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Board Certified Exercise Physiologists and Exercise Medicine: A 2016 Perspective

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ABSTRACT

Boone T. Board Certified Exercise Physiologists and Exercise Medicine: A 2016 Perspective. **JEMonline** 2016;1(2):1-25. Chronic diseases (also known as non-communicable diseases) result from lifestyle choices. Between 2010 and 2030, the direct and indirect costs of chronic diseases are expected to exceed $30 trillion. Exercise medicine in the form of regular exercise (e.g., 30 min of physical activity 5 $d \cdot wk^{-1}$) is integral to the prevention and treatment of many chronic diseases, including heart disease, hypertension, obesity, diabetes, cancer, depression, arthritis, and osteoporosis that result from physical inactivity. Following the founding of the American Society of Exercise Physiologists (ASEP) in 1997, work began regarding the first-ever certification in the U.S. for an exercise physiologists. By 2000, the first “Exercise Physiologist Certified” exam took place at the University of New Mexico, Albuquerque, NM. The “Exercise Medicine Clinic” is founded on the understanding that exercise is often as effective as the common prescription of drugs when it comes to preventing chronic diseases. Not only is the CPX an excellent beginning point in the development of a client’s exercise prescription, it allows for a solid assessment of physiological function on cardiovascular morbidity and mortality rates. Given the limitations of the exercise pill, are people setting themselves up to fail? Now that we know that regular exercise is the equivalent of medicine, why shouldn't society simply embrace exercise medicine? The short answer is that many people are not interested in the work required to stay with a regular exercise program. Society is interested in a quick fix for its problems. Regardless of age and sex, the majority of Americans and people worldwide are not interested in exercise medicine, although obviously they should be to realize the mind and body health benefits. The idea of waiting for an exercise pill to solve society's health problems is not the right answer to acknowledging that we, the people, must do our part. In just the past 13 yrs, the exercise component of exercise physiology is now recognized as exercise medicine. Clearly, exercise physiology is a healthcare profession and not simply a research discipline. The absence of bold and authentic leadership in exercise physiology is a problem. Exercise physiologists have much to offer to society in the name of exercise medicine. Where to from here begins with a vision. Why not take a look at the ASEP vision for exercise physiology, especially students who want to be an exercise physiologist first and a healthcare professional second?

Key Words: ASEP Vision, Exercise Medicine, Board Certified Exercise Physiologists, Academic Degree

INTRODUCTION

Chronic diseases (also known as non-communicable diseases) result from lifestyle choices such as sitting too much and avoiding physical activity. These are unhealthy behaviors that can be changed. Seven of the top 10 causes of death in 2010 were chronic diseases, killing more than 1.7 million Americans every year (20). Two of these chronic diseases (heart disease and cancer) accounted for nearly 48% of all deaths (21). The total costs of heart disease and stroke in 2010 were estimated to be $315.4 billion. Of this amount, $193.4 billion was for direct medical costs, not including the costs of nursing home care.

Obesity is a serious ongoing health concern. During 2009–2010, more than one-third of adults, or about 78 million people were obese (defined as body mass index [BMI] ≥30 $kg \cdot m^{-2}$). Nearly one of five youths aged 2 to 19 yrs was obese (BMI ≥95th percentile) (22). The total cost of obesity to U.S. companies is estimated at $13 billion annually. This includes the "extra" cost of health insurance ($8 billion), sick leave ($2.4 billion), life insurance ($1.8 billion), and disability insurance ($1 billion) associated with obesity (60).

Arthritis is the most common cause of disability (37). Of the 53 million adults with a doctor diagnosis of arthritis, more than 22 million say they have trouble with their usual activities because of their disability (7). Diabetes is the leading cause of kidney failure, lower-limb amputations other than those caused by injury, and new cases of blindness among adults (23). Seven of 10 deaths each year is linked to chronic diseases. The economic impact is $2 trillion or 84% of healthcare spending.

In 2011, 52% of adults aged 18 yrs or older did not meet recommendations for aerobic exercise or physical activity. In addition, 76% did not meet recommendations for muscle-strengthening physical activity (24). About half of U.S. adults (e.g., 47%) have at least one of the following major risk factors for heart disease or stroke: uncontrolled high blood pressure, uncontrolled high LDL cholesterol, or are current smokers (34). Ninety percent of Americans consume too much sodium, increasing their risk of high blood pressure (26).

More than 42 million adults (close to 1 of every 5) said they currently smoked cigarettes in 2012. Cigarette smoking accounts for more than 480,000 deaths each year. Each day, more than 3,200 youth younger than 18 yrs smoke their first cigarette, and another 2,100 youth and young adults who smoke every now and then become daily smokers (62).

People with chronic conditions are the most frequent users of healthcare in the U.S. They account for 81% of hospital admissions, 91% of all prescriptions filled, and 76% of all physician visits (49). As of 2012, about half of all adults (117 million people) had one or more chronic health conditions. One of four adults had two or more chronic health conditions (25). By 2025, chronic diseases will affect an estimated 164 million Americans, which is nearly half (49%) of the population (48).

Between 2010 and 2030, the direct and indirect costs of chronic diseases are expected to exceed $30 trillion. This will place unprecedented strain on the U.S. healthcare system and national economies (8) and yet, the majority of premature deaths, illnesses, and healthcare costs is preventable (42). That's right, preventable, that is if the medical doctors would

prescribe exercise medicine to treat the suffering caused by lifestyle choices. Regular exercise is a powerful medicine that deters illness and protects life.

REGULAR EXERCISE = EXERCISE MEDICINE

Exercise is defined as physical activity that is planned, structured, repetitive, and undertaken to improve or maintain aspects of physical fitness (19). The health-related components of physical fitness are: (a) cardiorespiratory endurance (the ability of the heart and lungs to take in and deliver oxygen to the tissues and remove carbon dioxide); (b) muscular endurance (the ability to perform repeated repetitions of a strength exercise); (c) muscular strength (the capability of the muscles to lift weight); (d) body composition (the ratio of fat to muscle); and (e) flexibility (the ability of the joints to move through their full range of motion).

Exercise medicine in the form of regular exercise (e.g., 30 min of physical activity 5 $d \cdot wk^{-1}$) is integral to the prevention and treatment of many chronic diseases, including heart disease, hypertension, obesity, diabetes, cancer, depression, arthritis, and osteoporosis that result from physical inactivity. Yes, regular exercise is exercise medicine (or exercise therapy); it confers actual health benefits while more often than not many of the pharmaceutical solutions result in serious side effects and complications. In fact, convinced of the positive effects of exercise medicine, Mark Sisson (54) identifies the side effects of several types of drugs.

