

Contemporary Exercise Physiology: The Big Picture

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IT WOULD BE next to impossible to think that an academic exercise physiologist has not heard about the 1947 closing of the Harvard Fatigue Laboratory. How magnificent it was and all of its outstanding productivity [1-4] has been written about in many ways for a number of years. Charles M. Tipton is the author and expert on the life and influence of the Harvard Fatigue Laboratory [5]. His work is detailed and very interesting, especially in the manner in which he describes the history and influence of the "...Laboratory's impact on the origin, emergence, and establishment of the discipline of exercise physiology in the United States..." [5].

Did the Harvard Fatigue Laboratory define exercise physiology? To some degree that appears to be the case, at least from Tipton's point of view [5]. He concluded that the Laboratory resulted in the "emergence of exercise physiology as an academic discipline." Note Tipton's use of the word *discipline*, which isn't surprising. It is consistent with the traditional definition of exercise physiology. In fact, during the two decades of exercise physiology related research published by outstanding individuals from the Harvard Fatigue Laboratory and the six decades since its closure, it is clear that academic exercise physiologists still believe exercise physiology is a discipline of researchers.

It is strange but true that it is difficult for exercise physiologists to break free of their traditional thinking. That is why Tipton [6] concludes the following: "...an exercise physiologist is an individual academically prepared to be a physiologist, by

medical, physiological, or biological science departments, who specializes in the discipline of exercise physiology as demonstrated by his/her research, teaching, service, or clinical activities.” The definition is problematic for many reasons. First, it excludes individuals who may think of themselves as exercise physiologists but do not have the doctorate degree. Ask any doctorate-prepared exercise physiologist and you will find out very quickly that under no circumstances is it appropriate for a college graduate with an undergraduate degree in exercise physiology to refer to himself as an exercise physiologist. Of course the traditional way of thinking is entirely wrong! It grew out of an identity crisis, so its scope is limited.

Second, it is inappropriate to promote the idea that an exercise physiologist is academically prepared to be a physiologist. Imagine what that actually means to the person with a PhD in physiology. It is as senseless as an exercise physiologist who can read a 12-lead ECG referring to himself as medical doctor. This failure to think straight is an established dogma in exercise physiology, as is the case when a physiologist or a medical doctor is referred as an exercise physiologist if he or she publishes an exercise physiology-oriented paper. As an obvious example, it would be hard to find an academic exercise physiologist who hasn't heard the expression: “A. V. Hill is a pioneer in exercise physiology.” The take away message is that he must have been an exercise physiologist, but truth is that he was a physiologist.

The point is that if a chemist publishes a paper on the measurement of VO_2 max, even if it legitimizes exercise physiology, it does not make the author a physiologist or a medical doctor or an exercise physiologist. If it sounds too hard to believe, then, read what Rob Nix [7] published in 2009: “From 1900-1920, A.V. Hill, an English physiologist, won the Noble Prize for work in muscle physiology. He is considered to be the "First Exercise Physiologist." Two pioneer men studied under Hill. These two men established the Harvard Fatigue Lab. This is where it all started to boom. This is the very first exercise physiology lab in the U.S. and it was literally in the basement of the Harvard Business School. Bruce Dill was one of the two founders and acclaimed as the first American Exercise Physiologist.” Just for the record,

Bruce Dill returned to Stanford in 1923 as a fellow in chemistry and received the PhD degree in 1925.

Third, there are very few academic opportunities whereby exercise physiologists are academically prepared as students in "...medical, physiological, or biological science departments, who specialize in the discipline of exercise physiology." The hundreds of doctorate exercise physiology programs in academic institutions throughout the U.S. and/or at least academic programs in kinesiology or something similar (e.g., exercise science) with a concentration in exercise physiology represent the method by which students earn the degree and the title. Clearly, it is incorrect to continue thinking about exercise physiology from a 20th century perspective. Why, because it is simply too unsettling to many non-traditional thinkers.

