The Incremental Shuttle Walking Test  PAGE 3

Behavioral Theory and Counseling Techniques for Increasing Physical Activity Participation  PAGE 4

Enhancing Mental Health Through Resistance Exercise  PAGE 9

Exercise Training for Overweight Youth: Why Weight?  PAGE 6

Lung Sounds  page 10
FAREWELLS

By Peter Magyari, Ph.D., and Peter Ronai, M.S., FACSM

As co-editors of ACSM’s CERTIFIED NEWS, we wish to thank Paul Visich, PhD, MPH, for his valuable service to us and to readers of ACSM’s CERTIFIED NEWS.

We have been privileged to have Paul as our clinical columnist and we have all enjoyed reading and learning from his Clinical column articles over the last year. His article series on heart sounds was an excellent reference for exercise professionals. Regrettably, Paul’s term as clinical columnist has ended and we must say farewell. Paul will continue to educate us however. He and his colleagues, John Ehrman, PhD, FACSM; Steven Keteyian, PhD, FACSM; and Paul Gordon, PhD, FACSM, have been editing a third edition of their textbook, Clinical Exercise Physiology. The third edition promises to be an excellent learning resource for clinical exercise professionals as the first two editions have been. We wish you much continued success and thank you for your dedication and service to us. Paul also will continue to serve as the chair of the exercise science department at the University of New England in Biddeford, Maine.

Finding a successor for Paul has been challenging. He is a difficult act to follow. After careful consideration, we have selected a new clinical columnist to continue enhancing the quality of clinical information we are able to offer our readers. We are pleased and fortunate to announce Gregory B. Dwyer, PhD, FACSM, as the new clinical columnist for ACSM’s Certified News. He is a clinical exercise physiologist and full professor in the Department of Exercise Science at East Stroudsburg University (ESU) of Pennsylvania. Dr. Dwyer has been at ESU since 1997. Prior to ESU, Greg was an associate professor for eight years in the School of Physical Education at Ball State University in Muncie, Indiana.

He is certified by the American College of Sports Medicine (ACSM) as an ACSM Exercise Test Technologist, ACSM Exercise Specialist, and ACSM Program Director. In addition, Dr. Dwyer is an ACSM Registered Clinical Exercise Physiologist (RCEP). Dr. Dwyer has been involved in ACSM certification efforts for more than 13 years most currently serving as the senior editor for the upcoming (4th edition) of the ACSM Certification Review.

His main research interests are in exercise testing and training responses of apparently healthy and chronic disease populations, and the reliability of various physical fitness test measurements.

He has authored and co-authored numerous peer-reviewed and refereed articles and will be sharing his clinical knowledge and expertise with us and readers of ACSM’s Certified News. We are thrilled to have him as our new clinical columnist.

Good Luck Greg!!
THE INCREMENTAL SHUTTLE WALKING TEST

By Peter Ronai, M.S., FACSM, RCEP, CES, CSCS-D

A recent article in ACSM’s Certified News (Volume 21, issue 4, 2011) discussed issues regarding the use of the 6-minute walk test as a tool to assist the clinical exercise physiologist (CEP) in assessing: 1) submaximal functional capacity, 2) need for supplemental oxygen or oxygen titration, 3) exercise prescription from peak heart rate, rating of perceived dyspnea/exertion, and estimated METS, 4) physiological responses to exertion, and 5) the physiological response to medical interventions with pulmonary patients.1 The 6-minute walk test is a clinically-based field test which has been widely used to accomplish these objectives.1

The incremental shuttle walk test (ISWT) was developed by Dr. Sally J. Singh and her associates2 as a tool to assess functional capacity in patients with chronic obstructive pulmonary disease (COPD). It is relatively fast and easy to administer. Performance on the ISWT correlates strongly with direct measures of peak oxygen consumption (V\textsubscript{O}\textsubscript{2\text{peak}}) allowing the prediction of peak V\textsubscript{O}\textsubscript{2}.3 Results can be used to evaluate the efficacy of an exercise and/or rehabilitation program and to measure outcomes and progress over time.4,5 The object of the ISWT is to simulate a cardiopulmonary exercise test using a field walking test.6 The ISWT also has been validated for elderly people with and without airflow limitations,7 people being assessed for heart transplant,8 people with intermittent claudication from peripheral vascular disease9 and people with congestive heart failure (CHF).10 The ISWT has been shown to be more accurate than the 6-minute walk test in the evaluation of maximal exercise capacity and in the degree of ventilatory impairment in COPD patients.6 The 6-minute walk test remains the assessment of choice if the clinical outcome in COPD patients is exercise endurance.7

