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# The
# ASEP
# Exercise Physiologist's Thinking

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The **American Society of Exercise Physiologists** (ASEP) was founded in 1997 in Minnesota at The College of St. Scholastica in Duluth, MN. At the time it was created and placed on the Internet as the nonprofit professional organization of exercise physiologists, many academic exercise physiologists were unclear as to why it was needed. However, after decades of membership in non-exercise physiology organizations, more academic exercise physiologists have become aware that the students of exercise science and related programs of study (such kinesiology, human performance, and sports medicine) cannot refer to themselves as an exercise physiologist. The primary reason for this obvious conclusion is that they either do not have an academic degree in exercise physiology or they are not certified by ASEP.

Hence, it is also increasingly obvious that the students who graduate with a health and physical education degree cannot refer to themselves as an exercise physiologist. To help correct this obvious error across the academic institutions, the ASEP leadership created the first professional definition of "what is exercise physiology" and "who is an exercise physiologist." Also, the leadership developed the ASEP Board of Accreditation guidelines to accredit academic institutions and the ASEP Board of Certification procedures to certify exercise physiologists. The ASEP Board of Directors believe that the professional services developed and published by the **American Society of Exercise Physiologists** are 100% required in the development of the "profession" of exercise physiology.

The **Journal of Exercise Physiology-online** (**JEPonline**) is the official ASEP peer-reviewed electronic research journal that features original exercise physiology research, reviews, and editorials. Also, the **Journal of Exercise Medicine-online** (**JEMonline**) is the first "exercise medicine" journal in the history of exercise physiologists. To help exercise physiologists understand the importance of professional development, the **Professionalization of Exercise Physiology-online** (**PEPonline**) is the first journal to publish articles about professional development in exercise physiology to help with believing in and sharing the importance of professionalism. There is also the **JPEPonline**, i.e.,

the **Journal of Professional Exercise Physiology**, to further emphasize the quintessentials of developing professionalism. The degree to which ASEP is successful in promoting exercise physiology research and professionalism will speak to its success, which will also be shared in the **ASEPNewsletter**. It was developed to keep all ASEP exercise physiologists informed of what is new in the profession as well as upcoming events of professional interest in exercise physiology.

In addition, there are other ASEP services, such as: the ASEP Directory of Membership; Career Opportunities and Resources; Conflicts of Interests; Professional Networking and Development; Annual Meeting Opportunities; and Student Support as well as the opportunity to build leadership skills within ASEP.

## Clarification of Titles

While it is common to hear colleagues refer to themselves as a "physiologists," the ASEP philosophy is geared towards a more definitive and professionally appropriate title. As stated earlier, since there is a degree in physiology, a person should not refer to him- or herself as a physiologist unless he or she has a degree in physiology. This point and other similar inconsistencies have been written about and discussed many times in articles published across many years in **PEPonline**. Similarly, since there is an academic degree in exercise physiology, a person should not use the title, Exercise Physiologist, unless he or she has either earned the degree in exercise physiology or has successfully completed the ASEP Board Certified Exercise Physiologist credential.

Also, this is exactly why the degree in exercise science and the degree in kinesiology is not an academic degree in exercise physiology. This thinking is consistent with the sports science degree, given that the graduates of such programs are not exercise physiologists. Furthermore, there is the notion that exercise physiology is an applied science, much like a discipline rather than a profession. In fact, it is generally believed that the definition of exercise physiology is "the acute and chronic adaptation to exercise training". This point of view is the result of decades of influence by sports medicine, where exercise physiology is still thought of as a research discipline and not a profession.

## ASEP Vision and Mission

While it is common for many exercise physiologists to think of exercise physiology as being the same as either exercise science or sports science, the ASEP leaders disagree. They believe it is just a matter of time before this tangled and misdirected thinking is properly understood. Meanwhile, one way to help promote the ASEP vision is to agree that the greatest gift that can be given to exercise physiologists is that it is a exercise medicine healthcare profession that generates

hope, improves health and well-being while also motivating the members of the profession.

As an example, the ASEP vision is consistent with being recognized as the leading professional organization of American scholars and practitioners in the study and application of exercise physiology to physical fitness, health promotion, rehabilitation, and sports training. The ASEP leaders are dedicated to unifying exercise physiologists in the United States to promote the study, practice, teaching, research, and development of the profession of exercise physiology to serve the public good.

