Exercise and HIV

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INTRODUCTION

Human immunodeficiency virus (HIV) is a retrovirus that progressively lowers the body’s CD4+ cell counts and impairs the immune system. Acquired immunodeficiency syndrome (AIDS), a chronic, life-threatening condition that is caused by HIV, is the final stage of the HIV infection (see Table 1). At the end of 2003, an estimated 1,039,000 to 1,185,000 persons in the United States were living with HIV/AIDS, with 24% - 27% undiagnosed and unaware of their HIV infection. Many unfavorable metabolic and morphological abnormalities are associated with HIV, particularly body composition and muscle wasting.

The standard treatment for HIV is a combination of medicines called highly active anti-retroviral therapy (HAART). Antiretroviral medicines slow the rate at which the virus multiplies and promotes favorable virological control, which significantly decreases the morbidity and mortality associated with HIV. Although the introduction of HAART has improved longevity among HIV patients, HIV and its therapy have been associated with the development of several metabolic complications and may put patients at an increased risk of metabolic and cardiovascular diseases. Examples of metabolic complications related to HIV and HAART include dyslipidemia, lipodystrophy (swollen abdominal region with loss of fat tissue in the face and extremities), insulin resistance, and diabetes mellitus. In regards to cardiovascular disease (CVD) and HIV-infected patients, one study reported a 32% increase in the relative risk of CVD over five years following the initiation of HAART. Metabolic syndrome, the clustering of specific cardiovascular risk factors, is another metabolic complication of HIV and HAART. The prevalence of metabolic syndrome in HIV-infected patients ranges from 17% - 45.5% and is associated with greater insulin resistance. In patients who develop metabolic syndrome while on HAART, the risk of developing diabetes increased four to five-fold while CVD risk increased three-fold. Lipodystrophy is another notable complication associated with HAART and is the most difficult to reverse. It is characterized by loss of fat in the face, arms, and legs and the accumulation of fat in the abdomen.

The cost of improved immune function and
life expectancy for HIV-infected patients on HAART is severe metabolic complications. These individuals are now living longer, but with more chronic diseases. Participation in an exercise program may be an important non-pharmacological alternative to improve the metabolic and morphological features of HIV/AIDS.

**Table 1. Stages of Human Immunodeficiency Virus**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>Stage 1</td>
<td>Primary HIV infection and seroconversion (HIV negative to HIV positive).</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Stabilization of the viral load (early disease stage). CD4+ count &gt;500 cells/mm-3.</td>
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<tr>
<td>Stage 3</td>
<td>CD4+ cell count falls to 200 – 400 cells/mm-3. Skin disorders become evident. Increased risk of advancing to stage 4 if disease left untreated.</td>
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<tr>
<td>Stage 4</td>
<td>CD4+ cell count drops below 200 cells/mm-3. This stage meets the Centers for Disease Control and Prevention definition for AIDS. Risk increases of developing opportunistic infections.</td>
</tr>
<tr>
<td>Stage 5</td>
<td>HIV infection is uncontrolled and CD4+ cell counts drop below 50 cells/mm-3. Risk of death from opportunistic infection is highly probable.</td>
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*Smith et al.*

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**Opportunity… Continued from Page 1**

led to monthly haircuts, but I certainly don’t fault others for their choices. Yet, when money gets tight, people naturally gravitate to expenditures based on needs rather than wants. It follows that if we are unable to demonstrate the tremendously high value and need for regular exercise, we are at the mercy of becoming a nonessential budget cut.

So far, the impact of the recession on the health-club industry is unclear. An informal survey recently conducted by the International Health, Racquet and Sportsclub Association (IHRSA), a trade group, found that two-thirds of the 200 respondents said business in January 2009 met or surpassed their expectations.

However, the remainder reported that low usage among existing members and poor sales for new memberships led to monthly results that were dismal compared with the previous January. IHRSA expects to release industry-wide performance results for the fourth quarter in the near future.

This naturally circles back to increasing the value of the services that we provide, which might mean pointing out the benefits of exercise beyond improving appearance. Robert Sallis, M.D., FACS, the immediate past-president of ACSM and the founder and chair of the Exercise is Medicine™ (EIM) task force often starts his EIM-related presentations with this statement: “If there was a pill that could provide both the preventive and rehabilitative benefits that exercise offers, it would be the most widely prescribed drug in the world.” Exercise is truly medicine and there is no better time to promote the contributions that we as health and fitness professionals can make than now!

The ExercisesMedicine.org Web site has slides for health and fitness professionals to use or modify for various audiences that present the value of exercise as medicine. This then could be used as a platform to promote your own services.

You might also consider modifying your services to include packages for moderate-income or financially challenged populations. How about a one-visit offering with monthly optional follow-ups? Or, consider selling 10-visit packages that are spread over three to six months? I know this is counter to the current model for personal training, but it is centered around working toward supporting your clients and/or patients in becoming independent exercisers.

These are challenging times for many people and now more than ever our support as fitness professionals is needed and a valuable contribution to quality of life. Let’s think creatively in a manner that will contribute to the health and well-being of others and continue to move our profession to a status of a valued health care service provider.
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Another study examining aerobic training in adults with lipodystrophy and dyslipidemia, a mean reduction of 12 cm in visceral fat was noted, as well as a reduction in total cholesterol and fasting triglycerides and in increase in HDL cholesterol. Both of these studies suggest that aerobic training may reduce central body fat, which is an important factor in reducing cardiovascular risk factors.

Metabolic complications arising from HIV and HAART and AIDS related wasting have been found to be associated with a decline in physical functioning and quality of life. Resistance training (RT) has the ability to increase lean body mass and reduce fat mass in individuals who have HIV. However, many studies are inconsistent in their findings. One notable study showed that participants in an eight-week RT program significantly increased their fat free mass while decreasing their fat mass. Another study examining the effects of RT on body composition showed a whole-body lean mass increase of 2.5% and a 2.6% increase in trunk adipose mass. This study also noted a decrease in fasting triglycerides. These studies suggest that a progressive RT program may be effective intervention for patients suffering from AIDS-related wasting.