- ***Statins:*** memory loss, forgetfulness, confusion, muscle damage, increased risk of diabetes, liver injury
- ***Anti-coagulants:*** excessive bleeding, severe bruising, bloody urine or stool, headache, back pain, chest pain, difficulty breathing
- ***ACE-inhibitors:*** dizziness, headache, fatigue, loss of appetite, gastrointestinal problems, diarrhea, numbness, fever, joint pain
- ***Beta-blockers:*** diarrhea, stomach cramps, nausea, vomiting, rash, blurred vision, muscle cramps, fatigue, headache, depression, confusion, sexual dysfunction, low or high blood glucose

While exercise medicine is not the answer to every health problem, it can prevent and reverse overweight-obesity (52), cardiovascular diseases (58), type 2 diabetes mellitus (38), and the risk factors that contribute to hypertension (27), dyslipidemia (32), insulin resistance (36), systemic inflammation, and endothelial dysfunction (35). That said, there is irrefutable evidence that exercise medicine improves immune system function (33) and decreases the risk of many cancers (59).

So, why aren't doctors talking about exercise medicine in their treatment plans? Part of the reason is that the doctors are not educated to the power of exercise medicine as a prescription to prevent and treat chronic diseases. As well, they are not interested in sending their patients to exercise physiologist to guide their exercise medicine sessions. The second problem is too many patients are willing to stand in line at the pharmacy at CVS or elsewhere to get a prescription to avoid exercising. Taking a pill is often believed to be the easier way of normalizing blood glucose, insulin, or leptin levels. The fact is it simply is easier to prescribe a pill or surgery. This is true even though instinctively patients may understand that regular exercise is recognized as powerful preventive medicine. Just 20 minutes from start to finish,

twice-weekly lowers body fat, boosts energy and libido, improves muscle size and strength, and increases the production of human growth hormone (41).

It is time that healthcare providers prescribe exercise as medicine, but will they? Regardless of the fact that exercise medicine improves the function of the heart and lungs, creates new red blood cells, promotes the growth of muscle tissue and strengthens the skeletal system, and increases the number and quality of the mitochondria that results in more energy, the majority of the medical doctors are still not interested in talking about the benefits of regular exercise (15). Also, aside from the difficulty in finding time to talk with patients, the lack of motivation versus the incentives for staying the course with pharmaceutical therapy means exercise medicine will not be a primary discussion between the patient and his/her physician for some decades to come.

Bridging the gap between physicians and the Board Certified Exercise Physiologist (BCEP) isn't going to be easy. But, in time, it should happen because the BCEP has the academic training and laboratory expertise in frequency, intensity, duration, specificity, and other training variables involved in optimizing the client's physical and mental status with a safe exercise prescription.

BOARD CERTIFIED EXERCISE PHYSIOLOGISTS

Following the founding of the American Society of Exercise Physiologists (ASEP) in 1997, work began regarding the first-ever certification in the U.S. for an exercise physiologists. By 2000, the first "Exercise Physiologist Certified" exam took place at the University of New Mexico, Albuquerque, NM. Over the next several years, the EPC credential was also known as the ASEP "Board Certification" credential or the Board Certified Exercise Physiologist. The organization leaders state that an "exercise physiologist" is a healthcare professional who either has an academic degree in exercise physiology or who is certified by ASEP to practice exercise physiology [via the Exercise Physiologist Certified exam (EPC)] and, therefore, is recognized as an ASEP Board Certified Exercise Physiologist, or who has a doctorate degree in exercise physiology from an accredited college or university (2).

The leadership also defined "exercise physiology" as the comprehensive delivery of treatment services concerned with the analysis, improvement, and maintenance of the physiological mechanisms underlying physical and mental health and fitness through regular exercise, the rehabilitation of heart disease and other chronic diseases and/or disabilities with exercise medicine, and the professional guidance of athletes and others interested in athletics and sports training (3). The ASEP exercise physiologist's practice describes the responsibilities for which exercise physiologists are held accountable: (a) promoting health and wellness; (b) preventing illness and disability; (c) restoring health; and (d) helping athletes reach their potential in sports training and performance (4).

Currently, the BCEP does not work alongside in collaboration with medical doctors. For obvious reasons, much change is required within medicine itself to embrace the new paradigm of exercise medicine and exercise physiology. It is conceivable that the two will come together in the foreseeable future (that may be 10 to 20 yrs in the future). But, for now, it is important that the BCEP understands it is important to take some courses in business and entrepreneurship to facilitate the starting of his or her own Exercise Medicine Clinic. The

idea itself is explained in detail in ***The Business of Exercise Physiology: Thinking Like an Entrepreneur*** (12).

The “Exercise Medicine Clinic” is founded on the understanding that exercise is often as effective as the common prescription of drugs when it comes to preventing chronic diseases such as heart disease, stroke, and diabetes. Aside from helping to manage weight and improve muscle and bone strength, regular exercise helps to delay cognitive impairment. It is never too late walk 30 $min \cdot d^{-1}$, 5 $d \cdot wk^{-1}$ to improve blood flow and prevent muscles from getting to rigid.

Understandably, Board Certified Exercise Physiologists determine the intensity, frequency, and duration appropriate for individual clients. Among other considerations, their analysis will take into consideration the client's readiness to start and continue an exercise program. By supervising the client's workout sessions in the Exercise Medicine Clinic, the BCEP can help encourage appropriate physical activity on a regular basis.

Please appreciate that the BCEP is a credible healthcare professional. Board Certified Exercise Physiologists are trained during weekend training sessions to assess and counsel clients. They are not fitness trainers or exercise instructors. They are academically prepared healthcare providers. They understand the scientific evidence that exercise medicine contributes to primary and secondary prevention of chronic diseases in people of all ages. In the other words, BCEPs can help clients and patients reduce their risk of premature death.

PHYSIOLOGY OF EXERCISE MEDICINE

For many years, exercise physiologists have been aware that regular exercise helps people feel better and live longer. They understood early on that physical inactivity and prolonged rest resulted in changes in the body and mind that are unhealthy while the medical profession often turned a blind eye to both the research and the obvious connection between the two. Naturally, the lack of medical support has not helped over the decades of society’s physical inactivity. Fortunately, while a small part of the medical profession appears to have gotten the message, talking about and prescribing exercise medicine will eventually become the thing to do. Society is gradually coming to the idea that regular exercise helps to keep the mind and body healthy and strong. Of interest is the anticipated decrease in the incidence of ischemic heart disease and the increased integrity of the muscles and bones.

While society does not always recognize exercise physiologists as healthcare providers, exercise physiologists are aware of the importance of regular exercise and health. They realize there are differences between at random physical activity and regular exercise. The latter is medically helpful in developing and maintaining healthful lifestyle. Regular exercise improves and/or maintains cardiovascular endurance, muscle strength, endurance, and flexibility. The most common method of determining the influence of regular exercise on the body is by measuring maximal oxygen uptake (VO_2). The units for reporting VO_2 at rest and at maximum are liters per minute ($L \cdot min^{-1}$), milliliters per minute ($mL \cdot min^{-1}$), and milliliters per kilogram of body weight per minute ($mL \cdot kg^{-1} \cdot min^{-1}$) (15).