It is unfortunate that many academic exercise physiologists think their primary function is to publish research papers to get promoted and tenured. They are not interested in promoting exercise physiologists as exercise medicine healthcare professionals. While there is a need to bring together medical doctors, exercise physiologists, health educators, physical educators, and others interested in the benefits of regular exercise, doing so at the expense of the profession of exercise physiology is simply more of the wrong thinking. Similarly, to speak of exercise science majors as exercise scientists, exercise physiologists as physiologists, and exercise physiology as a branch of physiology that simply deals with the functions of the body during exercise nothing more that a continuation of the same problematic ideas.

While the historical aspects of exercise physiology are important and noteworthy, particularly in reference to the first exercise physiology textbook, *Physiology of Bodily Exercise*, by Fernand LaGrange in 1889, the scientific work at the Harvard Fatigue Laboratory throughout the first-half of the 20th century, the research and mentoring by Peter Karpovich at Springfield College (Massachusetts), and Thomas K. Cureton at the University of Illinois, along with many other pioneers like Henry L. Taylor, Elsworth R. Buskirk, and John Holloszy at Washington University (St. Louis), Charles Tipton at the University of Iowa, and Phil Gollnick at Washington State University, the need to bring together exercise physiologists under one professional organization is important for the professional development of exercise physiologists as exercise medicine healthcare professionals. Also, as more colleges and universities throughout the United States become accredited by adhering to the ASEP Accreditation Guidelines, the quality of the exercise physiology students and their teachers will improve accordingly.

## Change and Self-Regulation

The difference between the 20th century sports medicine perspective and the 21st century ASEP perspective is that the ASEP leaders have demonstrated a commitment to the professional development of exercise physiology as a healthcare profession, not as a research discipline. This thinking is focused

appropriately on the ASEP accreditation process that drives Board Certification to hold exercise physiologists accountable to their own Code of Ethics and Standards of Practice. The significance of the Code is that both students and professionals in the study and application of exercise physiology to health and wellness, rehabilitative services, and athletics and sports training can turn to it for guidance in their professional conduct.

Adherence to the ASEP Code of Ethics is an expected self-regulatory step in the professional development of exercise physiologists. It is based on the belief that exercise physiologists are healthcare professionals who are accountable for their high-quality competence in the practice and the delivery of exercise physiology concepts, ideas, and services.

1. Exercise physiologists should accurately communicate and provide health and fitness, educational, preventive, rehabilitative, and/or research services equitably to all individuals regardless of social or economic status, age, gender, race, ethnicity, national origin, religion, disability, diverse values, attitudes, or opinions.

2. Exercise physiologists should be responsible and accountable for individual non-medical judgments and decisions about health and fitness, preventive, rehabilitative, educational, and/or research services.

3. Exercise physiologists should maintain high quality professional competence through continued study of the latest laboratory techniques and research in preventive and rehabilitative services.

4. Exercise physiologists are expected to conduct health and fitness, preventive, rehabilitative, educational, research, and other scholarly activities in accordance with recognized legal, scientific, ethical, and professional standards.

5. Exercise physiologists should respect and protect the privacy, rights, and dignity of all individuals by not disclosing health and fitness, rehabilitative, and/or research information unless required by law or when confidentiality jeopardizes the health and safety of others.

6. Exercise physiologists are expected to call attention to unprofessional health and fitness, preventive, rehabilitative, educational, and/or research services that result from incompetent, unethical, or illegal professional behavior.

7. Exercise physiologists should contribute to the ongoing development and integrity of the profession by being responsive to, mutually supportive, and accurately communicating academic and other

qualifications to colleagues and associates in the health and fitness, preventive, rehabilitative, educational and/or research services and programs.

8. Exercise physiologists should participate in the profession's efforts to establish high quality services by avoiding conflicts of interest and endorsement of products in the health and fitness, preventive, and/or rehabilitative services and programs.

9. Exercise physiologists should participate in and encourage critical discourse to reflect the collective knowledge and practice within the exercise physiology profession to protect the public from misinformation, incompetence, and unethical acts.

10. Exercise physiologists should provide health and fitness, preventive, rehabilitative, and/or educational interventions grounded in a theoretical framework supported by research that enables a healthy lifestyle through choice.

## Professionalism and Commitment to Excellence

The thinking of the 1960s, especially the development of exercise science and sports science, is corrected with the ASEP infrastructure for professionalism. In particular, now that the ASEP leaders have defined exercise physiology: "**as the identification of physiological mechanisms underlying physical activity, the comprehensive delivery of treatment services concerned with the analysis, improvement, and maintenance of health and fitness, rehabilitation of heart disease and other chronic diseases and/or disabilities, and the professional guidance and counsel of athletes and others interested in athletics, sports training, and human adaptability to acute and chronic exercise"** there is every reason to think of exercise physiology as a healthcare profession.