Combined aerobic and RT may be a more effective adjunct therapy for patients with lipodystrophy than either type of training alone. Jones et al. reported that aerobic and RT combined has the potential to reduce central body fat redistribution and results in positive changes in body composition. Combined aerobic and progressive RT also has been found to significantly improve muscle size and quality. These changes in muscle included decreases in muscle fat, which may contribute to improved metabolic profiles in HIV-infected individuals. Furthermore, improvement in strength and muscle mass may help ameliorate the metabolic complications of HIV/AIDS and the negative metabolic side-effects of HAART.

EXERCISE TESTING AND PRESCRIPTION

Individuals with HIV can undergo exercise testing similar to that of someone without the infection. However, their exercise tolerance may be limited due to a number of factors. Often, depending on the stage of the disease, individuals taking antiretroviral medications (i.e., HAART) suffer from nausea, vomiting, and become easily fatigued. Thus, the type of exercise test (or the decision not to test) that is to be conducted will be based on the clinical judgment of the exercise professional (e.g., RCEP, CES). If the individual has led a relatively active lifestyle and maintained a higher level of fitness, they may tolerate a treadmill test, conversely, if the individual to be tested leads a sedentary lifestyle, or they are in a later stage of the HIV (i.e., stage 3 or 4) (see Table 1) they may not be candidates for exercise testing.

Regular physical activity and/or exercise can favorably impact the devitalized state of many individuals suffering from HIV. Varying, but measurable improvements of the five components of fitness (cardiovascular fitness, muscular strength and endurance, body composition, and flexibility) can be seen following exercise training in individuals with HIV. These individuals do not need any special supervision beyond that of teaching the appropriate exercise techniques, progression, and safety. The primary concerns of the exercise professional when designing physical activity/exercise programs in this population is to be aware of the current fitness/activity level of the individual, stage of the disease, medication regimen and side-effects, and fatigueability (see Table 2). The exercise professionals understanding of HIV, the medications prescribed and their numerous side-effects, and their compassion to want to help those with this infection improve their quality of life are essential.

SUMMARY

Today, due to medical advances and an increased focus by the individual on their own well being, many individuals who are HIV+ are living relatively normal lives. Beginning an exercise program or maintaining a physically active lifestyle is one way to help improve the quality of life of not only the apparently healthy population, but also those diagnosed with chronic conditions like HIV. The exercise professional has a role in helping these individuals meet their fitness goals, while understanding the limitations involved with working with this special population.

REFERENCES


About the Authors

Nicolette Casato is a community health major at the University of North Florida in Jacksonville, Florida. Nicole is completing her internship at Shands Hospital in Jacksonville, which is affiliated with the University of Florida. Nicole is trained in human subject research and serves as a research assistant and volunteer in the Emergency Department. She is currently assisting in the data collection for a metabolic syndrome research study.

James R. Chiuilla, Ph.D., M.P.H., M.S., RCEP, CSCS is an assistant professor of Exercise Physiology and Physical Activity Epidemiology in the Brooks College of Health at the University of North Florida in Jacksonville, FL. His research focuses on physical activity, the metabolic syndrome, and population health. James is ACSM Program Director Certified, an AT-Large Member of the SEACSM Executive Board, and a current member of the ACSM Publications Subcommittee. James is a member of the ACSM, the American Heart Associations Council on Nutrition, Physical Activity and Metabolism, the American Physiologic Society, and the National Strength and Conditioning Association.

Table 2. Primary Concerns of the Exercise Professional Working with HIV + Clients

- Stage of Disease (See Table 1)
- Current fitness and/or physical activity level of their client
- Medication regimen and side-effects
- Fatigability
Osteoporosis and Osteopenia:  
A Guide to Proactive Bone Health

By Peter M. Magvary, Ph.D., HFS, CSCS,  
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INTRODUCTION

Many exercise professionals mistakenly categorize bone health as an aging issue. Bone health is an issue that should be addressed with clients of all ages, and both sexes. The manner in which exercise professionals address bone health, with exercise prescription, will be somewhat age dependent. A thorough understanding of the etiology and terminology involved with bone health as well as an awareness of the definitions of disease criteria are essential tools an exercise professional (e.g., RCEP, CES, HFS, CPT) should possess.

Throughout one’s life, bone undergoes a dynamic process of breakdown (resorption) and formation known as remodeling. Bone remodeling is a natural process that involves cells that act on degrading older bone (osteoclasts) and cells that stimulate the building of new bone (osteoblasts). During childhood, adolescence, and early adulthood the balance between these processes favors bone formation with peak bone mass being attained sometime during the second or third decade of life. After the third decade, there are a combination of lifestyle choices and natural physiologic processes that eventually shift the balance of bone remodeling in favor of resorption.1 If specific steps are not taken to optimize bone formation (build up bone mineral reserves) early in one’s life and minimize the resorptive process that follows as one ages, bone loss may progress to the level of osteopenia or osteoporosis (See Table 1).

Osteoporosis and osteopenia are skeletal disorders characterized by a compromise in bone strength. Bone strength is reflective of bone mineral content (grams of mineral per area of bone), most commonly referred to as bone mineral density (BMD). A person can be classified as having normal bone strength with a BMD that is either above the mean or does not exceed one standard deviation below the mean of peak values for young normal adults. Osteoporosis is defined as a BMD of ≥ 2.5 standard deviations below mean peak values for young normal adults and represents an increased susceptibility to fracture. Osteopenia (low bone mass) is defined as a BMD that is between 1.0 and 2.5 standard deviations below mean peak values for young normal adults. It has been estimated that 44 million Americans have osteoporosis or osteopenia and that one half of all women and one quarter of all men over the age of 50 will suffer a fracture related to these disorders during their lifetime.7

There are a host of nutritional, pharmacological, and exercise interventions which can be employed in the prevention and treatment of osteoporosis and osteopenia. The remainder of this paper will focus primarily on exercise interventions for individuals of various ages and stages of bone health. As with other chronic health issues, bone health is most effectively addressed with preventative measures that begin early in life.