The ISWT is a performance-based test that assesses exercise performance levels by measuring walking distance in meters. Longer walking distances signify better performance.6 According to Singh et al.4 “improvements of 47.5 meters and 78.7 meters in the ISWT indicated that patients felt slightly better and better respectively and are considered minimal clinically significant improvements or differences.”10

**Administration**

Standard instructions for the ISWT are given on a pre-recorded CD (2, 8) and a level walking course of at least 12 meters and a portable CD player are required to administer it.2,8 Prior to testing, patients/clients should rest in a seated position and then have their resting heart rate (HR), blood pressure (BP), oxygen saturation (Sp\textsubscript{O}\textsubscript{2}) and dyspnea (shortness of breath) measured/recoded. Patients prescribed bronchodilator medications should take them within one hour of testing or as soon as they arrive for testing.2,8 Subjects walk back and forth around two cones placed nine (9) meters apart.9 The actual distance of each shuttle (laps between the cones) is 10 meters. Subjects keep pace with a pre-recorded auditory signal so that they complete a turn as each sound beeps. The audio signal or beep sounds at increasingly shorter intervals each minute (each stage is one minute long). One beep indicates the length of one shuttle and three (3) beeps indicate an increase in speed and change of stage. Initially, walking speed is very slow (0.50 meters/second), but each minute the required walking speed progressively increases to potentially a 2.37 meters/second speed during the 12th and final stage (there are 12 stages). The test is measured in meters and unlike the 6-minute walk, no verbal encouragement is provided. Patients/clients may use ambulatory assistive devices (single point cane, rollator walker, or standard walker) but must pull or carry their supplemental oxygen themselves.2,8

**Standardization**

Exercise professionals should follow instructions given on the CD. They should instruct patients/clients to walk faster each time the beep sounds, and tell patients that they are not walking fast enough and that they should speed up to make up the speed this time if they are less than 0.5 meters from the cone when the beep sounds. Exercise professionals also should record each shuttle as it is completed. Two test trials are given with 30 minutes rest between trials. The best distance between the two trials is recorded. Test trials can be administered on separate days for debilitated patients/clients but should not occur more than one week apart. A comfortable ambient temperature and humidity must be maintained and the same walking course should be used for all tests.2,8

**Test Termination**

The test should be terminated if the patient/client is more than 0.5 meters away from the cone when the beep sounds (allow one lap to catch up), reports they are too breathless to continue, reaches 85% of predicted maximum heart rate using the formula [210—(0.65 x age)], or has the following symptoms:

- Chest pain that is suspicious of/for angina
- Evolving mental confusion or lack of coordination
- Evolving light-headedness
- Intolerable dyspnea (shortness of breath)
- Leg cramps or extreme leg muscle fatigue
- Persistent Sp\textsubscript{O}\textsubscript{2} <85% (Oxygen saturation)
- Any other clinically warranted reason

In addition, number of shuttles completed and HR, BP, shortness of breath (immediately post-test and two minutes post-test) should be measured and recorded respectively.2,8 Exercise professionals should ask patients/clients, “What do you think stopped you from keeping up with the beeps?”

**Summary**

The ISWT is a valid, reliable, and efficient means of assessing functional capacity, exercise program efficacy and long-term outcomes in patients/clients with COPD.

Shuttle Walking Test (continued on page 13)
The benefits of physical activity are well recognized. Unfortunately, participation in physical activity (PA) is generally low and dropout rates are high. Whether an individual has decided to start an exercise program for personal reasons, or has been told by a health professional to be more active, the participant needs to learn a new behavior. The challenge for the exercise professional is to help a client develop the motivation and skills to start, and stick with a program of regular physical activity.

A number of theories have been used to describe the process of behavior change. Each theory is characterized by specific constructs or correlates which are thought to influence behavior. The purpose of this article is to provide an overview of some popular behavioral theories. Having an understanding of these theories may enable the exercise professional to guide a client through the process of making PA part of a healthy lifestyle.