Also, since an exercise physiologist is a person who has either: (a) an academic degree in exercise physiology; or (b) successfully completed the ASEP Exercise Physiologist Certification exam (i.e., the EPC), graduates of all other academic programs (regardless of any similarities) cannot refer to themselves as an "exercise physiologists".

After reading the ASEP definition of exercise physiology, it is clear that the ASEP exercise physiologist is a member of a scientific-based profession with a strong interest in non-communicable diseases (NCDs) and the challenges of an aging population. Also, it is important to point out that the increasing elderly population will drive growth in the demand for safe exercise programs. In particular, the elderly population is vulnerable to several chronic and debilitating conditions that

require the services of a qualified exercise physiologist. Also, the baby-boom generation is entering the prime age for heart attacks and strokes, which will increase the demand for cardiac and physical rehabilitation programs.

The widespread interest in healthcare has increased the demand for scientifically proven services by exercise physiologists. In fact, it is clear that a growing number of healthcare employers are using ASEP exercise physiologists to evaluate physical fitness worksites and to develop exercise programs that promote the health and well-being of their employees. It is also important to remember that decades of epidemiologic evidence by exercise physiologists support the healthcare benefits of regular and properly prescribed exercise. As an example, most research shows that a client-specific exercise program results in a mild but significant decrease in systolic blood pressure and numerous other physiologic responses.

Moreover, it is scientifically recognized that an active lifestyle via regular walking and/or running are highly protective from many chronic diseases, particularly coronary heart disease by decreasing the low density lipoproteins, increasing the high density lipoproteins, and by reducing the triglyceride levels. These findings represent the epidemiological evidence that supports the hypothesis linked to the increase in physical activity and the decrease in the rate of death from heart disease. The ASEP EPC exercise physiologists are enthusiastic about promoting exercise for wellness enhancement, and they believe that the future holds great promise for the profession of exercise physiology. An excellent example is an old Indian story, as told by Robert A. Schuller (*Power To Grow Beyond Yourself*). It illustrates an awesome truth.

> The story is about a brave who went out hunting and found an eagle's egg that had fallen from its nest but miraculously remained unbroken. The Indian took the egg and put it in the nest of a prairie chicken. The eagle's egg hatched along with the other eggs in the nest, and the little eaglet grew up with the other baby birds. All his life the young eagle thought he was a prairie chicken. He learned to do what chickens do: “Scratch in the dirt for seeds and insects, cluck and cackle and fly just a few feet off the ground with wings thrashing and feathers scattering to the wind.”
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> After all, that is how chickens fly. They do not know any other way. Years passed and the young eagle became full grown. One day he looked up and saw a magnificent bird high above in the cloudless sky. The huge bird seemed to hang in the air, soaring with scarcely a beat of its huge, powerful wings. "What a beautiful bird!" he said. "What is it?" "That's an eagle – the chief of birds," somebody said. "But don't give it a second thought. You could never be like him." The eagle might have died after living the life of a chicken but, fortunately, he did give it a second thought. On another day, as he scratched in the dirt for seeds and insects, he looked up and again saw

that same majestic bird as it soared high above, its huge wings outstretched against the sky.

Strange, he said to himself. I, too, have giant wings and my feet have these huge claws that could be used for more than scratching the dirt. And so the eagle got a running start and leaped into the air, working his huge wings rhythmically and steadily as he had seen the huge bird do. Instead of rising only a few feet as usual, he soared into the sky and found his true potential and destiny. What made the difference, you might ask yourself? As the chicken-eagle soared past, he got another glimpse of excellence and, then, something clicked inside. He had always heard an inner voice whispering, "You can do more than this," but he had never responded. He had taken the advice of his chicken companions who said, "Why make more dust than necessary as you scratch your way through life? Settle for the status quo. This is the way it has always been! It is safer than the wild, blue yonder."

We are all eagles in a chicken world. Or, should I say, "We are all exercise physiologists in an exercise science world." I believe that when we look to the ASEP initiatives and perspectives, we realize status quo is not who we are, and as we find out who we are, we begin to do and be "Board Certified Exercise Physiologists." The chicken-eagle story illustrates an awesome truth: The person you see is the person you will be. The ASEP exercise physiologists have committed themselves to the pursuit of excellence. They are not interested in settling for anything else. That is why they dare to think as exercise medicine healthcare professionals. Yes, they can be a personal trainer or a fitness instructor. There are plenty chickens, and that is a good thing. But, if you want to be an exercise physiologist, then why not embrace ASEP and its infrastructure that supports the professionalism of exercise physiology?