EXERCISE PRESCRIPTION FOR THE YOUNG CLIENT: OPTIMIZING PEAK BMD

With prevention in mind, clients less than 30 years of age should concentrate on an exercise program that optimizes peak BMD. The level of BMD that is achieved during early adulthood is an important predictor of subsequent bone mineral status later in life. While all types of physical activity should be encouraged in children and adolescents, there are specific activities that will enhance the osteogenic (bone formation) impact. Children and adolescents should be encouraged to participate in sports (e.g., soccer, basketball, gymnastics, track and field, etc.) or other activities that generate relatively high ground reactive forces such as running, skipping, and jumping. Active children who participate in activities that generate high impact forces have higher bone mass than children who engage in low impact activities (e.g., walking) or non-weight bearing activities (e.g., swimming).1

Young adults can add other physical activities that generate relatively high intensity loading forces such as plyometrics and high-intensity resistance training. It is important to remember the exercise principle of specificity that in only the bones that are stressed by a specific activity receive an osteogenic stimulus. Therefore, including resistance exercises that focus contraction on the hip (e.g, leg press, squat) and spine musculature (e.g., back extensions) will help optimize peak BMD values in regions that are prone to resorptive bone loss in later years.

Exercises intended to stimulate an osteogenic effect should be focused primarily in the exercise programs of children, adolescents, and young adults at a minimum frequency of three days per week and duration of 10-20 minutes.1

EXERCISE PRESCRIPTION FOR THE MIDDLE AGE CLIENT: MAINTAINING PEAK BMD

With clients between the ages of 30 and 50, exercise programming should focus on activities that will maintain BMD’s at or near peak levels. Exercise professionals should pay particular attention to the principle of reversibility in middle-age clients. Too few middle-aged adults have kept up with the level of physical activity that they performed at younger ages. Therefore, bone loss may exceed 0.5% per year after the age of 40, independent of sex or ethnicity.1

With the focus on maintaining BMD, the high intensity activities needed to build a healthy bone base during youth can be scaled back to moderate to high intensity bone loading forces during middle age. While the

<table>
<thead>
<tr>
<th>Table 1. Bone Health</th>
<th>Diagnostic Criteria</th>
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<tbody>
<tr>
<td>Normal</td>
<td>BMD that does not exceed one standard deviation below the mean</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>BMD that is between 1 and 2.5 standard deviations below the mean</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>BMD of ≥ 2.5 standard deviations below the mean</td>
</tr>
</tbody>
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Note: BMD = Bone Mineral Density

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Coaching News

Exercise Is Medicine™: Doctors, Coaches, & Clubs

At long last, the ACSM/AMA Exercise is Medicine™ initiative acknowledges that exercise is a breakthrough medicine which is safe and effective to prevent or ameliorate most common medical conditions. This initiative offers health clubs a new opportunity to reach out to the medical community, and open up markets for new members and programs. What will it take for success?

Deploy the cutting edge toolbox of the fitness or wellness coach. The combination of the professional coach’s toolbox with clinical exercise physiology has unleashed a new generation of certified fitness and wellness coaches. Not only are they skilled at helping people build and sustain healthy lifestyles, they impress physicians with their command of exercise science along with their ability to help people make lasting change. While personal training is valuable to many, training sessions alone often do not provide the skill and support to move people to take charge and sustain regular exercise. Coaches promise to be an important bridge between the club and the physician to implement Exercise is Medicine™.

Help physicians spark patient motivation to adopt fit lifestyles. Medical schools spend little time teaching students about exercise prescription or how to help patients pursue healthy lifestyles. Clubs and coaches have a unique opportunity to assist doctors with the exercise prescription of their patients and provide them with a resource to use short physical visits to spark patient motivation to get fit. Further, offering trial club memberships and coaching programs to physicians and their staff will help them learn what coaches do and why it is important to walk the walk.

Build trust and collaborative relationships with physicians. To build trusting relationships, physicians appreciate open communication and detailed background information from clubs on the credentials of their employed fitness professionals and coaches, on equipment and programs available for people who are sedentary and have health risks, and a communication method to receive concise feedback on the progress of their patients. Being honest about what your facility offers and communicating about patient progress is essential to a lasting collaboration with physicians. A short summary of a patient’s fitness or wellness plan and goals, including motivators, strengths, and challenges is valuable. Detailed feedback (data) to physicians should be tailored to address the reason the physician advised the referral, such as BMI, waist circumference, blood pressure, and heart rate measurements for someone who is overweight and hypertensive.

Cultivate your market. Cast a wide net. In addition to working directly with physicians, including alternative medicine, may also be an option. Examples may include chiropractors, acupuncturists, and rehabilitation facilities. To facilitate the relationship, set up fact finding meetings with these providers to uncover unmet needs of their patients, then offer your memberships and programs that meet the needs of their patients. Examples could include a club membership plus a wellness coaching program, short-term membership for first time exercisers, prevention programs or lecture series for patients with risk factors and rehabilitation programs.

Learn from success stories. The Theraoue Club partnered with a local hospital to deliver the Prelude program first to its employees, and later to patients via physician referrals. The Prelude program was an 8-week introductory membership that included weekly sessions with a wellness coach, personal trainer, and nutrition consultations. On-site fitness programs are offered at the hospital to further the project’s goals of joining the club and reinforce the club’s brand. To reciprocate, hospital clinicians present educational sessions for club members on prevention and health care. A win-win for the club and hospital!