**The Health Belief Model**

The Health Belief Model (HBM) suggests that people will modify behavior to prevent or control undesirable health conditions if they regard themselves as susceptible to the condition. The four main components of the model include perceived susceptibility to a condition, perceived severity of a condition, perceived benefits to taking action, and perceived barriers to taking action. Cues/strategies to take action and self-efficacy also have been associated with this model. Proponents of this theory would suggest that all of these combine to influence a person’s motivation to take action to improve the health condition. For example, a person who believes he is at risk of developing heart disease or diabetes, and believes that those are serious health risks, may be prompted to increase PA to reduce the threat of disease. In this scenario, the HBM also would suggest that the person must believe that PA would be an effective means of combating the disease, and that the benefits outweigh any potential disadvantages to exercise participation. Cues to action may come in the form of information from a physician or the media suggesting that PA is an effective means of preventing heart disease/diabetes; and self-efficacy means that the person has confidence that he is capable of overcoming any barriers that might get in the way of the planned exercise program.
The Theory of Reasoned Action/Theory of Planned Behavior

The Theory of Reasoned Action (TRA) suggests that the most important determinant of behavior is intention, and intention is influenced by a person’s “attitude toward the behavior” (based on perceived value of the behavior) and “subjective norm” (i.e., beliefs about whether others approve of the behavior). The TRA assumes that as individuals receive and interpret information, they identify reasons (and develop intentions) for performing (or not performing) a behavior. Later, the Theory of Planned Behavior (TPB) was proposed as a modification of the TRA when the construct of “perceived behavioral control” (the participant’s belief that they have a choice to participate in a behavior) was added to the model. These control beliefs are described as being comparable to self-efficacy beliefs. Control beliefs acknowledge that some factors influencing behavior are out of the individual’s control and are affected by a person’s confidence in his abilities to make a change in spite of the barriers that may be encountered. Applying TPB to PA, when a person believes that PA is valuable and can contribute to a desirable result, the “attitude toward the behavior” is positive. At the same time, if the participant believes that friends or significant others approve of PA participation and is motivated to do what others think is appropriate, the rating of “subjective norm” is high. Finally, the individual who believes that it will be easy to overcome any barriers to PA participation will have high “perceived behavioral control.” The sum of the three constructs contributes to the person’s intention to participate in PA; this, in turn, leads to the adoption of the exercise behavior.

Primary Constructs of Specified Behavioral Theories

<table>
<thead>
<tr>
<th>Health Belief Model</th>
<th>Theory of Planned Behavior</th>
<th>Transtheoretical Model</th>
<th>Social Cognitive Theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior change is driven by:</td>
<td>Intentions drive Behavior</td>
<td>Behavior change is a process which goes through stages:</td>
<td>Reciprocal Determinism—the following factors interact to influence each other:</td>
</tr>
<tr>
<td>• Perceived Susceptibility</td>
<td>Intentions are influenced by:</td>
<td>• Pre-Contemplation</td>
<td>• Environmental</td>
</tr>
<tr>
<td>• Perceived Severity</td>
<td>• Attitude Toward Behavior</td>
<td>• Contemplation</td>
<td>• Personal</td>
</tr>
<tr>
<td>• Perceived Benefits</td>
<td>• Subjective Norm</td>
<td>• Preparation</td>
<td>• Behavioral</td>
</tr>
<tr>
<td>• Perceived Barriers</td>
<td>• Perceived Behavioral Control</td>
<td>• Action</td>
<td></td>
</tr>
<tr>
<td>• Cues to Action</td>
<td></td>
<td>• Maintenance</td>
<td></td>
</tr>
<tr>
<td>• Self-Efficacy</td>
<td>Movement between stages is influenced by:</td>
<td></td>
<td>A number of constructs influence the behavioral result:</td>
</tr>
<tr>
<td></td>
<td>• Decisional Balance</td>
<td></td>
<td>• Observational Learning</td>
</tr>
<tr>
<td></td>
<td>• Self-Efficacy</td>
<td></td>
<td>• Behavioral Capacity</td>
</tr>
<tr>
<td></td>
<td>• Processes of Change</td>
<td></td>
<td>• Outcome Expectations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Self-Efficacy</td>
</tr>
</tbody>
</table>