## Reflections and Challenges

The ASEP organization is here to stay, regardless of the challenges before it. Can the leaders be sure of success? Yes! How? By never giving up, and if they never, never give up, there can be success. It all comes down to "Never Say Quit." But, please appreciate what is meant by "Never Quitting" – Literally speaking, it means "giving yourself completely over to ASEP. How? By starting with what you have where you are and supporting the ASEP exercise physiologist. This thinking is the reality of the ASEP exercise physiologist who believes that nothing can take the place of persistence and determination.

Where there is a dream, there is hope, and where there is hope, there is faith. I have faith that if not today, then tomorrow. I have faith that there are EPCs who understand they are eagles, not chickens, and that they have the passion and knowledge to create their own career opportunities, and who are exercise medicine entrepreneurs with a dream to fly high. There will be EPC exercise

physiologists: (a) who will listen and hear the message behind the ASEP words; (b) who will set priorities on behalf of the profession of exercise physiology; (c) who will refuse to spend time on things and even people who interfere with those priorities; (d) who will sort through the facts, behaviors, and feelings of the professionalization process; (e) who will determine what is important for their clients/patients, whether it is physical, emotional, and/or spiritual; (f) who will promote their healthcare services to the young and old alike, and to athletes as well as clinical rehab patients; and (g) who will make professional and ethical decisions in a timely fashion to support all ASEP exercise physiologists.

## Envisioning the Future

Today, 80% of deaths are linked to non-communicable diseases that are the result of aging and an inactive lifestyle, but it doesn't have to be that way. Imagine tomorrow with ASEP Board Certified Exercise Physiologists who know how to go after their dream and create new career opportunities that are both financially stable, credible, and extremely beneficial to the health and well-being of society. Imagine the future of exercise physiology!

> When I approached the building, I got the impression that something was special about it. I thought it might be a lawyer's office complex or a medical clinic. I parked my car in the one spot that was available. As I walked towards the building, I noticed the sign above the entrance read, "The Exercise Physiology Sports and Healthcare Complex." I was excited to see what was inside. As the door opened, a woman approached me with her hand out. As we shook hands, she said: "Thanks for visiting the future of exercise physiology and healthcare in the United States."
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> In rooms to my left there were athletes of all ages who were hooked up to metabolic analyzers while other rooms had post-MI patients on treadmills and bikes. Everyone was under the supervision of an ASEP Board Certified Exercise Physiologist. Many of the patients were being counseled for obesity, others for improving their lean muscle mass and strength, and still others for various health conditions (such as diabetes, osteoporosis, depression, and cancer). From underwater weighing to aerospace and different forms of training, there were fancy computer-driven exercise testing equipment everywhere. There were rooms dedicated to computers, statistical software, data-reduction programs, and big-screen assessment tools; all the rooms were supervised by EPCs who, I was told, were writing research papers, grant proposals, and other important reports.
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> In a very large room, there was an EPC exercise physiologist lecturing on faith, spirituality, and health. I was told that counseling by the EPCs is

a big part of the Complex. As we walked to the end of the hallway and took the stairs to the third floor, on one wall I read: "We are here to help you be stronger mentally, physically, and spiritually." The EPC who was showing me around said that the future of the profession of exercise physiology is open for more opportunities to sustain personal financial stability and, yet do so with a reasonable cost to the client than ever before. Clearly, a revolution is taking place in The Exercise Physiology Sports and Healthcare Complex and the EPCs are at the heart of the change process.

I was told that exercise physiology, as a healthcare profession, allows Board Certified Exercise Physiologists to achieve as much or as little as they are determined to do so. Clearly, the community in which the Complex is located has reached out to it and values its presence. I left the Complex significantly excited, not just for those who are helped by it, but for the students who want to be exercise physiologists. As I made my way back to my car, I passed a high school athlete bouncing a ball, a mother with her young child, maybe 5 or 6 years ladies who looked to be in their 80s, and man and his wife who looked anxious and would appear to benefit from the EPC counseling. As I looked back, they were entering the Complex with a smile.