Adapted from The IHRSA Report/Club Advisor: The Exercise is Medicine™ Advantage with permission at www.ihrsa.org/chi

Laura Klein, Wellness Director, Theraoue Club, Concord, MA; www.theraoue.com
Beth Frates, MD, Clinical Instructor, Harvard Medical School, Director of Education, Institute of Lifestyle Medicine; www.instituteoflifestylemedicine.org
Margaret Moore, CEO, Wellcoaches Corporation, www.coachmeg.com

Join Wellcoaches Corporation... a strategic partner of the ACSM and Medical Fitness Association, for a one-day workshop on wellness and health coaching core competencies.

This workshop is appropriate for both experienced coaches and for those new to coaching. Learn current evidence based positive coaching psychology and skills, and how to work with your clients in a way that gives them the power and confidence to make lasting lifestyle changes.

**Location Sites for 2009**

Dallas, TX  Boston, MA  Portland, OR  Cincinnati, OH  Minneapolis, MN  Orlando, FL

Register at www.wellcoach.com

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REFERENCES


For a complete list of references email: certification@acsm.org.
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continued involvement in sports such as tennis, basketball, volleyball, and soccer should be encouraged, the inclusion of weight bearing (e.g., stair climbing, elliptical exerciser, moderate to high impact group exercises, jogging) and resistance training exercises help fill the exercise gap. Weight bearing endurance activities should be performed three to five days per week and resistance training exercises encompassing all major muscle groups, in the 8-10 rep maximum range, should be performed two to three days per week.\(^1\)

EXERCISE PRESCRIPTION FOR THE OLDER CLIENT: DEPENDENT ON CURRENT BONE STATUS

Exercise programming for clients over the age of 50 will be heavily dependent upon the level of attention placed on proactive bone health (earlier in life) and current bone status if preventative exercises were either ignored or underutilized in optimizing or maintaining peak BMD. For older clientele who have a BMD within the normal range, the exercise prescription should concentrate on maintaining BMD and/or minimizing bone loss as the body adjusts to a changing hormonal milieu that favors bone resorption. In this population, the exercise prescription would not vary greatly from that recommended for the healthy middle-aged persons mentioned above. The primary difference would be that as age increases, attention paid to safety issues such as balance and exercise intensity must increase as well.

In older adults who have been diagnosed with osteopenia, exercise prescription should focus on preventing further bone loss. The exercise prescription should include moderate resistance training loads of 12-15 rep-maximums (attention should be placed on preventing compressive forces on the vertebral column), two to three days per week, and weight bearing endurance activities. Additionally, attention to nutrition (calcium, vitamin D) and pharmacologic intervention (bisphosphonates, calcitriol, estrogens) may be needed to realize improvement in BMD. Those who were taking either bisphosphonates or calcitriol realized significant improvements in BMD when resistance training was added to the pharmacologic intervention, while subjects on pharmacology alone were unable to realize improvements.\(^1,2\)

The exercise prescription for older adults diagnosed with osteoporosis presents additional challenges for the exercise professional. Many of the activities with high bone loading forces (recommended to increase BMD in non-osteoporotic patients) are contraindicated for patients with osteoporosis. Contraindicated exercises include running, jumping, jogging, rowing, plyometrics, high-intensity resistance training, and any type of spinal flexion, especially when combined with a resistive or twisting movement.\(^3\,^4\)

Prior to prescribing exercise for an individual with osteoporosis the exercise professional should consult with the clients’ physician.

Exercise programs most suited for osteoporotic patients focus on fall prevention. These include conservative muscle strengthening, aerobic/endurance, balance, and agility exercises. Recommendations include walking or stationary cycling, conservative resistance training with 8-10 exercises of 15 repetitions, performed one to two days per week, and range of motion exercises that avoid spinal flexion.\(^4\) Unfortunately, more specific resistance training guidelines, with regard to intensity, are not available at this time. Treatment may also rely heavily on pharmacologic and nutritional interventions.

SUMMARY

Bone health is an issue that should be addressed with clients of all ages. The exercise prescription varies throughout the lifespan beginning with building a strong foundation of bone prior to the age of 30, preserving as much bone as possible through the aging process, and understanding the exercise limitations of patients diagnosed with low BMD. As with all exercise prescription in special populations, it would be prudent to obtain medical clearance (prior to exercise testing and training) of individuals diagnosed with either osteoporosis or osteopenia.

References

About the Author
Peter M. Magani, Ph.D., HFS, CSCS is an assistant professor of exercise physiology in the Brooks College of Health at the University of North Florida in Jacksonville, FL. He has collaborated on several studies designed to investigate the impact of resistance exercise training on bone health.
Peripheral Arterial Disease

By Nina Markil, B.S.
Exercise Science and Health Promotion at Florida Atlantic University.

Peripheral arterial disease (PAD), also known as peripheral artery occlusive disease, is the most common form of peripheral vascular disease (PVD), with an estimated 8-12 million American adults who are affected.1 Health and fitness professionals may see a rise in the number of exercisers with PAD as the benefits of exercise in this population become better known. Therefore, fitness professionals must be aware of the possible exercise limitations of this population, as well as their health goals and the benefits that can be achieved through physical activity (PA) and patient education.

Peripheral arterial disease is characterized by occlusion of arteries in the limbs due to endothelial dysfunction and atherosclerosis in the vascular beds of the lower extremities.7 Inadequate circulation to the legs, or limb ischemia, especially during PA can cause painful and physically limiting leg pain, known as intermittent claudication. Consequently, individuals with intermittent claudication have ambulatory dysfunction that affects their ability to carry out activities of daily living and can inhibit their ability and desire to exercise, which negatively affects their health risk profile for other cardiovascular diseases.4 Exercise may improve the clinical outcome of patients with PAD by improving their risk profile. Therefore, it is critical that PA not only be encouraged, but that exercise be supervised to ensure proper safety and program maintenance.