The respiratory system is responsible for inspiring oxygen from the atmosphere and expiring carbon dioxide that is an end product of metabolism. The blood in the pulmonary circuit

transports the oxygen from the lungs in combination with hemoglobin (HbO_2) to the heart where it is pumped from the left ventricle throughout the circulatory (systemic) system to the metabolizing tissues (e.g., muscles). Oxygen uptake and carbon dioxide output (VCO_2) at the cellular level are measured during gas exchange testing. The O_2 consumed during cellular metabolism is equal to oxygen consumption (VO_2). The increased metabolism during exercise is reflective of the increased need for O_2 consumed by the mitochondria to produce adenosine triphosphate (ATP, a high energy phosphate compound), which is necessary for muscle contraction. Hence, exercise increases the work of the lungs, heart, and muscles that in return helps to ensure that they can function at increasing levels of work above the resting VO_2 (15).

CPX Testing

In normal individuals, like Bob next door, maximum VO_2 indicates his maximum aerobic capacity, which is also referred to as his maximal oxygen consumption (or maximum oxygen uptake or aerobic power). In a person like Linda, who lives several blocks away, heart disease has compromised the function of her heart. The decreased left ventricular function results in a decrease in cardiac output (Q), which is the product of heart rate (HR) and stroke volume (SV). Hence, even though the arterial blood is generally full of O_2, the decrease in SV and thus, the decrease in Q is primarily the reason for Linda's decrease in VO_2, metabolic capacity, and physical ability to exercise (15).

The cardiopulmonary exercise (CPX) test measures the body's capacity for gas exchange. Often, it is carried out in conjunction with an ECG stress test with the subject on either a cycle ergometer or treadmill. By measuring the exercise performance of the subject's respiratory, cardiovascular, and circulatory systems, the CPX test via breath-by-breath measurements of gas exchange provides an excellent indicator of functional power or functional capacity. In addition to this physiological information being useful to develop the type, duration, and frequency of the subject's exercise prescription, it allows for the assessment of the potential danger of excessive or inappropriate exercise.

Not only is the CPX an excellent beginning point in the development of a client's exercise prescription, it allows for a solid assessment of physiological function on cardiovascular morbidity and mortality rates. Thus, by determining that VO_2 is increased after the exercise prescription (given that VO_2 = ATP, which = Energy = Muscle Contraction = Life), there should be a reduction in cardiovascular morality (thus VO_2 = Life). This is especially the case when the exercise prescription results in the expenditure of more than 2000 $kcal \cdot wk^{-1}$ *vs.* 500 $kcal \cdot wk^{-1}$ (46). While it should not be surprising that regular exercise is inversely related to the risk of developing heart disease and stroke (40), it is still not accepted by the majority of the population (including the medical profession) in the United States.

Regular Exercise

The idea that regular exercise is an important prescriptive treatment for high blood pressure, type 2 diabetes mellitus, obesity, elevated lipids, thrombosis, coronary artery endothelium function, and improved measures of heart rate variability just as certain prescriptive drugs are a recognized medical treatment means that regular exercise is the equivalent of a powerful drug. Bear in mind that this conclusion does not mean that ASEP Board Certified Exercise

Physiologists are practicing medicine when they prescribe exercise medicine because they are not medical doctors. Rather, it means that the BCEPs are prescribing regular exercise in the same context as physical therapists might do when applying therapy to help patients. However, the difference is (or, perhaps, should be) is that physical therapists create physical prescriptions for their patients while exercise physiologists create exercise prescriptions.

If, at any time, the BCEP has reason to believe that a patient, referred from a medical doctor has signs or symptoms of a condition that requires treatment beyond the ASEP standards of practice or is not progressing toward documented exercise treatment goals as demonstrated by objective, measurable, or functional improvement, the BCEP understands the importance of referring the patient to his or her physician. Exercise medicine is critical in treating chronic diseases, but the fact that certain diseases are rather advanced means that there is the necessity of combining the role of medicine and exercise physiology in the recovery process.

While regular exercise helps to prevent the development of hypertension (47), increases the sensitivity to insulin while decreasing the production of glucose by the liver (63), promotes weight loss while decreasing total cholesterol and low-density lipoprotein (LDL) cholesterol (65), favorably influences the fibrinolytic system by decreasing platelet aggregation (55), and enhances the activity of the parasympathetic nervous system with a resulting decrease in double product (DP) and myocardial oxygen consumption (MVO_2), it is always important and ethically correct to embrace the education and experience of the medical community.

Exercise medicine is defined as low to moderate intensity aerobic exercise carried out 3 to 5 times$\cdot wk^{-1}$ for ~20 to 60 min$\cdot d^{-1}$ (15). The benefits are enormous, especially the respiratory, cardiovascular, and metabolic responses. Regular exercise increases the efficiency of the respiratory process. For example, at a given physical workload, expired ventilation (V_E) is decreased. This increased efficiency is the product of an increase in tidal volume (V_T) and a decrease in frequency of breaths (F_b). Also, the diaphragm and the external intercostals (i.e., the primary muscles responsible for respiration) become more efficient during the respiratory process. This means they use less O_2, thus allowing for more O_2 to be used elsewhere in the body (particularly the muscles).

The oxygen that diffuses from the alveoli into the pulmonary blood is transported by more hemoglobin (Hb) per 100 mL of blood. In general, the non-exercise trained concentration of Hb is ~15 g$\cdot$100 mL of blood. With training, it is slightly increased to ~17 g$\cdot$100 mL. This means that the oxygen carrying capacity of the blood increases from 20.1 mL of O_2 per 100 mL (i.e., 1.34 mL of O_2 x 15 g$\cdot$100 mL) to ~23 mL$\cdot$100 mL of blood). Since the development of energy in the form of ATP in the electron transport system (ETS) of the mitochondria requires O_2, then, more O_2 in the blood is helpful in producing more energy for muscle contraction (15). There is also an increase in the number of capillaries at the respiratory level and at the cellular level. This means that more O_2 can diffuse per unit of time from the lungs into the pulmonary blood that is then transported to the heart and by way of the left ventricle into the arterial system. Hence, it also means that there is more O_2 to dissociate from the HbO_2 combination at the tissue level to diffuse into the muscle cells.