It was then that I understood the inscription on the outer wall of the building, “The Prescription that Rescues YOU.” Frankly, I was deeply touched and wondered how many things I had missed. I should have known this all along, for I was told that the owners of the Complex had a deep visceral interest in and dedication to exercise medicine as the core ingredient to effective healthcare. As I got into my car, I found myself reflecting on the fact that exercise physiology was more than acute and chronic changes to regular exercise. As I drove away from the Complex, I was so excited to share my experience with others. Also, I was asking myself, “Why has it taken so long to discover the power of exercise to build, sustain, and to heal the mind and body while also improving performance in sports and athletic programs. Then, at that moment, I knew I needed to share my thoughts with others to help them understand the professional work of exercise physiologists.

## Healthcare Professionals

Exercise physiologists are set apart from personal trainers, fitness instructors, or so-called fitness professionals. Why? Because either they graduated from an academic exercise physiology program or they were able and willing to sit for the ASEP Board Certification exam. I know it sounds bad, but the truth is fitness instructors are not adequately prepared to safely apply anatomy and physiology for health enhancement. This is true regardless of their good intentions. Not being

academically prepared in scientifically derived principles that define much of the exercise physiologist's thinking, the risk to members of the public sector is simply too high for untoward events.

This is why the credibility of the ASEP exercise physiologist is not in question. ASEP members understand the importance of scientific concepts and appropriate hands-on laboratory experiences that support safe and effective exercise training and conditioning programs. They understand that the credibility of the exercise physiology profession is critical to prescribing safe and effective training programs for clients, patients, and athletes interested in improving their health-related fitness, rehabilitative care, and/or the athlete's physiological ability to perform in his or her sport. For these reasons, the ASEP exercise physiologists understand the physiological mechanisms underlying the required participation in various forms of exercise for different health reasons.

Recognized as a strong foundation for professionalism, the ASEP accreditation process helps to ensure that the students are exposed to a comprehensive exercise physiology education. The ASEP leaders understand the necessity to separate exercise physiology academic content from overly generic and often fragmented exercise science or human performance programs. Also, it is understood that the profession of exercise physiology is not in danger of extinction by assimilation into other areas of study. For example, during the past several decades, it has been increasingly clear that a major in sports sciences, kinesiology, or one of a dozen other titles is simply not exercise physiology, although the content is relevant for each of the intended majors. This analysis is also true with the exercise physiology major, especially since ASEP leaders acknowledge that clinical exercise physiologists working in cardiac rehabilitation is a narrow view of the exercise physiologists' career opportunities and scope of practice.

The ASEP Board Certified Exercise Physiologists are uniquely qualified to work with the apparently healthy population, whether in fitness centers or corporate settings. Fortunately, it is just a matter of time before they will replace individuals who are not qualified to develop exercise medicine prescriptions for the healthy clients and patients with cardiac and/or respiratory diseases. Entry-level or not, it is naïve to think that fitness instructors and personal trainers should direct such programs or that they should engage in wellness interventions and/or other models of secondary prevention via the exercise medicine prescription.

In fact, from the ASEP perspective, exercise physiologists have the academic and hands-on laboratory depth of knowledge that supports them as the first-choice healthcare professionals in understanding, designing, and applying effective exercise training for mind and body wellness enhancement, cardiac rehabilitation, prevention of muscular and/or orthopedic problems (particularly in the ergonomic and occupational fitness settings in regards to adults suffering from arthritis, back pain, and osteoporosis), management of stress, anxiety,

depression, and other psychophysiological symptoms, sports training, and special populations with emphasis on prescribing and/or monitoring exercise and training programs for children and senior citizens. This is done by acknowledging the importance of the ASEP Standards of Exercise Physiology Practice that provide what exercise physiologists believe is the professional framework for understanding the scope of exercise physiology practice as it applies to the ASEP Board Certified Exercise Physiologists. The Standards demonstrate the educational requirements for attaining professionalism and recognition through the practice of exercise medicine to extend and improve quality of life of the patient and/or client.

## Exercise Medicine

As credible professionals with a scientific background, ASEP exercise physiologists recognize the positive impact that regular exercise has on many clinical conditions, longevity, health, and aging. Regular exercise increases the body's transport of oxygen to the working muscles and their ability to use the delivered oxygen. Along with the decrease in heart rate at rest and during exercise, there is an increase in stroke volume at the same cardiac output that delivers oxygen to the different tissues throughout the body. Other changes include a favorable lipoprotein profile, increased bone density, and stronger ligaments and tendons throughout the body. Endurance training results in myoglobin and glycogen adaptations, along with an increase in the number and the size of mitochondria, as well as the enzymes specific to energy development within the skeletal muscles.

