everything that is wrong with us? (The fact is, many are, and are reaping huge financial settlements.)

The answer, of course, is that just because a degenerative type of musculoskeletal affliction (like carpal tunnel syndrome, herniated spinal disks, osteoarthritis, etc.) occurs on the job does not necessarily make it work-related. This is especially true if the "risk factor" deemed to have caused the affliction happens, also,

sonable degree of *scientific* certainty," which gets to the heart of criteria that specifically define cause/effect relationships. Making a diagnosis and treating a patient, even if that treatment is effective, does not necessarily mean that one knows exactly what is wrong with a patient, much less what caused it. (I discuss this at some length in my books, *Engineering Principles of Physiologic Function*, New York: NYU Press, 1990, and *Biomedical Desk Reference* [with Dr. Alan Tempkin], New York: NYU Press, 1991.)

In and of itself, I am less concerned with the fact that 50% or more of what doctors learn in medical school is actually wrong than I am with the existence of an establishment that 1) believes otherwise, 2) refuses to recognize that uncertainty is the essence of the medical profession (as it is, to a great extent, the scientific profession as well), 3) declares its point of view to be unquestionable (especially in court!), 4) veils itself in a cloak of authenticity, and 5) quells (often violently) any attempt to challenge or refute its various positions (it was literally worth one's life to challenge Galen, and not much has changed since). Yet if scientific formulations are to withstand the test of time and prevail as viable theories, they, as the famed philosopher of science Sir Karl Popper (1904–1994) pointed out, must be expressed in a way that subjects them to the possibility of "falsification." They must be couched in a way that allows them to be chal-

lenged; indeed, such challenge should be encouraged! I might add to that, the theories must be quantified and terms rigorously defined. Especially in the case of WMSDs, it should be incumbent on the accuser to quantify his or her allegation that the "risk factors" to which he or she was exposed at work did, indeed, subject his or her musculoskeletal system to a biomechanical loading

this, therefore as a result of this"] philosophy, which is lame at best!

But alas, we humans are a fad-oriented society, and science and medicine are no exceptions. We latch on to something that sparks our interest—a fashion, diet, style of music, type of art, movie star, clinical procedure (like what used to be a routine removal of tonsils), the prevailing scientific the-

Thus, when the newly formulated germ theory of disease dominated the medical community (driven from around the middle of the 19th century through at least a quarter of the 20th century by the growing field of microbiology), any disease for which there was no known cause was automatically classified as "zymotic" (an early term for infectious disease, from the Greek word for the fermentation process believed to cause it). Today, we seem to be looking for a genetic basis for everything because the human genome project has established a new fad. So, too, any degenerative musculoskeletal disease whose etiology is not clearly defined, but that can, by whatever means, be shown to have some vague association with the labor force, is being automatically categorized as a work-related musculoskeletal disorder. And why not? After all, people do work. People spend half or more of their waking hours at work. We don't really know what causes these afflictions, and it's a very lucrative business. Is it for real? Perhaps, until the next fad comes along.

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that exceeded its ability to tolerate such loading without consequence. Merely having a treating physician say so hardly meets the civil case criterion of guilt by a preponderance of the evidence, especially when that "evidence" is gleaned mainly from the accuser's qualitative description of what happened, and the physician's opinion is based "to a reasonable degree of medical certainty" on the *post hoc, ergo propter hoc* ["after

ory of the day (like global warming and the "big bang"), a catchy phrase (like work-related musculoskeletal disorders)—and it becomes the craze until something else comes along to usurp it, or prove it to be wrong. Again, this capriciousness, by itself, would be quite tolerable were we not guilty of refusing to recognize (or to admit) that "half of what we teach you here is wrong." That denial of our authenticity could, and often does, lead to trouble.



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