As a result of regular exercise, the heart becomes stronger with each contraction that delivers the blood into the circulatory system, and it does so with a decrease in HR at rest and during exercise. This means that the increase in ventricular contractility results in a larger volume of

blood ejected per beat (SV), often at a lower HR for a given workload. The decrease in MVO_2 is directly related to the decrease in HR and systolic blood pressure (SBP). The product of both variables is double product (DP). The lower the DP for a given workload, the less O_2 is needed by the heart during exercise to deliver Q to the muscle fibers (15).

Regular exercise promotes the activation of more motor units and the transmission of nerve impulses for increased muscular strength and muscular endurance. The increased supply of O_2, removal of CO_2, and ATP molecules at the cell level allows for an increase in muscular activity to perform daily physical tasks and recreational activities energetically. Overall, there is an increase in VO_2 max that argues for increased chances of surviving chronic diseases (such as a myocardial infarction, MI). The increased elasticity of the arterial system along with the decrease in LDL cholesterol with the increase high-density lipoprotein (HDL) cholesterol provides increased protection from coronary artery disease (CAD).

Also, it is important to point out that regular exercise improves the ratio of total cholesterol (CHL) to HDL cholesterol. If the CHL:HDL ratio is 6 or greater, it is likely that there is significant CAD (e.g., 180 $mg \cdot dL^{-1}$ ÷ 30 $mg \cdot dL^{-1}$). In other words, even though the total cholesterol is less than 200 $mg \cdot dL^{-1}$ (which is good), the low HDL is associated with a high risk for CAD. Fortunately, regular exercise helps to raise the HDL cholesterol while lowering total CHL as well as having a favorable effect on stress and depression. In short, it is clear that a change in lifestyle that includes a prudent diet and more exercise helps to lower CAD death rate (53).

Regular exercise helps to decrease cardiac mortality on one hand while improving recovery after a cardiac event on the other (6,8). Regarding the first, regular exercise helps to decrease triglyceride levels in the blood, increase body fat loss, decrease emotional tension, and brings about the regression of atheroma in major arteries that afford important protection against CAD. As to the second, regular exercise improves metabolic capacity and function, such as decreases resting HR, increases the efficiency of the myocardium (heart), promotes peripheral blood flow and distribution, and lowers blood pressure, platelet stickiness, and glucose intolerance. In sum, exercise medicine not only increases cardiac fitness and muscle strength, it improves psychological health (44,56).

In terms of disease management, Board Certified Exercise Physiologists play a vital role in defining, prescribing, and encouraging clients and patients to take an active part in regular exercise (57) and healthcare. They are scientifically educated and prepared to provide an ethical and safe approach to explaining the mind and body benefits of regular exercise. The recommended target for exercise medicine is at least 30 min, 3 to 5 $times \cdot wk^{-1}$. Of course it is also important to understand the need to teach progressive relaxation techniques and the power of positive thinking, including the role of spirituality in psychosocial health (11,13). Individually and collectively each intervention reduces the stress of work and life while helping to promote positive and relaxing feelings. Spirituality, in particular, can have a very positive influence on the immune, cardiovascular, hormonal, and nervous systems.

EXERCISE MEDICINE AND A VASCULAR PERSPECTIVE

Exercise is the equivalent of a drug that prevents and treats cardiovascular disease (14). That is why regular exercise is known by the expression: Exercise is medicine! However,

from the ASEP perspective (17), the correct expression is: **Exercise Medicine!** In a nutshell, a person who exercises has a higher exercise capacity than someone who does not exercise, which correlates to a larger dose of exercise medicine that decreases mortality. Hence, individuals who are highly fit are statistically less likely to die of coronary disease and/or other chronic diseases.

While the benefits of exercise medicine represent both structural and physiological changes that diminish the risk of disease, there is increasingly more discussion of the beneficial effects of exercise on the vascular cells. The biology of endothelial cells reveals a variety of health related functions, particularly given the impact of exercise medicine on restoring a healthy endothelial phenotype.

The effect of exercise medicine itself on the muscles that contract to produce movement is linked to vasodilation and enhanced blood flow throughout the contracting muscle tissues. The result is an increase in the hemodynamics forces (i.e., shear stress and cyclic strain) and/or circulating factors released from adipose tissue and skeletal muscle that are believed to initiate endothelial adaptations in the arteries supplying the contracting skeletal muscles and nonworking tissues (45).

Interestingly, there is also evidence to support that the exercise medicine adaptations take place in healthy as well as in the unhealthy (i.e., diseased states) subjects. This means exercise medicine should be prescribed to everyone, regardless of age, sex, healthy, or unhealthy. Thus, individuals with preexisting cardiovascular risk factors benefit from regular exercise training just as non-diseased individuals do.

Exercise medicine is statistically associated with a decrease in strokes (e.g., cerebrovascular events) by decreasing arterial stiffness and the risk of carotid artery plaque, the likelihood of a rupture, and emboli. Thus, exercise medicine plays a significant role in the prevention and treatment of cardiovascular disease because exercise medicine is anti-atherogenic, and it decreases oxidative stress through the up-regulation of the antioxidant enzyme, superoxide dismutase (50).

Also, there is scientific evidence of exercise medicine induced improvements in functional and cognitive outcomes due to the positive changes in vasodilator action and cerebral circulation in specific regions of the brain. Exercise medicine increases cardiac output that results in an increased blood flow across the endothelium, which creates a shear stress stimulus that increases the production and release of nitric oxide (NO) by the endothelium to dilate the vessels.

Aside from this very brief statement regarding exercise medicine and endothelial adaptations, there are other improvements in cardiorespiratory fitness, efficiency, and blood pressure. For example, as stated earlier, specifically, with respect to the lungs, both at rest and during exercise, ventilation is improved with a larger tidal volume and lower frequency of breaths per minute. Similarly, the improved left ventricle pumps a larger volume of blood per beat (i.e., stroke volume) while beating less frequently per minute (heart rate). Exercise medicine also improves tissue extraction of oxygen and the removal of carbon dioxide (15). The reduced fasting blood glucose and the increased insulin sensitivity help to protect against lifestyle-related diseases.

While physical inactivity is a major risk factor that contributes to numerous chronic diseases (such as high blood pressure, heart disease, obesity, and type 2 diabetes), exercise medicine is the stimulus that produces myocardial and skeletal muscle adaptations and remodeling. The changes set the stage for increased substrate delivery and utilization, mitochondrial density and respiration, intrinsic oxidative capacity, contractile function, and resistance to fatigue (15). Exercise also increases skeletal muscle glucose uptake through an insulin-dependent pathway.

Both aerobic training and resistance training versus either training alone (as exercise medicine) are effective in decreasing insulin resistance in obesity and metabolic syndrome (28) and improving glycemic control in type 2 diabetes mellitus (52). Muscle hypertrophy and neurological adaptations represent two additional important changes that increase muscle function. The latter is the result of the collective improvements in motor unit activation, firing frequency, and synchrony of high-intensity motor units (30,51). This is true for increasing athletic performance as well as improving health-related musculoskeletal function.