Fourth, note what is implied in the following statement that is self-evident of 20th century thinking, "Exercise physiology is a subdiscipline of physiology that examines how the body responds and adapts to muscular activity. Exercise physiologists specialize in research, teaching, service, or clinical activities." In other words, a subdiscipline is not a profession or even a semi-profession. One could argue that the statement supports the notion that the purpose of the degree is to work in academia as a research discipline, not as a health care professional. Therefore, there can't be the expectation of non-doctorate exercise physiologists calling themselves exercise physiologists if the prerequisite for academic employment is the doctorate degree. This means that the undergraduate and master-prepared exercise physiologists must call themselves by a different name, perhaps, such as clinical exercise physiologist.

One of many problems that result from faulty thinking is the lack of a proper definition of something. This failure to see the Big Picture during the 1950s and 60s, while physical therapists and athletic trainers were well on their way to establishing themselves as health care professionals, has resulted in 40 or more undergraduate and graduate academic degrees that share a similar name [8-11] explains why students are confused and unhappy. As such, in order to tackle this problem, it is important to think about exercise physiology from the ASEP 21st century

perspective [12]. This is the challenge for academic exercise physiologists. They need to modify their original thinking about exercise physiology as a discipline and start thinking of it as health care profession. Obviously the conducting of exercise physiology research is an essential component of exercise physiology. Refining, testing, and creating knowledge while also using information generated in other fields represents the amalgamation that provides the content for the practice of exercise physiology.

However, the failure to see the Big Picture of who is an exercise physiologist continues today with all kinds of obvious indicators of a failed rhetoric. For example, it was not until 1996 that ACSM approved a specific designation for clinical exercise physiologists. The history of the designation and strife is well-known. Yet, it is hard to understand the selfish needs of the PhD exercise physiologists who believed that the CEP certification and membership would diminish their definition of themselves as physiologist! It is almost unbelievable that the PhD exercise physiologists are so fundamentally wrong about their identity. The end result of the failure to look beyond themselves resulted in the formation and ultimate failure of the AACVPR organization. Furthermore, that failure is the reason for the new CEPA organization. Regardless of one's personal beliefs, exercise physiologists should appreciate that something is wrong.

The trouble with academic exercise physiologists trying to get the outcome they want without understanding the professionalization process is that they end up instead getting the outcome of confusion and neglect of their students. Students are asking, "Who am I" "Am I an instructor or a professional?" "What is my place in healthcare?" "How will I financially make it?" These are all questions that focus on one's identity, either personal or collective/social. The academic environment in which the students learn about exercise physiology is important. The students' education about the practice of exercise physiology is a profoundly important thread in the fabric of life in the health care professions. Cultivating the practice begins with department administrators and faculty thinking right, however difficult it is to do (given the consequences of technician level thinking). This means spending

hours if not days studying the “helping” professions and what they have done and are still doing by way of professionalism and professional development. This is especially important when it comes to recognizing the value of a college degree and finding a credible job in healthcare.

Exercise physiologists aren't just doctorate prepared academic researchers. They are also college graduates with an undergraduate degree. They may or may not be ASEP board certified, and they are probably just learning about the importance of starting their own healthcare practice. One of many problems is that their professors have not taught them even the basics of business thinking. If values reflect a person's beliefs about what should be taught, it is clear that the business of exercise physiology is not valued. And yet, students need instruction in how to hire, fire, and manage their staff along with getting loans and dealing with accountants. They need information about regulatory issues that deal with insurance and licensing renewals in addition to the study of muscles and the physiology of metabolism and sports training. Without having information about leasing, equipment purchase, and how to market the business, college graduates aren't likely to be successful. After all, exercise physiology is a health care business just as medicine, law, and physical therapy. Professors from these academic areas do not undermine the students' credibility by not dealing with the conflict between what was, what is, and what is evolving. They understand that the view of the world is complex, unpredictable, and constantly changing.