Regular exercise increases the capacity to engage in physical activity and plays an important role in primary and secondary prevention of cardiovascular disease. It results in a lowering of blood pressure in certain individuals with high blood pressure. Also, regular exercise helps to correct the independent risk factor of physical inactivity and its relationship in the development of coronary artery disease. Numerous studies indicate that blood lipid reduction, smoking cessation, regular exercise, and weight control significantly decrease the rate of progression and even promotes the regression in the atherosclerotic lesions in persons with coronary disease.

ASEP Board Certified Exercise Physiologists are in the driver's seat with both the opportunity and the responsibility to promote exercise medicine as well as the teaching and counseling of lifestyle changes in risk factors for diseases and disabilities along with other health promotion strategies. They not only teach about the health problems resulting from obesity, but they are part of only a few healthcare professions that teach, measure, analyze, and publish data about body mass index. They teach that physical inactivity and the level of fatness are strongly related to watching television. That is why they teach that losing weight and keeping it off is most successfully done when exercising on a regular basis.

This is an important point since exercise physiologists understand the power of exercise as an “exercise medicine profession”. This point should help lead physicians and others to use exercise physiologists in assessing a baseline body-composition in their patients along with the incorporation of exercise in losing weight and improving self-esteem through regular exercise. Physicians should incorporate Board Certified Exercise Physiologists in their practice along with Physician Assistants, particularly in regard to their patient’s cardiovascular assessments and the teaching of an exercise prescription to help guide their patients in living a healthier lifestyle. In fact, it is increasingly clear that that exercise physiologists can be and in certain regions of the United States are the scientific cornerstone in the multidisciplinary approach to managing and preventing obesity.

Regular exercise is a cost-effective treatment for depression, and as well it helps to protect against the development of depression. In fact, exercise compares favorably to individual psychotherapy, group psychotherapy, and cognitive therapy, and it is a necessary ingredient in behavioral treatments that decrease self-reported pain in individuals with chronic pain. Regular exercise is also recommended as an adjunct treatment in the more traditional treatment programs for schizophrenia, conversion disorder, and alcohol dependence. The evidence is clear that regular exercise is a viable, cost-effective medicine for many of the common behavioral health conditions. ASEP Board Certified Exercise Physiologists are encouraged to pursue jobs in this area of healthcare and, equally important, the directors and administrators of these programs need the ASEP exercise physiologists for they are recognized exercise medicine healthcare professionals.

For decades, exercise physiologists have encouraged sedentary clients and patients to adopt a more active lifestyle for mental and physical reasons. They have also documented the importance of providing systematic follow-up exercise tests in the development of individualized exercise medicine prescriptions, which are followed by walking and low-intensity jogging as the primary mode of treatment. When clients and patients comply with the prescribed program, their mental and physical abilities improve. There is a lowering of the myocardial work requirement and improvement in peripheral factors that increase oxidative enzymes that help with the use of oxygen delivered to the working muscles. Thus, ultimately, there is a decrease in the oxygen cost at the same submaximal exercise intensity that parallels a decrease in the work of the lungs (i.e., metabolic cost of breathing). The latter is facilitated by an increase in tidal volume, decrease in frequency of breaths, and an improvement in alveolar ventilation.

The ASEP Board Certified Exercise Physiologists understand the importance of including resistance training in an exercise program to improve health and help prevent chronic diseases. Resistance training prevents a decrease in skeletal lean muscle mass and function during extended periods of physical inactivity and

aging. The research indicates that adaptation to resistance training lowers the cortisol response to acute stress, increases total energy expenditure, and relieves anxiety, depression, and insomnia in clinical depression. Resistance training has beneficial effects on bone strength, osteoarthritic symptoms, high blood pressure, lipid profiles, and exercise tolerance in post-MI patients and others with coronary artery disease.

The ASEP exercise physiologists are healthcare professionals who understand the science of the exercise prescription, whether it is engaging in resistance exercise or in aerobic exercise. They understand that a typical workout consists of 8 to 10 exercises to cover the major muscle groups (e.g., chest, shoulders, arms, back, abdomen, thighs, and lower legs) and that the resistance should be moderate, which is defined as 30% to 40% of 1 RM for upper body exercises and 50% to 60% of 1 RM for lower body exercises. When 12 to 15 repetitions can be accomplished with little difficulty, weight is increased. This progressive resistance strategy meets the requirements of the overload principle, which is the basis for improvement in muscle strength. Similarly, exercise physiologists apply the overload principle in aerobic training through the interplay of four variables: intensity, duration, frequency, and type. When the scientific principles of the exercise prescription are followed, aerobic power ($VO_2$ max) is increased 5% to 30%.