Chronic diseases are costly for everyone, and the bottom line is that the diseases are only going to increase without a serious exercise medicine intervention. The aging of the population and the sedentary lifestyle contribute to higher rates of heart disease, blood pressure, and diabetes (1). Exercise medicine is the most logical intervention both at a personal level and collectively by society. Everyone regardless of age should begin an exercise program to reduce the risk of increased clinician visits and hospitalization. Yes, it is a major challenge but it is an absolute necessity to change everyday living, eating, and working habits. Otherwise, chronic diseases will continue to take its toll on performing basic activities of daily living. One very important answer to this problem is Exercise Medicine!

EXERCISE PILL OR EXERCISE MEDICINE

Recently, a friend said, "I wish I had a pill that would keep me healthy." He wasn't talking about a drug such as atenolol that is commonly prescribed for high blood pressure. As our conversation continued, it became clear that he wanted a pill that would produce physiologic changes similar to what takes place when a person exercises. He wanted what is known as an exercise pill. After a deep breath I looked him in the eyes and said, "Actually, researchers have been working on developing a drug that causes the body to respond as though it had just finished an exercise session."

His comment was, "Really, where can I get some?" I said, "Presently, the research has been done only with mice. But, of course, all you need to do is to start a 30-min walking program 3 $d \cdot wk^{-1}$." He said, “No way, I want a pill. I don't want to exercise." He was not interested in exercising. He had made up his mind that he wanted to be healthy and strong without exercising! After all, the majority of the population is not interested in exercising. It takes a lot of mental effort to start an exercise program and stay with it. Even getting a person to engage in a progressive relaxation session once or twice a week to deal with stress is next to impossible.

Although the idea of an exercise pill is very appealing to men and women of all ages, it raises many questions. For example, is it the answer to the many hours that adults spend in

sedentary behavior? Will it correct society's obesity and type 2 diabetes problems? If so, how long will it work, how much will it cost, and will it work across age and sex? Will the exercise pill require “some” exercise? If so, how much exercise is enough to improve the musculoskeletal system versus the heart and lungs when taking the pill? Will it result in cardiovascular adaptations, such as a decrease in double product, myocardial oxygen consumption, and relative cardiac efficiency? Will the pill do everything that exercise does for the mind, particularly the improvement in well-being? Will it control the percentage of body fat in children and adolescents? Will the exercise pill promote fun among friends and family?

Since the federal government (61) issued its first national exercise guidelines in 2008, there is the general acceptance that an increase in physical activity will protect against chronic diseases (e.g., coronary artery disease, hypertension, and some forms of cancer) and disabilities. Yet, even though the medical community understands the importance of regular exercise, ~40% of the medical doctors talk to their patients about exercise (31). The majority of the doctors would rather tell their patients about the benefits of a particular drug to prevent a heart attack or a stroke, to enable ambulation, improve circulation, and promote relaxation. After all, it is easier to prescribe a pill or a combination of pills than to take the time to talk about the patients' unhealthy lifestyle behaviors and the specifics of an exercise prescription.

If the conversation between the physician and the patient is not about surgery to reduce body fat, then, it is likely to be about the "exercise pill" to burn fat. Why, because the idea of an exercise pill is gaining popularity as the answer to improving the nation’s health problems. In fact, if such a pill does exist for human beings, it is reasonable to conclude that it would replace exercise (given that a very small percent of Americans take time to exercise). It would be the answer to our health problems. Everyone would purchase "compound 14" (a molecule created by scientists at the University of Southampton in Great Britain) (5) to decrease body fat. Compound 14 is said to work by setting off a chemical reaction that ultimately tricks cells into thinking they have run low on energy, which causes them to increase metabolism and uptake of glucose (that improves glucose tolerance and promotes weight loss in obese mice). Let me see, which approach (the exercise pill or the exercise medicine prescription) makes more sense? Think about it.

I asked my brother Ed, which makes more sense? He said, “I admit that I have never had an interest in exercise and, frankly, I have a bad attitude about exercising. If there is actually a magical exercise pill that I can pop every day or every other day, then, I want it.” Then, I said, to my understanding there will not be an exercise pill for decades to come. So, if you want to avoid sarcopenia (i.e., muscle wasting) with aging or a certain predisposition to chronic diseases (myocardial infarction, in particular) that result from a sedentary lifestyle, you will need to engage in a regular exercise program. He said, “I will wait for the exercise pill. Surely, in the near future the pill will be available like other drugs.”

In *Treads in Pharmacological Sciences*, Ismail Laher of the Department of Pharmacology and Therapeutics at the University of British Columbia in Vancouver and Shunchang Li (39) of Beijing sport University said that with an increased understanding of how exercise influences the molecular pathways, the development of an exercise pill is feasible for some of the benefits. In other words, the statement is one of a hopeful benefit of some positive changes in structure and function to help avoid certain diseases and disabilities.

Narkar et al. (43) studied AICAR in mice for 4 wks and reported that it induced metabolic genes and enhanced running endurance by 44%. They concluded that AICAR enhanced training adaptation by activating AMP-activated protein kinase (AMPK), which stimulates glucose uptake by skeletal muscle cells. Then, AMPK interacts with another protein (PGC-1x) that results in an improvement in oxidative metabolism, mitochondrial biogenesis, fiber-type transformation in skeletal muscles, and ATP production. The lead researcher, Ronald Evans of the Salk Institute said, "It's tricking the muscle into 'believing' it's been exercised daily," and "…it proves you can have a pharmacologic equivalent to exercise."

Another pharmacologic equivalent is known as GW501516 (also known on the black market as Endurobol), which was created by Ligand Pharmaceuticals and GlaxoSmithKline in the 1990s as a drug for metabolic and cardiovascular diseases (64). It was abandoned in 2007 because animal testing showed that it caused cancer to develop in several organs (including the liver, bladder, stomach, skin, thyroid, tongue, testes, ovaries, and womb). When the drug was given in high doses to mice, their physical performance dramatically improved. Athletes understand what this means, and they are abusing the drug as a doping agent (29). The World Anti-Doping Agency (WADA) developed a test for GW501516 and other related chemicals and added them to the prohibited list in 2009. It has issued additional warnings to athletes that GW501516 is not safe.

According to Li and Laher (39), the exercise pill "...cannot act as a substitute for all the benefits of physical activity." They also said that, "It is unrealistic to expect that exercise pills will fully be able to substitute for physical exercise...." Hence, it looks like my friend (and my brother) will have to bite the bullet and put on the walking shoes, that is, if they interested in counteracting the consequences of physical inactivity that include a decrease in body's sensitivity to insulin, an increase in the storage of body fat, and a confirmed relationship with decreased health and longevity. Also, it is important to point out that an exercise pill is not likely to have a positive link to endorphins that come from exercising.