Most people understand that it is important that exercise physiologists are good at doing research. After all, exercise physiology knowledge is based on scientific inquiry. The skillful exercise physiologist, as a health care practitioner, understands this point as well as being able to blend scientific inquiry, knowledge of the client's situation, and hands-on laboratory skills to care for the client. In addition, the health care professional must be a competent practitioner in addressing exercise as medicine. If the exercise physiologist is incapable of operating a business, then his/her chances of making it financially aren't good. The message to be garnered from this brief review of the Big Picture is that the academic exercise physiologists

must step back from the trees to see the forest. This is what the ASEP leaders have done. They created the first-ever professional standards for exercise physiologists [13], code of ethics and professional development [14], including academic accreditation of exercise physiology programs [15]. It hasn't been easy. It is hard work, but it is not enough. As one college professor said "For every step ASEP takes to rectify the failed rhetoric, opposing colleagues take two of the same to keep maintain influence."

The ASEP goal is to convey to all academic exercise physiologists that the ASEP standards of practice are authoritative statements by which the exercise physiology profession defines the responsibilities for which its board certified exercise physiologists are accountable. The exercise physiology practice reflects the values and priorities of the profession and provides direction for future growth and new opportunities for exercise physiologists to practice. The ASEP standards also define the exercise physiologist's accountability to the public and the outcomes for which board certified exercise physiologists are responsible. Many different settings for greater work and practice opportunities continue to evolve, including long-term care facilities, home care programs, and as exercise physiology entrepreneurs who have developed their own health care businesses. With the understanding that exercise is medicine, more exercise physiologists are practicing in settings such as schools, industries, privately owned fitness centers and clinics and, not too distant in the future, physician's offices.

As a profession, exercise physiologists are professionals with philosophical beliefs about health and sports training who perform their work in an ethical manner. The fact that exercise physiology qualifies as a profession is based on their work defined by a systematic body of teachable and applied knowledge that exercise is medicine. Exercise physiologists require a specialized college education in scientific thinking and research application that provides a practical service to the public. Through ASEP, exercise physiologists have the freedom to regulate and control their work behavior (autonomy), and they have their own code of ethics that is consistent with their desire to help others (altruism). While some critics believe that exercise

physiology falls short of meeting these criteria, the ASEP leadership is working to advance the standing of exercise physiology through the amalgamation, synthesis, and application of its specialized knowledge developed from carefully upholding the scientific method. They are confident that the ASEP professional infrastructure emphasizes the commitment and beliefs necessary to guide board certified exercise physiologists to function autonomously.

Thus, it is important to keep in mind this point: It is time to start thinking about exercise physiology as a profession; one that is built on a professional foundation and practice with its own professional organization. This take home message isn't complex. When Americans are troubled about the rising costs of college tuition, academic exercise physiologists appear to be more concerned about their personal priorities. Unfortunately, with their focus on the all-too-familiar research paper, they fail to realize that they aren't living up to their responsibility to the students. This is at the core of American higher education's failure to serve the larger public good. Thus, they either dismiss or turn a blind eye to the practice of exercise physiology, which involves: (a) giving professional advice to clients and patients; (b) developing individualized exercise prescriptions; (c) using exercise as medicine to improve and/or rehabilitate the diseases and/or disabilities; and (d) recording outcomes in a standardized and confidential manner. Taken one step further, board certified exercise physiologists must do all they can to keep themselves aware and informed about the scientific facts and whether they are valid and relevant resources from which to prescribe exercise as medicine.

When you think about it, it comes down to the simple understanding that a scope of practice is defined by the range of health care activities and services that the board certified exercise physiologist, as a health care professional, is educated and certified to provide. The key issue is who can do what to whom, under what conditions, and in what settings. Why the pioneers in exercise physiology failed to see exercise as medicine is hard to understand. Clearly, they were concerned with finding answers through research and sports physiology papers of which both are important. Now it is time to apply the power of the prescriptive use of exercise as a great equalizer for

social and health mobility in the United States. Instead of concentrating on what colleges and universities actually do for students, in terms of a credible career, once they graduate, the current research paradigm says that the institution is good for the faculty. Colleges and universities want such faculty because the researchers and their published papers add prestige to the institution.