The Transtheoretical Model

The Transtheoretical Model (TTM) proposes that a person goes through five stages of change (pre-contemplation, contemplation, preparation, action, maintenance) in the process of lifestyle modifications. The premise is that people must be in motivationally ready to make behavior changes or the change won’t occur. People may move back and forth through the stages (not always linearly), and a number of variables affect movement between stages. Those variables include decisional balance (weighing of pros and cons), self-efficacy (confidence) and ten cognitive and behavioral processes of change. The TTM initially emerged in treatment of addictive behaviors such as smoking, but also has been applied in settings to increase physical activity. A person in the pre-contemplation stage is not participating in PA and has no intention of starting in the next six months. In the contemplation stage, the client is still only thinking about exercise, but intends to start a program within six months. When someone has reached the preparation stage, the individual has taken steps to get ready to change behavior (e.g., has purchased exercise clothes, looked into fitness club membership, made arrangements to go walking with a friend) and plans to initiate the program within the next month. Additionally, someone participating in PA irregularly, or at a level below that prescribed in ACSM’s guidelines, is designated as being in the preparation stage. Action is the stage where the person is participating in PA at a level or above the current guidelines, but has maintained the program for less than six months. The person who has continued in a PA program for more than six months, is meeting the recommended levels, has a high level of confidence in the ability to continue with the program, and has reached the maintenance stage.

Social Cognitive Theory

The Social Cognitive Theory (SCT) uses the idea of “reciprocal determinism” to describe how environmental, personal, and behavioral factors interact to influence each other. Environment refers to factors that are external to the person and can include both social (e.g., family and friends) and physical aspects (e.g., places like home, neighborhood, or a workout facility). Personal factors include knowledge (cognitions), perceptions, values, and experiences. Constructs of SCT include observational learning (watching others), behavioral capability (having the knowledge and skill to perform a behavior), outcome expectations (anticipated benefits from participating in a behavior), reinforcement (positive consequences that promote continuation of behavior), and others. Bandura, who first described SCT, has suggested that self-efficacy is the most important predictor of behavior change. Self-efficacy indicates a person’s confidence in the ability to succeed at a specific task in specific difficult situations. The strength of that confidence influences whether a task is attempted, how much effort is expended to complete the task, and how persistent a person will be when faced with obstacles. Because self-efficacy perceptions are task-specific, individuals may have a high level of confidence in one area, such as eating a low-fat diet, but have low self-efficacy for another task, such as maintaining a regular exercise program.

Self-efficacy is derived from four sources: mastery, vicarious experience, verbal persuasion, and cognitive interpretation of physiological states. These four sources combine to determine a person’s confidence. Mastery refers to feelings of accomplishment experienced by the person who succeeds at a given task. Vicarious experience promotes confidence as someone pays attention to the successes of similar others. Verbal persuasion is used when another individual provides words of encouragement to reinforce a person’s capabilities and accomplishments. Finally, the understanding of normal physiological responses to a situation will minimize the stress of participating in a new behavior. The exercise professional is well-positioned to help build self-efficacy by providing verbal encouragement to a client, helping establish appropriate goals which a client can master, pointing out the successes of other participants with suggestions that “you can do...”
EXERCISE TRAINING FOR OVERWEIGHT YOUTH: WHY WEIGHT?

By Avery D. Faigenbaum, EdD, FACSM, and Jill A. Bush, PhD, FACSM

The global epidemic of pediatric obesity and associated co-morbidities has become a critical public health threat for the 21st century with far-reaching health, economic, and social consequences. While there is not one program of proven efficacy to manage this, multifaceted interventions including behavioral counseling, nutrition education, family support, and physical activity promotion offer the best chance for success. Of these components, regular physical activity is critical for weight maintenance and the prevention of abnormal weight gain.

Understanding how sensible lifestyle choices such as regular physical activity can improve body composition and enhance health and well-being of youth is a growing area of interest. An increasing number of fitness centers now offer programs for youth and health-conscious parents who are becoming more aware of establishing healthy habits at an early age. Fitness professionals who have an understanding of pediatric exercise science and genuinely appreciate the physical and psychosocial uniqueness of youth are in an inimitable position to develop safe, effective, and enjoyable physical activity programs.

In addition to aerobic forms of exercise (e.g., cycling and sustained games), new insights indicate that resistance training can be a safe, effective, and worthwhile method of conditioning for all youth regardless of body size. This article examines the potential benefits of resistance exercise for overweight children and adolescents and provides suggestions for designing resistance training programs, defined as a specialized method of physical conditioning that involves the progressive use of a wide range of resistive loads and training modalities designed to enhance muscular fitness. Youth and pediatric are broadly defined to include children and adolescents.