Given the limitations of the exercise pill, are people setting themselves up to fail? Now that we know that regular exercise is the equivalent of medicine, why shouldn't they simply embrace exercise medicine? The short answer is simple: people are lazy. They are not interested in the work required to stay with a regular exercise program. Society is interested in a quick fix for its problems. Regardless of age and sex, the majority of Americans and people worldwide are not interested in exercise medicine, although obviously they should be to realize the mind and body benefits of exercise medicine. The idea of waiting for an exercise pill to solve society's health problems is not the "right" answer to acknowledging that we, the people, must do our part!

The Wakening

While an exercise pill is appealing for people who cannot exercise due to paralysis or other reasons, the point is that the exercise research is self-evident. This idea is a major awakening to the profession of exercise physiology, especially from an entrepreneurial perspective. The American Society of Exercise Physiologists (ASEP) created the first-ever professional infrastructure to promote professionalism and entrepreneurship in exercise physiology (9,10,16). The ASEP leadership understands that exercise is the magic exercise medicine every person needs to empower the mind, to strengthen the musculoskeletal

system, and to prevent heart disease and some types of cancers. ASEP Board Certified Exercise Physiologists are in a key healthcare position to implement safe and meaningful exercise medicine prescriptions.

The couch potato must stop looking for the exercise pill in the mail. The researchers must stop with the idea of creating one for the sedentary population. It is either a dream or a misdirected way of thinking, similar to cheating and doping in athletics. It is the wrong thinking to help with the life-changing decisions that are necessary to prevent chronic diseases and disabilities. The idea that we need a pill so we can continue our bad lifestyle habits of physical inactivity, watching too much TV, failing to exercise, consuming too many calories, and living with too much stress and anxiety is misguided thinking.

Is it cruel and hurtful to categorize physically inactive Americans as lazy or weak-willed? The short answer is “no” because life is about making choices. We can decide to exercise or we can hasten our death by living a sedentary lifestyle. The fact that we want an exercise pill to be healthy means that the pharmaceutical industry continues to win the battle of financial profits over common sense. Even now we look for a pill when we have a headache after work while failing do anything positive about the stress and tension with colleagues. We need a magic exercise pill for our failure to monitor stress, to exercise to keep our heart and lungs healthy, and to lift weights to keep our muscles strong. Otherwise, without the exercise pill we will have to either experience the act of exercising or grow old and sick prematurely.

Isn't it interesting that hardly anyone disagrees with a magic pill for all the things we need to do but fail to do properly to live a happy and fulfilled life? Yet, exercise is medicine! While we know psychologically what we are doing, deep down we accept the idea of popping a pill because it has become part of our culture and who we are as human beings. No doubt similar thinking goes into using sports supplements and drugs to increase the athletes' chances of winning. It is easier to cheat to win than to put in the work to increase the likelihood of winning. The magic athletic pill to win is essentially the equivalent of the magic exercise pill to obtain fitness without working for it.

All that is necessary for a healthier life is to actually do the exercises that keep us healthy. Yes, we might find that we will break a sweat, get tired, and even bored on numerous occasions. So what? Life is about doing the work that is required to get good grades in college, to keep a job, to connect with that special person, to raising a family, to be successful in sports, and to be mentally and physically healthy. The amazing benefits of exercise come with a price and that is the willingness to do the work.

Exercise enhances who we are and even how we influence others while also living a healthier life, which is a critical factor in sustaining life. Thus, the obvious question is, "Why the lack of interest in exercise?" One answer that is rather common is, "I didn't enjoy PE or sports in high school and, frankly, I would rather watch TV or read a book." Others might feel less than competent or they have a physical limitation that renders them awkward. Life isn't fair in dozens of ways, but because it is so precious we should think positive and do what is necessary to keep going. More often than not, this means doing things outside of our comfort zone. After weeks, months, or even years later, we may grow to love what we didn't like.

Take a breath. For a moment, think with me. Exercise medicine contributes to the primary and secondary prevention of cardiovascular disease. Similarly, from a somewhat different perspective, who among us can live a wonderful life without muscular strength, endurance, and flexibility? Each is required to perform many of the activities of daily living, which is also true for the body's ability to transport and use oxygen during life's activities (aerobic fitness). Each is also acquired as a positive outcome of exercise medicine. The benefits of exercise are clear to the academic, scientific, and medical entities. They understand different types of activities and training intensity, duration, and frequency specific to preventing or treating diseases and/or disabilities.

A person who is thinking about starting an exercise program should understand that even a modest improvement in daily physical activities (such as walking or riding a bicycle) can yield tangible benefits in well-being and longevity. Also, while it is apparent that an exercise pill will not produce acute and chronic adaptations in the body as does regular exercise, the focus on the partial effects of exercise (such as increasing metabolism) is a limited view of what must be achieved and maintained to be healthy. Compared to the exercise pill, a person who engages in regular exercise demonstrates a lower resting and exercise heart rate with a corresponding increase stroke volume that means the heart needs less oxygen to pump the required blood volume (i.e., cardiac output) to the peripheral tissues. Also, aside from the exercise training effect of a greater oxygen extraction by the muscles, exercise increases the size (hypertrophy), strength, and endurance of the muscular system.

Moreover, regular exercise helps to decrease the commonly prescribed medications, including statins and anti-platelet drugs. Regular exercise increases joint flexibility. Taking an exercise pill will not produce an increase in range of motion. It will not increase mental health, self-esteem, cognitive function, and cardiorespiratory function and yet, exercise medicine can do those things and more (such as):

➢ Increased cardiac output per minute ➢ Higher stroke volume and total blood volume ➢ Greater tissue oxygen extraction ➢ Higher oxygen consumption ➢ Lower resting heart rate ➢ Greater muscle strength ➢ Lower risk of early death ➢ Lower risk of coronary heart disease ➢ Lower blood pressure ➢ Lower risk of stroke ➢ Lower risk of hypertension ➢ Lower risk of adverse blood lipid profile	➢ Lower risk of type 2 diabetes ➢ Prevent weight gain ➢ Reduce abdominal obesity ➢ Lower risk of metabolic syndrome ➢ Reduce symptoms of depression ➢ Increase cognitive function ➢ Increase sleep quality ➢ Increase ambulation ➢ Improve balance ➢ Lower frequency of falls ➢ Lower risk of hip fracture ➢ Lower risk of lung cancer ➢ Lower risk of colon cancer ➢ Lower risk of breast cancer

EXERCISE PHYSIOLOGY AS A HEALTHCARE PROFESSION

Since the 1970s exercise physiologists have carried out their work almost exclusively in academic settings, research laboratories, and cardiac rehabilitation programs throughout the United States. In fact, the scientific body of knowledge that undergirds exercise physiology warrants its application in both the clinical and non-clinical sports and academic programs. Sports-specific applied physiology, anatomy, biomechanics, and nutrition help to reduce training problems by providing safer training guidelines. This is true for athletes of both genders and all ages and competitive levels.