This state of affairs is both good and problematic. It is also highly resistant to change. However, in order for the students to benefit from their tuition dollars, exercise physiology faculty members must take more ownership of the curriculum and become more intimately involved in helping their students achieve success through financial prosperity. Working for \$12 an hour in Bob's Gym is a high school job. Having to apply for graduate school and spending thousands of dollars on another degree is a failure in the educational system. That is why the faculty members are responsible for teaching their students how to be entrepreneurs. Then, downstream, this thinking is naturally linked with ideas of helping clients who are limited by physical inactivity, either by lifestyle choice, injury or illness. To maximize the client's mind and body health, to prevent or improve upon muscular and/or physiological disability, to maintain wellness, regardless of talent, genetics, and/or ability, and to learn from experiences, failures, and triumphs through a personalized healthcare evaluation, treatment plan, and consultation represent outward and visible signs of a compassionate health care professional.

When you hear people say: "If only we had known then what we know now," remember, some did know of the importance of exercise as medicine. Now, since more know that exercise physiologists should not have emphasized just research and publishing for 60 plus years at the expense of failing to develop the profession of exercise physiology, why are the academic exercise physiologists still thinking of exercise physiology a discipline? Why can't they see the Big Picture? Why can't the academic exercise physiologist stop going to conferences to look at the sum total of all the pieces of the academic puzzle relevant to the success of their students and exercise physiology? To continue failing in this regards is disappointing. In the simplest of terms, the Big Picture of a college education is not to have to apply for

graduate school. That isn't what is meant by persistence. It is not about making mistakes and failing to correct them. It is not about more research and another trip to a regional meeting. The goal of a contemporary college education for exercise physiologists, that is, the Big Picture of exercise physiology is to graduate young men and women as health care professionals who can locate a credible job and service the public's concerns.

Seeing the Big Picture is all about having an open-mind about what is exercise physiology and who is an exercise physiologist, which allows a person to consider possibilities. While many academic exercise physiologists think they have an open-mind, their behavior communicates a narrow vision of exercise physiology. This is especially the case when they use words such as "no" or "that isn't the right way." The overall effect is a crisis of identity that is particularly evident at the doctorate level. Just to push the point to another level, note the specific wording of Russell Pate and Larry Durstine [16], "The discipline of exercise physiology dates back to the early 20th century....Alumni of the Harvard Fatigue Laboratory were subsequently responsible for developing exercise physiology research laboratories." While the Harvard connection can't be overlooked, is it actually the reason for the development of exercise physiology research laboratories? No. The majority of the exercise physiology laboratories (although most are referred to by a dozen different names) were started by faculty within the health and physical education departments throughout the U.S. But, to press the point, they are also so bold as to say, "The American College of Sports Medicine (ACSM)...is an important scientific society for exercise physiologists...." It isn't difficult to understand why the authors used the word, "Society." And yet, they concluded with this [16]: "Exercise physiology plays an important role in the practice of clinical sports medicine." It is unbelievable that they are still promoting sports medicine and not the profession and practice of exercise physiology!

When was it acknowledged or perhaps, more importantly, why are sports medicine personalities allowed to continue to promote the notion that the students of exercise physiology are not worthy of "...these truths to be self-evident, that all men

are created equal, that they are endowed by their Creator with certain inalienable rights....” Surely, the students of exercise physiology have the right to their own “practice of exercise physiology.” The idea of natural rights dates back to ancient Greece [17]. This point can and should be discussed, regardless of the very small possibility of offending someone.

Make no mistake about it those who oversee ACSM are not interested in the deeply held beliefs of the ASEP leadership. Closed-minded people shape beliefs and attitudes just as open-minded people do, and often they have little backbone for the new and untried. Just imagine the health care possibilities for exercise physiologists when they realize that there are approximately 76 million people born in the United States between 1946 and 1964 [18]. Each day, beginning in 2006, 8,000 baby boomers turn 60 or 330 boomers each hour. Between 2008 and 2020 tens of millions of people will turn 60 years of age and begin to leave the workforce [19]. The aging boomers will need credible health care professionals to work with them. Exercise as therapeutic prescriptions cannot be the work of trainers or instructors no more so than society should allow non-medical person to prescribe drugs or even a physician assistants to assume the full medical responsibilities of the physician.