**Potential Benefits of Resistance Training for Overweight Youth**

Although some once considered resistance training unsafe and potentially injurious to the developing musculoskeletal system, evidence related to the safety and efficacy of youth resistance exercise has increased over the past decade. In addition to enhancing muscular strength, regular participation in a resistance training program has been linked positively to cardiorespiratory fitness, bone mineral density, blood lipids, and psychosocial well-being. Of note, the positive effects of resistance training on body composition and metabolic health in overweight youth have received increased attention by clinicians and researchers.

Although aerobic exercise is typically prescribed to decrease body fat, a decrease in fatness among overweight youth who participated in a structured resistance training program has been reported in the literature. Of interest, Shaibi et al. found that body fat decreased...
and insulin sensitivity increased in overweight adolescent males participating in a progressive resistance training program. The increase in insulin sensitivity remained significant after adjustment in total fat and lean mass. Thus due to resistance training, it was speculated that the qualitative changes in skeletal muscle contributed to enhanced insulin action. Other researchers have identified muscular strength as an independent and powerful predictor of better insulin sensitivity in youth age 10 to 15 years, and a recent cross-sectional study showed that muscular fitness was negatively associated with fasting insulin levels in male adolescents. The potential benefits of resistance training for overweight youth are summarized in table 1.

These important findings highlight the clinical relevance of resistance training in overweight youth who are less willing and often unable to participate in prolonged periods of moderate to vigorous aerobic exercise. Excess body weight not only hinders the performance of weight bearing physical activity such as jogging, but the risk of musculoskeletal overuse injuries also should be considered. A notable finding from a prospective study of 9 to 12 year old children was that low levels of physical activity significantly increased injury risk. While youth should be encouraged to accumulate at least 60 min of moderate to vigorous physical activity daily in the context of school, community, and family activities, fitness programs for overweight youth need to be carefully prescribed and professionals need to realize that overweight youth tend to perceive physical activity more negatively and tend to find sedentary activities more reinforcing than normal-weight youth.7

Table 1. Potential Benefits of Resistance Training for Overweight Youth

<table>
<thead>
<tr>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increase muscular fitness</td>
</tr>
<tr>
<td>• Increase bone mineral density</td>
</tr>
<tr>
<td>• Improve blood lipid profile</td>
</tr>
<tr>
<td>• Improve body composition</td>
</tr>
<tr>
<td>• Improve insulin sensitivity</td>
</tr>
<tr>
<td>• Improve motor performance skills</td>
</tr>
<tr>
<td>• Increase resistance to injury</td>
</tr>
<tr>
<td>• Promote positive social interactions</td>
</tr>
<tr>
<td>• Enhance mental health and wellbeing</td>
</tr>
<tr>
<td>• Stimulate a more positive attitude toward lifetime physical activity</td>
</tr>
</tbody>
</table>

Program Design Considerations for Overweight Youth

Most overweight youth find resistance training activities enjoyable because it is not aerobically taxing and provides an opportunity for all youth regardless of body size to experience success and feel good about their performance. Since youth tend to be more physically active when in the presence of peers and when positive, rewarding relationships exist, resistance training provides an unique opportunity for all youth regardless of body size to experience success and feel good about their performance. Since youth tend to be more sensitive to any type of peer interaction than non-overweight youth,7 youth involved in fitness classes with group activities enhance muscular fitness, promote social networking, and gain confidence in their abilities to be physically active. Thus, the first step in encouraging overweight youth to exercise regularly may be to increase confidence to be physically active in a socially supportive environment which may lead to an increase in regular physical activity, an improvement in body composition and, hopefully, exposure to a form of exercise that can be lifelong.

Youth resistance training programs need to be carefully prescribed because unsupervised and poorly performed strength testing and training may be injurious. While there is no minimal age requirement for participation in a resistance training program, it is important that all children understand training procedures and safety rules. Close supervision, age-appropriate instruction, and a safe environment are paramount. In short, it is always better to underestimate the physical abilities of youth and increase risk of negative consequences (e.g., dropout or injury). Overweight youth should be seen by their physician or health care provider before beginning any exercise program. In addition, youth with pre-existing medical conditions including hypertension or seizure disorders should be withheld from resistance training until medical clearance is obtained.1

A variety of training modalities, sets, and repetitions have provided an adequate stimulus for strength enhancement and favorable changes in body composition in youth. Weight machines, free weights, elastic bands, and medicine balls have been used by normal weight and overweight youth in clinical- and school-based exercise programs. Since different combinations of sets and repetitions may be needed to promote long-term gains in muscular fitness, the best approach for overweight youth to start resistance training is with 1 or 2 sets of 8 to 12 repetitions on a variety of exercises, and then systematically vary the training intensity and volume in order to avoid training plateaus and optimize adaptations. Of interest, McGuigan et al. reported favorable changes in body composition in overweight/obese children who participated in a resistance training program including strength and power exercises. Since type IIb muscle fibers are the most insulin resistant and seem to be more prevalent in obese cohorts,21 high force/high velocity muscle actions may be needed to optimize training adaptations. Although additional research is needed, it is possible that different resistance training velocities may provide the most effective stimulus in overweight youth.