Advancing performance-related exercise physiology will always be a major part of the exercise physiology profession. Understanding the specifics of physiologic and metabolic responses to exercise is a primary responsibility of all exercise physiologists. Also, of increasing importance in the healthcare sector, the breadth and depth of the exercise physiology curriculum provides exercise physiologists with a comprehensive and engaging application of psycho-physiological factors in the health effects of regular exercise.

In just the past 13 yrs, the exercise component of exercise physiology is now recognized as exercise medicine. Clearly, exercise physiology is a healthcare profession and not simply a research discipline. Regular exercise and other forms of physical activity have become increasingly recognized as an essential component of an individual's overall health. This point has been recognized as since Hippocrates (460-377 BC) remarked that "if we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health."

In part, that is why ASEP is so important. Every exercise physiologist has a great responsibility to focus on important and safe guidelines by way of an individually designed prescription) for either the prevention or the treatment of a broad range of clinical conditions. In the United States, cardiovascular diseases accounts for more than 34% of all deaths. More than 81 million people currently have one or more forms of CVD. Statistical evidence indicates that "physical inactivity" is a primary risk factor for atherosclerosis, while regular exercise helps to lower blood lipid levels.

Daily physical activity can help prevent heart disease and stroke by decreasing body fatness, which is associated with high blood pressure. Regular exercise raise high-density lipoprotein (HDL) levels while lowering low-density lipoprotein (LDL) levels. People who perform regular exercise decrease insulin resistance and improve insulin sensitivity and, therefore, are less likely to suffer from type 2 diabetes than sedentary people.

Physical activity helps to preserve muscle mass and improve the body's ability to use calories. When physical activity is combined with proper nutrition, it can help prevent obesity. By increasing muscle strength and endurance and improving flexibility and posture, regular exercise helps to prevent back pain. This is important given that ~80% of all adults experience back pain that limits their ability to function normally. Regular weight-bearing exercise promotes bone formation and may prevent many forms of bone loss associated with aging.

Regular physical activity can improve mood and the way we feel about ourselves. Thus, the improvement in fitness, appearance, and the ability to perform new tasks improves self-confidence. Researchers also have found that exercise reduces depression and anxiety and helps manage stress.

It has been shown to reduce fibrin levels in the blood, thus decreases the likelihood of platelet adhesiveness and the concentration of platelets in the blood. Aside from these benefits and more, such as “a lower risk for dementia” -- physiologically speaking, regular exercise lowers heart rate and increases stroke volume, stabilizes electrical activity of the heart while decreasing SNS control of the heart, increases O_2 to the brain, improves coronary and peripheral circulation, and increases oxygen-carrying capacity of the blood and work capacity of the muscles.

But, for exercise to be safe and properly prescribed, all exercisers should participate in a cardiovascular screening prior to starting an exercise program. The screening should include a personal history of disease and an exercise examination (including where appropriate an electrocardiogram) designed to identify the potential for cardiovascular problems as well as a beginning point for starting a regular exercise program.

Periodic physiologic testing should be part of the exercise program protocol, particularly with respect to monitoring the effectiveness of the exercise prescription or the tracking of key physiologic variables to optimize performance and well-being. Of course, it is important that the prescription process is also “educational” with appropriate time spent to clarify the targeted effects of the training program on mind-body improvements.

Exercisers frequently encounter unanticipated questions and challenges in training. These include unexplained reasons for a specific exercise program or a combination of programs and failure to understand the training effect on different physiologic factors. Thus, the exercise prescription as exercise medicine should have an educational component that explains the expected changes in the exerciser’s physiologic profile. For example, if the exerciser’s economy of movement has decreased, emphasis on training techniques that are expected to improve specific physiologic variables and on explaining the role of variables that reduce or increase efficiency is appropriate.

Equally important, BCEPs must anticipate the need to educate and troubleshoot health problems associated with older exercisers and female athletes with eating disorders, amenorrhea, and osteoporosis. While the triad of health problems is not always sports or activity related, regular exercise can add to the disturbance of caloric balance that triggers it. Increasingly, BCEPs are using the findings of this research to design safe and progressive “exercise medical prescriptions” for better mind-body health through exercise.

The continued demand for an economically sound and physiologically evidence-based proven medicine in the form of regular exercise requires that exercise physiologists and medical practitioners work together to optimize health and exercise performance. But, having said that, it is the responsibility of the exercise physiology profession to promote and prescribe regular exercise as a personalized medicine. This means optimizing exercise dosing strategies to maximize health benefits while minimizing psychological barriers to

participation by increasing the educational relevance of physiologic-driven preventive health interventions such as exercise medicine.

This means first acknowledging that ~5% of United States adults obtain the recommended 30 $min \cdot d^{-1}$ of physical activity. Also important is the fact that less than half of children aged 6 to 11 yrs and only 8% of adolescents achieve this goal. Then, second, it means that exercise physiologists must learn to think proactively to become part of the preventive as well as therapeutic interventions that focus on exercise medicine.

This is where the client's individualized exercise prescription in the form of an individualized exercise medicine that has been professionally developed by a BCEP can increase the efficacy of exercise prescriptions. Such work by exercise physiologists could have strong implications not only for the improvement of healthcare outcomes, but also for the exercise physiology profession. Such targeted thinking and interventions are likely to combine nutritional and other forms of therapy with chronic exercise training.

But, the truth is that more work must be done to understand exercise-mediated improvements and physiologic health and well-being. Exercise physiologists have not investigated the effects of interventions that use spirituality and home-based as well as entrepreneur-based exercise strategies to optimize the beneficial effects of personalized exercise regimens and career opportunities. And yet, to date, it is common knowledge that less than one-third of all doctors advised their patients to engage in regular exercise or physical activity. Almost assuredly, far fewer have taken an active role in prescribing exercise. Many do not understand the benefits of aerobic exercise, resistance training or a combination of the two in persons with type 2 diabetes or other chronic diseases.

It is the opinion of the ASEP leadership that it is time to think of preventive medicine strategies that include the expertise of Board Certified Exercise Physiologists in the prescription of exercise medicine. The personalization of exercise prescription has the potential to improve the awareness of the importance of regular exercise to preserve function as the client ages, to improve quality of life, and to enhance mental and psychological functions. To this end, it is equally important that society is made aware of the fact that physical inactivity is a major risk factor for hypokinetic diseases, including but not limited to, coronary artery disease, hypertension, stroke, and certain forms of cancer.