Pennington [20] said, “Led by baby boomers...sports injuries have become the No. 2 reason for visits to a doctor's office nationwide....” In other words, as the aging boomers realize the importance of exercise, they go to gyms and similar places to exercise and to, hopefully, benefit from the physical activity. The problem is multifaceted, but without question the aging boomers are not receiving the right instructions regarding exercise and so they end up hurt. Society cannot simply send this problem to the primary care physicians either. Moreover, according to the AMA’s Physician Characteristics and Distribution in the United States, 35% of physicians nationwide are over the age of 55. Most will likely retire within the next 5 to 10 years. Unless steps are taken now, there will not be enough primary care physicians to take care of an aging population with growing incidences of chronic diseases [21]. Exercise is very much like primary care. Both are vital parts of client or patient care. Access to proper exercise, care, and services by a credible exercise

physiologist provides higher quality care than when provided by a trainer or an instructor.

It is becoming urgent that society reflects on safer ways of preventing the boomers from physically and mentally degenerating into increased disease states. Exercise physiologists are at the forefront of using regular exercise to manage chronic diseases. This is good because 45% of the US. population has a chronic medical condition and about half of these, 60 million people, have multiple chronic conditions [22]. For the Medicare program, 83% of the beneficiaries have one or more chronic conditions and 23% have five or more chronic conditions or co-morbidities such as hypertension, heart disease, arthritis, and diabetes. By 2015, an estimated 150 million Americans will have at least one chronic condition. By 2020, 164 million people or almost 50% of the population will have a chronic condition, 81 million (24%) will have two or more conditions.

The services of an exercise physiologist will be in great demand since the potential for regular exercise to reduce medical costs while still maintaining a quality of care that is vital in the health and well-being of clients and patients. How is this possible? Anderson and Horvath [23] indicate that spending on behalf of people with multiple chronic conditions increases with the addition of each condition. Equally important, they concluded that the “Average per capita spending for a person with one condition is \$1,900, almost tripling to \$5,600 for a person with three conditions and then doubling again for the person with five or more conditions.” One of the many problems inherent in growing older is the inactivity and the lack of regular exercise. There isn’t any question that society needs to improve health care to provide more support for ongoing care of chronic conditions, including when people do have access to covered benefits. The system has to be transformed. This is the challenge of the 21st century board certified exercise physiologists. Today, they are witnessing an unprecedented opportunity in which the world of disease and disability is entering a systematic crisis, both financially and otherwise. There is the very real possibility of effective prevention and treatment of chronic conditions by exercise physiologists.

Rest assured that exercise can be abused just as any prescription. However, it is recognized that board certified exercise physiologists know how to safely prescribe exercise. It isn't simply a matter of getting a personal trainer to scream and yell at a client while exercising beyond one's capacity at a point in time. Being overweight and exercising improperly can result in damage to the knees and ankles. Worse yet, improperly prescribed exercise or a marathon mentality can kill people at a relatively young age. Although seldom talked about in exercise physiology, the marathon runner James F. Fixx [24], author of the 1977 best-selling book, *The Complete Book of Running*, died in 1984 from a myocardial infarction at the age of 52. And yet, what most people do not know is that Fixx started running in 1967 at the age of 35. He weighed 240 pounds and smoked two packs of cigarettes per day. Ten years later, when his book was published, he was 60 pounds lighter and smoke-free. But, autopsy revealed that atherosclerosis had blocked one coronary artery 95%, a second 85%, and a third 70%. Running can be dangerous when taken to the extreme. That is why it is important to have a qualified exercise physiologist responsible for the exercise prescription.