Overweight youth tend to be the strongest students in class and often receive unsolicited positive feedback from their normal weight peers who are often impressed with the increased amounts of weight lifted. In support of this, Davis et al. reported a 1 repetition maximum load of 596 lbs (271 kg) leg press in an overweight male youth. Unlike other types of exercise, participation in resistance training program gives youth with a high percentage of body fat a chance to shine while creating a favorable impression from their peers. This is where the art and science of developing a youth resistance training program exists because training specificity and progressive overload need to be balanced with individual needs, realistic goals, and positive social interactions in order to optimize gains, prevent boredom, and promote exercise adherence.

Why Weight? (continued on page 12)
COACHING NEWS

By Margaret Moore (Coach Meg), M.B.A.

Hence you find yourself in a difficult situation. You don’t want to start down a negative path by questioning or criticizing your client’s tracking and recording skills and efforts. Yet you can’t really trust the data as a basis for your recommendations. A part of you feels frustrated and impatient because your client didn’t deliver what you hoped, and make it easy for you to provide an exercise prescription based on established evidence-based practices. So how do you move this partnership forward?

1. LET GO OF IMPATIENCE AND FRUSTRATION

First get yourself into a positive, curious, and non-judgmental mindset, and set aside any frustration or impatience that will instantly impair your partnership with your client. If you show even a speck of judgment or disappointment, your client will withdraw, perhaps already feeling badly that she didn’t do a great job on her tracking homework and now made her feel worse.

2. GET INTO A MINDFUL, CURIOUS, AND OPEN-MINDED MINDSET

Explore your client’s experience with completing the energy balance chart in order to help her gain self-awareness. View it as a starting experiment, an opportunity to figure out what the best next step would be. Was it a helpful exercise? Was it challenging? Was it boring? Did she do it immediately or wait for a few days and try to remember all the food she ate and activities she completed? Did she take her time or rush to put something, anything, in each of the boxes? What did she learn? What might work better?

Who knows what your client will say and where she will land, but she will appreciate that you were totally focused and engaged, without assumptions and judgment, on her welfare, her efforts, her strengths and weaknesses, and what would work best as next steps. The outcome is a mystery until it emerges. Maybe she will realize that she forgot about recording important information such as her snacks, or miscalculated the number of calories in a food type, and decide to have another go at filling in your chart. Or maybe she’ll decide that instead she’d like to replace her junk food snacks with fruit and nuts, or eat oatmeal and a boiled egg instead of a doughnut for breakfast, as a simple starting point.

One of the best things about being a coach is that it is never boring and predictable. Everyone finds his/her own path with our intent and creative input. It would be great if the research gave us the answers, such as completing energy balance charts as an essential starting point. Yet, how dull our work would be if a standard formula worked every time.

About the Author

Margaret Moore (Coach Meg), M.B.A., is the founder & CEO of Wellcoaches Corporation, a strategic partner of ACSM, widely recognized as setting a gold standard for professional coaches in healthcare and wellness. She is co-director of the Institute of Coaching at McLean Hospital, an affiliate of Harvard Medical School and co-directs the annual Coaching in Leadership & Healthcare Conference offered by Harvard Medical School. She co-authored the ACSM-endorsed Lippincott, Williams & Wilkins Coaching Psychology Manual, the first coaching textbook in healthcare and the Harvard Health Book published by Harlequin: Organize Your Mind, Organize Your Life.

References

A 2012 research review paper published in ACSM’s Current Sports Medicine Reports presented 15 well-documented benefits of regular resistance training (see Table 1). Although most of the reviewed research addressed physiological factors, some studies demonstrated that strength training may have a direct effect on three aspects of mental health and an indirect effect in at least two related areas. With respect to direct impact, resistance exercise has been shown to improve cognitive ability, to enhance self-esteem, and to reduce symptoms of depression. With respect to indirect influence, resistance exercise has been shown to reduce low back pain and to ease arthritic discomfort.