## Physiology of Exercise Testing

At rest, oxygen consumption ($VO_2$) is approximately 250 mL/min, depending upon body size and metabolism. For example, at rest, on average, cardiac output is 5 L/min and tissue extraction is 50 mL/L (or 5 mL/100 mL of blood). It is a simple matter of multiplying cardiac output (5 L/min) times tissue extraction (50 mL/L) to determine $VO_2$, which equals 250 mL/min. With exercise, $VO_2$ may increase to 3 L/min or 3000 mL/min. This means cardiac output would increase from 5 to 20 L/min and tissue extraction, that is, a-$vO_2$ diff, would increase from 50 to 150 mL/L. Hence, the cardiovascular response during exercise results from both central (cardiac output) and peripheral (a-$vO_2$ diff) adjustments. For example, cardiac output may increase in accordance with the adjustments in heart rate from 70 bpm at rest to 190 bpm during exercise, with stroke volume changing from 70 mL/beat at rest to 106 mL/beat (i.e., 20 L/min = 190 bpm x 106 mL/beat). The stroke volume for untrained males may approach 120 to 130 mL/beat while for the trained males, it may be 140 to 160 mL/beat.

For highly trained elite athletes, maximal stroke volume may reach or even exceed 200 mL/beat. The values for women are lower than those for the men. Maximal stroke volume for untrained and trained women is between 100 mL/beat and 120 mL/beat, respectively. Systolic blood pressure within the left ventricle helps to ensure that the blood is ejected into the vascular system. It may average a maximum of 190 to 200 mmHg. Because blood pressure is also directly related

to afterload (i.e., systemic vascular resistance) and the left ventricular wall stress, cardiac workload is significantly increased during exercise. As an example, with a heart rate of 190 and a systolic blood pressure of 200, the heart's need for oxygen would be 380 mL of $O_2$ per 100 grams per minute compared with the cardiac work at rest (e.g., heart rate of 70 and a systolic blood pressure of 120 equals 84 mL of $O_2$ per 100 grams per minute).

The graded exercise test provides a noninvasive method of estimating the integrity of the heart, given the linear increase in cardiac output and oxygen consumption with heart rate contributing more to cardiac output than stroke volume (since it tends to increase minimally above 40 to 50% of $VO_2$). The ASEP Board Certified Exercise Physiologists use the test to design individualized exercise prescriptions to assess the physiological effects of an exercise training or rehabilitation program. Also, the test is useful in assessing the role of different medications and/or arrhythmias at rest and during exercise as well as the effectiveness of coronary artery surgery. The ASEP Exercise Physiologist believes the test is safer when there is a physician alongside the client (and/or patient), especially when dealing with a decrease in the post-MI subject's blood pressure and/or an increase in chest pain. Also, if there are ECG changes or even should the subject simply want to stop the test, medical support is always good to provide any necessary assistance.

While there are several different devices for testing clients, the treadmill is often better than the bicycle. The Bruce protocol is historically the preferred treadmill test, especially in cardiac rehabilitation programs. However, there are numerous other testing protocols used to evaluate the subject's functional capacity. The Balke-Ware is an excellent test because of its constant treadmill speed of 2 or 3.3 mph and grade increments of 5% every 2 to 3 minutes. During the test, the ASEP Exercise Physiologist looks for indications to continue the test or contraindications to stop the test. Several indications for stopping the test include ST-segment changes, such as depressions that are indicative of subendocardial ischemia or elevation that is due to transmural ischemia and premature ventricular contractions (PVCs) that suggest myocardial irritability due to ischemia.

## Exercise Prescription

To "prescribe" exercise safely, knowledge of exercise physiology is required. This means more than taking one course in exercise physiology. It is a comprehensive knowledge and integration of the exercise physiology course work, which is typically 10 or more academic courses. Specifically, prescribing exercise on an individualized basis requires knowledge of the following academic courses: exercise physiology, psychophysiology, sports nutrition, applied anatomy, sports biomechanics, and resting and exercise electrocardiography (ECG) with specific information regarding the acute and chronic adaptations to regular exercise.

Knowledge of cardiovascular and muscular physiology and the relationship of both to systematic work placed on the body along with health and/or medical status, age and gender considerations with respect to kilocalorie and metabolic equivalents (METs) are also necessary in overseeing the development of the individualized exercise prescriptions.