RISK FACTORS

Because atherosclerosis has already affected the vasculature of the lower limbs in those with PAD, it is likely that these individuals may also develop atherosclerosis in coronary and/or cerebrovascular arteries as well. Lifestyle modification including regular PA can help manage risk factors and may help slow progression of such diseases. The health fitness professional can help by encouraging regular physical visits, motivate the patient to stay committed to PA/risk modification goals, and raise patient awareness through education.

DIABETES

Diabetes is the number one risk factor for peripheral vascular disease and puts individuals at a 1.5 to 2.0 times greater risk of developing PAD than those without diabetes.6 Tight glucose control (maintaining healthy blood sugar levels) in those with diabetes with PAD may be a method to deter the progression or severity of the disease. Therefore, the American Diabetes Association recommends that HbA1c levels be <7.0 in the population.2

SMOKING

In persons >45 years of age, the estimated risk of developing intermittent claudication is up to 16-fold higher among smokers than among non-smokers, making this the number one modifiable risk factor. Smoking cessation programs, where appropriate, can be an important component to a patient education plan.

BLOOD PRESSURE

In a Framingham Heart Study follow up, a positive association between hypertension and claudication pain was reported11 and may be important to manage claudication pain.2 The Joint National Committee on Prevention, Detection, and Treatment of High Blood Pressure recommends that blood pressure be maintained less than 130/80 mmHg for those with cardiovascular disease.1

HIGH CHOLESTEROL

According to the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP-III), LDL should be no higher than 100 mg/dL and HDL ≥ 60 mg/dL for individuals with cardiovascular disease.3 For individuals with high triglycerides (≥ 200 mg/dL), ATP III advises that non-HDL cholesterol be 30 mg/dL higher than the LDL goal.4

CLAUDICATION PAIN

The severity of PAD is many times classified by level of claudication pain experienced by the patient. The Fontaine classification system is used to organize the intensity of claudication to a stage of the disease progressing from mild to severe.1 In stage 1, patients are asymptomatic, stage 2 patients experience intermittent claudication, stage 3 is characterized by claudication pain at rest, and stage 4 patients experience gangrene leading to possible amputations. Exercise specialists most commonly work with Stage I and II patients. Stage III and IV patients require more aggressive treatment such as revascularization. However, exercise may play an important role in their rehabilitation and risk factor modification.

The risk of cardiovascular death increases with the severity of claudication.12 Therefore, individuals who are beyond stage II are at the highest risk for cardiovascular disease related deaths. This is incentive for patients in Stage I or II and their exercise professionals to aggressively help PAD... Continued on Page 8
Table 1: ACSM Claudication Pain Rating Scale

1. Minimal Discomfort
2. Moderate Pain (patient can be distracted)
3. Severe Pain
4. Unbearable Pain


The initial duration should include 35 minutes of walking time; however, duration may start at 15 minutes for more severely affected patients and may include intervals if claudication pain is severe (>3 on ACSM scale). Duration should increase five minutes each session until 30-50 minutes (preferable continuous) of walking time can be accomplished. The exercise intervention should last for at least six months in order to see improvements in walking distance. Intensity should be in the range of 50%-80% VO2peak or VO2max (if max known) or 55%-90% HRR.

EXERCISE PHYSICAL ACTIVITY

An exercise prescription for patients with PAD should focus on management of risk factors, a similar to a patient with CHD, and aim at improving functional mobility to help the individual accomplish activities of daily living while improving intermittent claudication. Aerobic exercise, such as walking, has been utilized as a means to increase VO2peak, as well as pain free walking distance in patients with PAD with improvements seen in the onset of claudication time and time to maximal claudication pain.

Time to onset is the moment during exercise when the patient begins to experience discomforting leg pain. Time to maximal claudication pain is the amount of time it takes the patient to experience severe enough leg pain that they are unable to continue exercising.

Exercise interventions have also shown promise in increasing peripheral adaptations, such as increased capillary density, oxidative enzymes, and central adaptations (e.g., stroke volume). It has also been suggested that another possible response to exercise training is an increase in pain tolerance. As participants become acclimated to the pain, they may be able to work through it more effectively. When considering the level of pain that must be tolerated during exertion, plus the fact that the participants are usually accustomed to exercise, encouragement to persist with the exercise rehabilitation can become an important factor for exercise adherence and long-term success.

EXERCISE PRESCRIPTION

Typically, patients with PAD are considered high risk and require medical clearance before starting an exercise program. Most will also require monitoring during exercise (i.e., blood pressure and heart rate). Consistent with the American College of Sports Medicine (ACSM) guidelines, PAD patients should engage in cardiovascular exercise three to five days/week. Patients should walk at a speed and incline that elicits claudication symptoms within three to five minutes and then continue to walk until they reach symptoms of moderate claudication. The ACSM claudication pain rating scale (Table 1) may be a useful tool during training, keeping the claudication pain at a moderate level (2 on the ACSM scale).

The initial duration should include 35 minutes of walking time; however, duration may start at 15 minutes for more severely affected patients and may include intervals if claudication pain is severe (>3 on ACSM scale). Duration should increase five minutes each session until 30-50 minutes (preferable continuous) of walking time can be accomplished. The exercise intervention should last for at least six months in order to see improvements in walking distance. Intensity should be in the range of 50%-80% VO2peak or VO2max (if max known) or 55%-90% HRR.

Cycling can be used as a warm up or cool down; however, it should not be used as the main mode of exercise because it does not elicit claudication pain and subsequent stimulus for claudication improvements. Similarly, the Upper Body Ergometer can be a useful exercise modality for managing risk factors and increasing cardiopulmonary fitness without the burden of claudication pain. Claudication pain may not improve, but walking ability may improve due to increases in stroke volume.

Resistance training (RT) programs consisting of exercises in the lower extremities may not be effective at improving claudication pain. One study found that RT was less effective than treadmill training in improving peak treadmill walking time and did not result in increased VO2max or onset to claudication pain. However, since RT does help maintain lean muscle mass and increase bone density to prevent osteoporosis, it should be included as part of a well-designed fitness program for PAD patients and should follow ACSM Guidelines for general population.