Honestly, it is ridiculous to believe that exercise, even properly prescribed, confers immunity to anything, especially sudden death from heart disease [25]. For example, Edmund Burke, Ph.D., who was a serious endurance cycling competitor died on a training ride at the age of 53. Similarly, Brian Maxwell, a former world-class marathon runner and the founder of the multimillion-dollar PowerBar empire, died from a heart attack at the age of 51. Maxwell invented the PowerBar after he was forced to drop out of a marathon race at the 21-mile mark. Alberto Salazar, one of the greatest American distance runners had a heart attack at age 48. Greg Welch, one of the most versatile all-around triathletes, was forced to retire at age 37 due to severe heart problems [26]. There are dozens of examples where excellent athletes end up exhausted, injured, or dead. Isn't it time to reflect on how the power and benefit of a safely prescribed exercise program will not be lost to the superficial and futile forms of extreme if not narcissistic activities?

Often times, people fail to understand that there is a difference between being healthy and being physically fit to exercise at a high intensity for a prolonged period of time. Is it not dangerously naïve to expect improperly prescribed exercise to help prevent certain chronic conditions? Is it not improper to think that just anyone with a weekend warrior certification or a college degree for that matter understands the scientific foundation of a safe and proper exercise prescription? Or, because exercise is assumed to be so simple on one hand while capturing the spirit of being fun and/or recreational on the other that exercise physiology is little more than leading an exercise session. Surely, insofar as the academic exercise physiologists are devoted to the discovery of truth, their ultimate reality and scholarship are limited by the restrictions of tradition and their own limitations. The right of college teachers to think as they please should not be confined by political bias, but it is. More than one ASEP member has had to reconcile with the reigning orthodoxy and political agenda to get tenure.

Having said this, it is nonetheless critical that the exercise physiology profession voices the urgent concern that improving the freedom of others to live a healthier life is consistent with its efforts to develop professionalism in exercise physiology. It has nothing to do with preening and posturing. Put otherwise, exercise as medicine requires the right prescription for each person. Exercise physiologists must therefore help their clients live in a world of common sense and balance. But appreciate that although this is a reasonable statement, it also challenges the current views of fitness, athletics, and training. How this thinking may be interpreted as doing evil (given that it goes against traditional thinking that more is better and winning-at-all-cost is okay) and not the freedom to speak openly to do good needs clarification for all academics. It is obvious that people can live to win-at-all-cost, while marginalizing those who do not, is evident in the common purpose of extreme sports. If one bears in mind the enormous benefit of a safe and progressive exercise program, then, is there not a risk to life that is inappropriate and unethical when exercise is improperly prescribed?

For additional reading on seeing the Big Picture, the February 2011 article in PEPonline, *The Exercise Physiologist's Professional Practice* [27], and the February 2011 article [28] in JPEP (*What Do "We" Need to Know About Professionalism?*) should prove helpful. In general, the Big Picture is this: Exercise physiology is a health care profession founded on a specialized body of scientific knowledge. The application of the core concepts, ideas, and services provided to society are delivered in a variety of formats and indeed the delivery is systematic, including assessment and implementation. Board certified exercise physiologists are morally and legally responsible for a safe and effective exercise prescription and, thus the delivery of health care services to society, including spiritual leadership [29]. They understand that improving a client's health is linked to the exercise physiology scientific body of knowledge.

It is a matter of time that exercise physiologists will be recognized as ASEP board certified college graduates who have earned the professional title – Exercise Physiologist. This should not be overlooked. It represents real change, and a new way to survive the enormous pressure and challenge of entering the public sector. In all likelihood these exercise physiologists will not have a doctorate degree. Based on today's thinking, this view is one of seeing the future before it comes into being. It is as Myles Munroe [30] said, "It is a mental picture of your destiny." But, there is a price. Academic exercise physiologists have to pay it by being willing to engage the ASEP change process. It will give them a reason to value their students, "...to see with their eyes, and to feel with their hearts..." [31], as an antidote to the traditional views and patterns of exercise physiology brought forth and sustained by the needs of sports medicine.

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