In addition to an understanding of exercise overload and specificity as foundational concepts to the individualized exercise prescriptions, the ASEP Exercise Physiologists must demonstrate knowledge of frequency, duration, intensity, type of exercise, and progression. The physiological benefits that result from the individualized exercise programs are directly related to the work placed on the body. Work is defined as the combined effect of frequency, duration, and intensity of exercise. Frequency of exercise should be at least 3 times a week with the possibility of increasing to 4 times a week after several weeks or even a month of regular exercise.

Exercise sessions should be 20 to 30 minutes in duration with a gradual increase to 40 to 60 minutes if the intensity of the exercise is low to moderate. The duration component of the exercise program is usually divided into three parts: (a) 5 to 10 minutes of warm-up; (b) 15 to 40 minutes of overload or sustained exercise; and (c) 5 to 10 minutes of cool-down, for a total of 25 to 60 minutes of exercise. Intensity is usually regulated by heart rate, although there are other methods (such as METs, $VO_2$ max, and RPE). It is always better to begin exercise at a low intensity and progress accordingly, such as from 30% to 50% of heart rate maximum. Exercise at low to moderate heart rate intensity for a longer duration is better than exercising at high intensity for a shorter time. It is not only a safer way to exercise, it also allows for an increase in the use of fat as the primary energy substrate.

## The ASEP Leadership

Professional leadership is everyone's business. It is 100% necessary to transform yesterday's thinking, values, and actions into tomorrow's reality of a better healthcare system. Today, there is an increase in demand for leaders who can build a shared community to improve the professional services to the public sector. The ASEP leadership is especially important in the long-term development of ASEP Board Certified Exercise Physiologists as credible exercise medicine healthcare professionals. In this way, by strengthening a shared voice, their unity is forged in pursuit of a commitment to their shared understanding of the future. The ASEP leadership helps the members to envision their exercise medicine healthcare future, to find meaning in their dreams and aspirations, and to seek opportunities to make a difference in the profession of exercise physiology as exercise medicine professionals, and sports and athletics.

The ASEP Vision is perhaps one of the greatest gifts given to the exercise physiologist. It generates hope, provides personal and professional endurance, and motivates the discouraged. No matter how difficult, the essence of the ASEP vision is 3-fold: (a) To be recognized as the leading professional organization of American scholars and practitioners in the study and application of exercise physiology to fitness, health promotion, rehabilitation, and sports training; (b) The ***American Society of Exercise Physiologists*** is dedicated to unifying exercise physiologists in the United States to promote and support the study, practice, teaching, research, and development of the exercise physiology profession; and (c) Through proactive and creative leadership, the Society empowers its members to serve the public good by making an academically sound difference in the application of exercise physiology concepts and insights.

## The Key to the Future

Vision is more than what you see. Vision is opening your eyes -- and your mind's eye, as well -- to that inner place where you see and foresee, where you dream and imagine and create. You could be satisfied with the status quo. You could be content to leave things as they are. You could choose not to "rock the boat, upset the apple cart, or make waves." You could repeat the sad and dangerous words, so often heard: "But we've *always* done it this way." But then you and your business would probably not improve, not progress, not prosper.

Hence, the ***American Society of Exercise Physiologists*** (ASEP) is the key to exercise physiology as an exercise medicine healthcare profession. It is not status quo, and it certainly does "rock the boat and upset the apply cart." Thank goodness for the existence of ASEP, especially given the standard mentality of "But what about exercise science and sports medicine?" Honestly, when are exercise physiologists going to wake up and stand up for their profession and who they really are? Exercise science, kinesiology, sports medicine, and human performance do exist, but they are not Exercise Physiology. That doesn't mean they are not important. Of course they are important for many reasons, but they are not the academic degree or the professional organization of an academically prepared or ASEP Board Certified Exercise Physiologist.

The key to the exercise physiologist's future is the ASEP vision to unify exercise physiologists and to serve the public through the application of sound exercise medicine healthcare procedures. That is why ASEP exist, and every person who is an exercise physiologist should be a member of the ASEP organization to broaden their knowledge, to develop skills as a leader, to become certified to demonstrate excellence in the practice of exercise physiology, to cultivate partnerships, to stay on the cutting edge of professional development, to maintain social connections, to stay inspired and grow personally, and to make a difference in the lives of their clients and patients.

As Ernest Holmes said in ***The Science of Mind: A Philosophy, A Faith, A Way of Life***, “What we outwardly are, and what we are to become depends upon what we are thinking….” Holmes also said the following, “We should erase the thoughts of yesterday that would rob us of today’s happiness.” So, “Know your own mind. Train yourself to think what you wish to think; be what you wish to be; feel what you wish to feel and place no limit on Principle.”