PAD AND SUCCESSFUL OUTCOMES

Collectively, regular exercise would result in an improved quality of life. It is necessary to improve functional capacity (VO2peakmax) in these patients because while performing everyday activities, they may be working at their maximal work capacity, become fatigued and stop more readily, which would only perpetuate the progression of the disease and complications.

Exercise programs should focus on risk factor reduction and improvement of walking distance to claudication. By reducing risk factors and claudication pain, patients may experience greater independence in their ability to perform activities of daily living, as well as a decreased risk of comorbidities. With appropriate supervised exercise and educational programs, exercise specialists and PAD patients or those at risk for PAD, can work together to achieve health and fitness goals that enable patients to live an independent life with successful clinical outcomes.

References

About the Author
Nina Markel, R.S., is an exercise physiologist currently completing a Master’s degree in Exercise Science and Health Promotion at Florida Atlantic University. As a graduate assistant, she is currently teaching the undergraduate exercise physiology and exercise testing labs. Nina holds her ACSM Clinical Exercise Specialist certification, and is a certified Yoga and Spinning instructor. She has worked as an exercise physiologist and exercise prescription specialist.
Parkinson's disease (PD) is a neurodegenerative disease affecting the basal ganglia of the brain, resulting in a deficiency of the neurotransmitter dopamine. It is the second most common neurodegenerative disease after Alzheimer's disease, and affects approximately one million Americans. The overall number of individuals afflicted by this disease is difficult to obtain due to its slow development; however, it is estimated that 0.3% of the entire population and 1% of those over the age of 60 years suffer from PD. Caucasian males have been reported to be at higher risk compared to their female counterparts, as well as African American and Asians. These differences, however, may be related to under-sampling and lower response rates from these ethnic groups in research studies not actual racial differences.

**ETIOLOGY & PATHOGENESIS**

Although the specific etiology of PD remains unknown, genetic and environmental factors have been thought to influence the disease; hence, two hypotheses have been developed to further understand its development, the genetic hypothesis and the environmental toxin hypothesis.

The genetic hypothesis is based on the discovery of ten genes associated to familial PD. These genes have been identified to be involved in the labeling of proteins for breakdown, as well as affecting the response to oxidative stress. Hence, why PD usually presents in the later decades of life.

The environmental toxin hypothesis is substantiated by the discovery of the neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) derived from the illicit production of the analgesic drug Demerol, which causes symptoms nearly identical to PD due to the toxic effect of its metabolism on the substantia nigra neurons - neurons affected by PD. This discovery allowed for the understanding of how exogenous toxins mimic PD-like symptoms and led to the study of herbicides and insecticides as possible causes for PD; as they behave similarly to MPTP and act as poisons in the environment. This may suggest that individuals who live in rural areas, are exposed to pesticides, or drink well water, may be more susceptible to the disease; however, these findings remain equivocal.

**CLINICAL CHARACTERISTICS, PREVENTION, AND TREATMENT**

The syndrome of Parkinsonism, of which Parkinson's disease is the most common (~80% of the cases), is defined as any disease with a dopamine deficiency resulting in tremors at rest, slow movements (bradykinesia), rigidity, loss of postural reflexes, flexed posture, and the inability to initiate movement (akinesia). A clinical diagnosis can be made when either tremors at rest or slow movements are present under other symptoms (see table 1). Although the disease mainly affects motor functions, with disease progression other non-motor features can be present (see table 2).

Due to the nature of the disease and current lack of identifiable biological markers or conclusive risk factors, primary prevention is not possible. Secondary prevention, should concentrate on slowing down the neurodegenerative effects of the disease as the patient ages. The three established therapeutic options include; drug therapy, surgical treatment and rehabilitation. These treatment options have been well established in the literature and are beyond the scope of this article.

The following section will concentrate on the effects of exercise as a therapeutic modality in this population. Additional information regarding PD, and the use of exercise as a therapeutic modality for these individuals can be accessed from the National Institute of Neurological Disorders and Stroke (NINDS) and the National Center on Physical Activity and Disability's (NCPAD) websites. The effects of exercise on PD have been less studied than other chronic conditions, such as cardiovascular disease, diabetes, hypertension or cancer. Nonetheless, a body of evidence exists to support the notion that aerobic, resistance and flexibility exercises are beneficial for those suffering from PD. Recently published evidence-based guidelines encourage the use of exercises to improve balance, range of motion and muscular power to improve functional capacity. Enhanced physical function may result in improved activities of daily living and promote independence, hence improving quality of life.

One study found heart rate and rate of perceived exertion' to be a useful tool when comparing individuals with PD during two maximal-effort exercise tests using an incremental protocol on a semi-recumbent cycle ergometer. Investigators found no differences between peak work rate, heart rate, or rate of perceived exertion between the two tests. Suggesting these variables may be useful when prescribing exercise to these individuals.

Brigewater and Sharpe' reported improvements in functional ability, as well as increases in cardiorespiratory fitness among individuals in the early stages of PD. Moreover, an inverse
Implications... Continued from Page 9

association between cardiorespiratory fitness and severity of symptoms and depression scores were reported, demonstrating the important role aerobic exercise may play in enhancing functional ability and quality of life.1

In another aerobic exercise study, the effects of a moderate intensity aerobic exercise (60% - 70% heart rate reserve) on movement initiation, a measurable component of neuromuscular coordination, was found to be significantly improved after 16 weeks of aerobic training.2 Additionally, those in the exercise group improved their VO2peak from 19.5 ml/kg/min to 24.5 ml/kg/min (26%), as well as increasing their power output on the cycle ergometer by 32% (123 watts to 163 watts); meanwhile the PD-control group showed a slight decline in VO2peak (15.9 ml/kg/min vs. 14.1 ml/kg/min; 13%) and in power output (109 watts to 98 watts; 11%). The most significant finding however was that although the mean movement initiation pre-tests were comparable between the PD exercise group and the PD controls, the movement initiation post-tests for the PD exercise group were similar to the healthy controls’ pre-test, indicating improvements in neuromuscular motor control following the aerobic training program.2

In addition to biological changes in muscle with age, the progressive nature of PD promotes the loss of physical conditioning, due to inactivity. Resistance training has demonstrated significant improvements in muscular strength among healthy adults,11 and researchers have considered it as a treatment option for PD patients; particularly those who have experienced decreased effects of drug (Levodopa) therapy or have experienced medical complications, such as muscle atrophy or physical injuries associated with falls.