### Table 1. Fifteen research supported health benefits of resistance training.

1. Increased lean weight  
2. Increased resting energy expenditure  
3. Decreased fat weight  
4. Reduced low back pain  
5. Reduced arthritic discomfort  
6. Increased functional independence  
7. Enhanced movement control  
8. Increased insulin sensitivity  
9. Improved glucose control  
10. Reduced resting blood pressure  
11. Improved blood lipid profiles  
12. Increased bone mineral density  
13. Improved cognitive ability  
14. Enhanced self-esteem  
15. Reversed aging factors in skeletal muscle

### Cognitive Ability

In an excellent review titled, “Strength Training as a Countermeasure to Aging Muscle and Chronic Disease,” Hurley, Hanson, and Sheoff described four studies that demonstrated an inverse relationship between muscular strength and mental decline/Alzheimer disease. In three of the studies, lower grip strength was associated with higher risk of cognitive decline, dementia, and Alzheimer’s disease. In a study that assessed 11 muscle groups, higher overall muscle strength was associated with lower risk of both mild cognitive impairment and Alzheimer’s disease.

Although associations do not necessarily confirm cause-and-effect, O’Connor, Herring, and Caravalho’s comprehensive review of the mental health benefits of strength training identified four studies that attained significant improvements in memory as a result of resistance exercise. In addition to improving cognition when practiced alone, strength training has been shown to enhance the cognitive benefits of aerobic exercise when both activities are addressed in a fitness program. A 2012 study by Nagamatsu and associates actually found resistance exercise to be more effective than aerobic activity for improving mental performance in 70 to 80 year old women with mild cognitive impairment.

### Self-Esteem

Self-esteem may be defined as an individual’s perception of himself or herself from a specific or general perspective. Although specific components of self-esteem may be more responsive to exercise, O’Connor and colleagues have suggested that overall self-esteem is relatively stable and may present a greater challenge to large-scale changes. It is therefore encouraging that research has revealed enhanced self-esteem resulting from resistance training among younger adults, older adults, women, and cancer patients. Based on their research review, O’Connor and colleagues concluded that “strength training alone is associated with improvements in overall self-esteem.”

### Depression

Depression is an increasingly prevalent and serious mental health problem that frequently leads to reduced functionality, particularly in older adults. O’Connor and colleagues reviewed more than 20 studies that examined the effects of resistance exercise on symptoms of depression in different populations of people, including those diagnosed with clinical depression. Based on the evidence, the authors concluded that “strength training alone is associated with both large reductions in symptoms of depression among depressed patients and moderate reductions in depression symptoms among patients with fibromyalgia.”

Research by Singh and associates has revealed beneficial effects of resistance exercise on older adults who experience depression. In one of their studies, strength training was more effective than a targeted health education program. More than 80% of the initially depressed elders in the resistance exercise group no longer met the criteria for depression after 10 weeks of training, compared to 40% of those in the health education group over the same time period. The authors concluded that progressive resistance exercise reduces depression in depressed older adults, while concurrently improving muscle strength, morale, and quality of life.

**Mental Health (continued on page 14)**
LUNG SOUNDS

As a clinical exercise physiologist that may be working in pulmonary rehabilitation, diagnostic testing, or cardiac rehabilitation, it is important to have a general understanding of pulmonary sounds. It takes practice listening to normal and abnormal sounds to become proficient in identifying their significance. A thorough pulmonary examination includes inspection, palpation, and percussion of the chest wall and thorax and auscultation of the lungs. The purpose of this article is to focus on the basics of lung sounds.

Abnormal lung sounds give us information that may relate to conditions such as: narrowing airways due to inflammation and excess mucus secretions (asthma, emphysema, chronic bronchitis), pulmonary edema (CHF), abnormal collection of fluid in the pleural space (pleural effusion), and intrinsic lung diseases (pulmonary fibrosis).

Auscultation of the lungs requires the use of a stethoscope using the diaphragm side. The clinician should work from the top of the anterior chest, (the apex), side to side to make comparisons between both anterior lung fields and then work posteriorly down to the bases. Physical examination of the lungs should ideally be in the seated position so that all lung fields can be accessed. The patient is asked to take a full breath, (inspiration and expiration) with an open mouth and the clinician listens at each location.