The ASEP organization is poised to promote and build upon this thinking to enhance dialogue and exchange of ideas to increase the involvement of exercise physiologists in the overall health assessment and well-being of target populations. The leadership understands that exercise lowers the risk for early death, helps to control weight and reduce the risk of heart disease, stroke, type 2 diabetes, mental disease and depression, and some types of cancer, including the fact that it lowers the risk of cognitive decline on one hand and hip fractures on the other.

Hence, there isn't any question that regular exercise should be considered as a viable alternative to or in combination with medications. Yes, understandably, it is tempting to believe that popping a pill will cure all our ills, but it hasn't while rather basic healthy lifestyle changes (such as being physical active and eating well) have proven effective in improving well-being and adding years of quality living. For example, statistics suggest that modest

changes in physical activity patterns and nutrition can prevent more than 400,000 deaths annually.

But, here again, the key to the “exercise medicine prescription” is first understanding and, second, correctly applying the scientific evidence-based “principles of regular exercise” such as the: Principles of Overload, Progression, Specificity, Reversibility, Dose-Response Relationship, Diminished Returns, and Rest and Recovery. Clients also need instruction as to frequency, intensity, and time commitment as well as the physical and psychological benefits. After all, feeling better and a sense of personal accomplishment are huge (regardless of age).

Who would have imagined decades ago that neuroscientists, psychologists, and medical doctors would agree that “exercise is the best thing a person can do for his/her brain.” In fact, the latest research shows that cognitive decline is not inevitable and that aerobic exercise reduces the level of brain loss and keeps cognitive abilities sharp.

The role of exercise physiology in preventive healthcare isn’t complicated. It is matter of assessing the client’s physiologic capacity. This can be done with the use of a standard metabolic cart or it can be done as a stepwise process of determining the client’s overall physiologic responses with the use of proven regression equations. What is important here is that the professional that drives the process is a Board Certified Exercise Physiologist and not the fitness professional or exercise practitioner. Either a college degree means something or it doesn’t. If it does mean something, then, it should provide career opportunities for the college graduate.

As you can tell, I have considerable concern about the importance of a credible academic degree for the students of exercise physiology, and the public’s healthcare and we within ASEP think that more attention should be placed on both. For certain, sitting on our hands is no solution to the challenges that face exercise physiology and healthcare in the 21st century. That is why there must be a fusion of effort, courage, persistence, and imagination by exercise physiologists at all levels to realize the ASEP vision.

Where To From Here

The past several years have been tough and interesting. To be an exercise physiologist on the outside looking in on professionalism is frustrating. In many ways this is a bad time for exercise physiology because the academic exercise physiologists are interested in only one thing and that is publishing their research papers. At times I think that if they can’t publish one more article this week they will fall to their knees and cry. Of course I wonder if this is why their office doors are more often than not shut tight. The abuse of our students is massive, especially since many of their teachers honestly don’t care much about teaching. And imagine, none of this is covered-up. No, it is just the way the academic system has been allowed to evolve and exist.

The absence of bold and authentic leadership in exercise physiology is a major problem. Exercise physiologists have so much to offer to society, especially exercise medicine. But, the students are not taught the actual application in society, only the steps necessary to past an exam. They know little to nothing about how to start a healthcare business, such as an “Exercise Medicine Clinic” or how to think as an entrepreneur. The effects of not receiving a

credible education are far reaching. They have left the students of exercise physiology at graduation without credible career opportunities, which raises this question: How is it that physical therapists know how to do research and teach about ethics, professionalism, and standards of practice and exercise physiologists don't? Perhaps, exercise physiologists, that is, the academic types, have been on their knees so long in praise of sports medicine and exercise science they can't think straight to understand what needs changing. Only a handful has managed to stand up and open their eyes to see what is actually happening on college campuses across the United States.

The very essence of the meaning, Exercise Medicine, is the foundation from which academic exercise physiologists should be building the profession of exercise physiology. Then, the students would actually have opportunities to be financially successful without spending more tuition dollars on yet another college degree. Allow me another stretch of the imagination. How many academic exercise physiologists are thinking the very same thing? The contribution of exercise medicine is enormous, but national impact must be spearheaded by leaders who get it. Leaders who understand what is necessary to move forward in educating their students and providing them with the expectation of success are needed throughout the academic system. This academic tragedy of telling students that they can always complete an application to physical therapy cannot be allowed to continue unchallenged.

Where to from here? In the future we within ASEP hope more academic exercise physiologists get the message that their job isn't just about them but more about their students. Imagine the impact if the academic types would move beyond their present day thinking to a new view of exercise physiology. Imagine the faces of students at graduation or 6 months later with smiles of success and happiness. Imagine seeing their faces and recognizing that they are no longer angry and frustrated because they see themselves being successful in their "profession" and in the business world of healthcare. It is pastime to think this way on behalf of exercise physiology and our students. No, it doesn't mean the end to publishing. On the contrary, it is simply a more natural balance between research and teaching.

Remember, there is nothing wrong with new ideas, possibilities that have not been tried, and taking the time to doing the right things for the right reasons. Think about it. If we are not part of the solution, then, we are the problem. So, why not stand up as an exercise physiologist, why not think differently, and why not act today on behalf of the evolving profession of exercise physiology and "everyone" who is interested in being an exercise physiologist? While we have come a long way from our physical education background, it is not enough. The change process that athletic training, physical therapy, and nursing understand is driven by the passion to be the very best they can be. We need to do the same. I know this may sound cliche or trite, but when exercise physiologists stand before their students in a classroom they are responsible for more than just lecturing and giving tests.

Where to from here? The answer is in doing what is right, even if non-exercise physiologists who desire what we have don't like it. When we are doing what is right we are actually living as professionals who care. So, if you are an academic exercise physiologist, why not today, this week, and every semester thereafter? If you are a college teacher, go out of your way to help your students by accrediting your academic curriculum with ASEP, which will show support for the American Society of Exercise Physiologists. Showing patience and courage in

speaking about and writing about the need for professionalism in exercise physiology is critical to our success. Our students need the help of all exercise physiologists. They need guidance in professional issues and ethical behaviors, and future thinking to help ensure that their world as healthcare professors after college will be bigger, brighter, and more significant than it has ever been.

Where to from here begins with a vision. Why not take a look at the ASEP website and read the vision for exercise physiology and everyone who wants to be an exercise physiologist? Remember, as it was stated in Proverbs 29:18, "Where there is no vision, the people will perish." I know this is true. I have witnessed too many students perish after graduation. Why, because in a department where there is no vision beyond yesterday's thinking, there is no future. After 40+ yrs of college teaching I have lived the students' pain and I understand their lack of a meaningful education. Let's rediscover the true meaning of a college degree so that our students of exercise physiology will live and experience with great wonder their vision of a 21st century college that prepares them for professional work and life that is abundant.

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