The effects of a rigorous eight-week resistance training program on muscular strength and gait between PD patients and controls was assessed by Scandalis et al.12 Although significant increases in abdominal strength were reported for both groups after training, the PD group performed significantly lower abdominal exercises compared to the controls. Additionally, lower limb strength also increased after eight weeks; however, significant differences were not observed between the PD and normal groups before or after training. When comparing gait analysis, PD patients demonstrated a significant increase in stride length without a significant change in cadence, while the controls did not show any changes in stride length or cadence. These findings support the notion that PD patients with mild-to-moderate disease respond similarly to a resistance-training program compared to healthy controls, even though they may have limited function.

In a later study, a 12-week eccentric resistance-training program found significant increases in muscle volume, as well as improvements in the six-minute walk test and stair descent and ascent time.13 This study demonstrated the effects of high-intensity resistance training, thus providing a potentially useful modality for patients with PD. High-intensity resistance training may be an effective mode of exercise allowing PD patients to increase functional ability, and promote muscle hypertrophy, leading to functional gains.

The use of creatine monohydrate supplementation for muscular strength gains has been very popular among healthy individuals. To investigate the effects of a progressive resistance-training program and creatine monohydrate supplementation in muscular fitness among patients with diagnosed PD compared to resistance training alone, investigators developed a resistance training program following the American College of Sports Medicine resistance training guidelines1 with a group of PD patients. They administered a creatine monohydrate supplement (loading phase 20 g/d for 7 days, maintenance phase 20 g/d 3-5 days/week) and a placebo.14 After 12 weeks of resistance training both groups significantly increased muscular strength. However, the improvements in strength were more pronounced in the creative group (20%) versus the placebo group (12%). Muscular endurance, measured as the number of repetitions lifted at 60% of 1RM, also showed improvement between the two groups, with the creative group showing greater improvements in chest press and leg extension exercises compared to the placebo group (38% and 95% vs. 33% and 59%, respectively). Based on these findings, the authors concluded that resistance training with creatine monohydrate supplementation might be a beneficial option for patients with PD. The limited restrictions placed on the regulation of dietary supplements demands caution be used by the fitness professional when working with PD patients or any other population. Medical supervision or a recommendation from a licensed dietary professional would be prudent, due to the vast amount of side-effects that accompany many supplements.

GENERAL EXERCISE PROGRAMMING FOR PD

A general aerobic exercise prescription should include large muscle group exercises three times per week at 60% - 80% peak heart rate. Depending on the individual’s functional ability, walking on a treadmill may be most beneficial. However, a cycle or rowing ergometer may be more appropriate for those with decreased mobility. Exercise time should be maintained to less than 60 minutes per session, with multiple bouts of 20-30 minutes, or as tolerated by the individual (see table 3).

Resistance training exercises for all major muscle groups have been shown to be effective and should be used. Two to three sessions per week is preferred, with at least one day off between sessions. Individuals should begin with one set of 8-12 repetitions, with a comfortable resistance determined by both the individual and fitness professional. Load should be increased when the individual is able to complete 12 repetitions without strain and without compromising safety or posture.

Flexibility exercises should be encouraged one to three times per week. Slow, static stretches and range of motion exercises involving all major muscle groups and joints should be prescribed. The stretch should be maintained for 20 to 30 seconds, or as tolerated by the individual. The shoulders and trunk should be emphasized, as these areas are affected earlier in the disease and may lead to adhesive capsulitis (frozen shoulder) and loss of segmental movement in the spine with disease progression, limiting upper body activities.16 For a list of specific stretches that may be used with these individuals, the reader is referred to the NCPS website or the work of Lieberman et al.12

Table 3: Exercise Programming for Parkinson’s disease

<table>
<thead>
<tr>
<th>MODES</th>
<th>GOALS</th>
<th>INTENSITY/FREQUENCY/DURATION</th>
<th>TIME TO GOAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic exercise and arm ergometry</td>
<td>Increase work capacity</td>
<td>Speed dependent on individual</td>
<td>~3 months</td>
</tr>
<tr>
<td>Endurance training</td>
<td>Increase work capacity</td>
<td>Speed dependent on individual</td>
<td>~3 months</td>
</tr>
<tr>
<td>Strength training</td>
<td>Maintain strength or arms, shoulders, legs, and hips</td>
<td>Use light weights</td>
<td>1 set of 8-12 reps, 3 sessions/wk</td>
</tr>
<tr>
<td>Flexibility training</td>
<td>Increase or maintain ROM</td>
<td>1-3 sessions/wk</td>
<td></td>
</tr>
<tr>
<td>Functional training</td>
<td>Maintain capacity to perform as many AUs as possible</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Selph... Continued on Page 12
April–June 2009 Continuing Education Self-Tests

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Self-Test #1: Exercise and HIV

1. As recently as 2003, what percentage of HIV-infected individuals living in the United States were either undiagnosed or unaware of their condition?
   a. 25%
   b. 35%
   c. 40%
   d. None of the above

2. Which type of exercise training may be the best for individuals suffering from lipodystrophy as a result of HIV?
   a. Aerobic or cardiovascular training
   b. Resistance or weight training
   c. Combined aerobic and resistance training
   d. None of the above

3. Which of the following would be primary concerns of a fitness professional working with the HIV+ population?
   a. Stage of disease
   b. Current fitness and/or physical activity level
   c. Fatigability
   d. All of the above

4. Human immunodeficiency virus (HIV) is a retrovirus that progressively lowers the body’s CD+ cell counts and impairs the immune system.
   a. True
   b. False

5. The cost of improved immune function and life expectancy for HIV-infected patients on HAART is severe metabolic complications.
   a. True
   b. False

Self-Test #2: Osteoporosis and Osteopenia

1. What type of cells function to degrade bone during the remodeling process?
   a. Osteoblasts
   b. Osteoclasts
   c. Osteomasts
   d. Osteoplasts

2. Osteoporosis is defined by which level of BMD?
   a. > 1.0 standard deviations below mean peak values for young normal adults
   b. > 1.5 standard deviations below mean peak values for young normal adults
   c. > 2.0 standard deviations below mean peak values for young normal adults
   d. > 2.5 standard deviations below mean peak values for young normal adults

3. What percentage of men and women over the age of 50 will experience a fracture related to low BMD in their lifetime?
   a. 25% of men and 75% of women
   b. 25% of men and 50% of women
   c. 10% of men and 50% of women
   d. 10% of men and 25% of women

4. Many of the exercises recommended to reach peak BMD in young adults are contraindicated for people with osteoporosis.
   a. True
   b. False

5. Activities that include trunk flexion are an important component of an exercise program for osteoporotic patients.
   a. True
   b. False

P Self-Test #3: PAD

1. ACSM Exercise Guidelines require the patient to:
   a. Exercise 3-5 days/week
   b. Walk at an intensity that elicits claudication pain within 3-5 minutes
   c. Accomplish a minimum of 30 minutes of walking time
   d. All are included in the exercise prescription

2. Which of the following exercise modalities should be the main focus of the exercise session?
   a. Recumbent Bike
   b. UBE
   c. Treadmill
   d. Resistance Training

3. The goal of risk factor modification should include:
   a. LDL < 100 mg/dL
   b. Blood pressure <130/80 mmHg
   c. HbA1c < 7.0
   d. All are risk factor modification goals

4. A beginning exercise plan for PAD patients will most likely require all EXCEPT:
   a. Non-stop exercise
   b. Medical clearance
   c. Exercise supervision
   d. Encouragement

5. The ACSM claudication pain scale allows patients and professionals to assess intensity, at what pain level should the activity reach?
   a. 1- Minimal discomfort
   b. 2- Moderate pain
   c. 3- Intense pain
   d. 4- Unbearable pain

P Self-Test #4: Parkinson’s Disease

1. Clinical features that affect motor function in Parkinson disease patients include tremors at rest, rigidity and...
   a. Paresthesia
   b. Bradyphrenia
   c. Passivity
   d. Bradikinesia

2. Parkinson disease is a degenerative disease affecting the:
   a. Medulla
   b. Basal ganglia
   c. Brain stem
   d. Cerebellum

3. The environmental hypothesis is substantiated by the discovery of which of the following compounds?
   a. MPTP
   b. Demerol
   c. MPH+
   d. Parquat

4. Although the number of individuals afflicted by the disease is difficult to obtain, what percent of the population over 60 years is estimated to suffer from Parkinson’s Disease?
   a. 0.5%
   b. 1.0%
   c. 1.2%
   d. 1.5%

5. The genetic hypothesis suggests that cases of PD are related to protein degeneration and a(n), hence its presence in the later decades of life.
   a. Decrease in Levadopa
   b. Decrease in dopamine
   c. Increase in toxic proteins
   d. Increase in Parquat
Parkinson’s... Continued from Page 11

Moreover, functional training including gait and balance exercises to prevent falls (a common consequence of neural degeneration in PD), and exercises specific to activities of daily living should be included, emphasizing slow, controlled movements through a full range of motion. Although significant studies in this area have not been completed, small studies have demonstrated some benefit.

SUMMARY AND CONCLUSION

Parkinson’s disease is a neurodegenerative disease characterized by a decrease in dopamine resulting in tremors at rest, slow movement, rigidity, loss of postural reflexes, flexed posture, and the inability to initiate movement. Although a number of medical and surgical therapies are available, the role of the fitness professional should focus on attenuation of the neurodegenerative effects of the disease by promoting an active lifestyle within the capabilities of the individual.

Numerous investigators have established the role of exercise for individuals with PD. Although these studies all share methodological limitations that may limit their application, a regular exercise program that includes aerobic, resistance, and flexibility components, as well as functional exercises, can be considered a safe and effective option to improve symptoms and gain functional ability among those with PD. Therefore, based on the information currently available, and with certain precautions in mind (Box 1-1) practitioners are encouraged to follow ACSM guidelines to develop a safe and effective exercise training program that enhances and promotes functional gains, may limit falling and may lead to favorable changes in the ability to perform activities of daily living while improving quality of life and promoting independence as long as possible.

About the Author

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Box 1-1: Things to Consider by the Exercise Professional:

1. Individuals should be screened for additional conditions that may be affected by an exercise program (i.e., cardiovascular or metabolic diseases, arthritis, and/or musculoskeletal conditions).
2. Exercise prescriptions should be individualized and revised as the disease progresses.
3. Provide simple and clear verbal instructions for individuals to follow during each exercise.
4. Demonstrate and closely observe the individual when performing all exercises.
5. For those with movement difficulties, exercising during medication peak time may be most appropriate to prevent injury.
6. Unassisted walking or treadmill exercises may not be appropriate for those with advanced disease, a history of falls or gait or balance problems.
7. Use of other modalities (i.e., stationary or recumbent bicycle, arm ergometer, or swimming/water exercises) should be considered as appropriate.
8. When doing strength training, consider using plate-loaded machines instead of free weights.
9. Groups exercise sessions may be beneficial to ensure safety and promote adherence and socialization.
10. Promote independence by instructing caregivers (i.e., spouse, friends, etc.) appropriate exercises to be done at home.