When assessing lung sounds it is important to determine if you hear abnormal sounds early or late in the breathing cycle. Hearing an abnormal sound in the beginning of inspiration would suggest an abnormality exists in the big airways (trachea, bronchi), whereas hearing sounds at the end of inspiration would suggest an abnormality exists in smaller airways (terminal bronchi and alveoli). As clinicians, we need to develop an ear for the intensity (how loud), pitch (frequency of a single sound) and duration of inspiration and expiration, which will vary based on the area of the lung you are listening to.

Vesicular sounds represent the soft sounds of normal breathing heard by auscultation over most of the lung fields and where the inspiratory phase is usually longer than the expiratory phase. Bronchovesicular sounds represent intermediate sounds and pitch where inspiration and expiration are fairly equal and typically heard in the first and second anterior intercostal spaces and between the scapulae. Bronchial sounds are loud and the pitch fairly high and expiration is longer than inspiration and primarily heard over the manubrium. Tracheal sounds are very loud, pitch is fairly high, inspiration and expiration are equal and they can be heard over the trachea.

Some of the more common abnormal lung sounds include: crackles (also referred to as rales), wheezes, and rhonchi. Crackles can be considered as fine (soft, high pitched, and brief) or course (louder, low pitch, and longer). The exact mechanism for crackles is not clearly understood, but may be related to the popping open of small airways or the result of air bubbles flowing through secretions. Crackles can be heard at different times in the respiratory cycle. Hearing crackles at the end of inspiration is indicative of interstitial lung disease such as fibrosis, CHF, and infections of the lung (i.e., pneumonia). Crackles heard at the beginning of inspiration are more associated with chronic bronchitis or asthma. Wheezes are heard when air travels through restricted airways and is associated with a high pitch sound. Wheezing is commonly heard in patients with COPD (emphysema and chronic bronchitis), asthma and possibly CHF. Wheezing may be heard in the entire respiratory cycle or in either the inspiratory or expiratory phase. Rhonchi, in contrast to wheezing, are lower pitched sounds that are heard in the larger airways usually caused by an accumulation of mucus. Typically, if one hears wheezing and/or rhonchi, asking the patient to cough can temporarily clear the passageways in individuals with chronic bronchitis. It also should be noted that if wheezing is accentuated during inspiration it is referred to as stridor, and if louder in the neck versus the chest region it can be indicative of a partial obstruction of the trachea and larynx and requires immediate attention.

Lastly, when there is an absence or decrease in lung sounds there are several conditions that should be considered, pleural effusion, and pneumothorax. A pleural effusion is caused by the accumulation of fluid in the pleural space. There can be many causes, CHF being the most common cause. The fluid separates the chest wall from the air-filled lung, decreasing the ability to hear air movement, however, when listening over the bronchi or higher, lung sounds may be heard. A pneumothorax causes air leaks into the pleural space and the lung collapses or recoils (usually unilateral) creating a space between the lungs and the chest wall, which leads to a reduction or absence of sound. Suspected pleural effusion and pneumothorax require immediate medical attention.

Mastering auscultation and the associated lung sounds is important in the evaluation of your patients that may have different pulmonary conditions. Listed are several websites that may be helpful to increase your knowledge and develop an ear for different lung sounds:

• www.wilkes.med.ucla.edu
• www.combs.colostate.edu/clinsci/callan/breath_sounds.htm
• www.easyauscultation.com/cases.aspx?CourseCaseOrder=5&courseid=201
• www.meddean.luc.edu/lumen/MedEd/medicine/pulmonar/pd/pstep29.htm

About the Author
Paul Visich, Ph.D., MPH, is the current chair and professor of the Exercise and Sports Performance Department at the University of New England in Biddeford, Maine. Paul served as a team editor of the textbook, Clinical Exercise Physiology, published by Human Kinetics. Paul served as a member of the Practice Board for ACSM’s Registered Clinical Exercise Physiologist (RCEP) credential, the chairperson of the ACSM Professional Education Committee, and a member of ACSM’s Committee on Certification and Registry Boards (CCRB).
THE fitness conference designed for ACSM Certified Professionals

from the organization that sets the standard in the field

ACSM’s Summit has everything ACSM Certified Professionals need to excel in the industry—the latest science in action, real-world takeaways, the newest workouts, tools to build your client base and much more!

18 ACSM CECs

Earn up to ½ of the CECs you need at Summit.

View the programming at this year’s Summit...
www.acsmsummit.org
Behavioral Theory (continued from page 5)

it too,” and helping the client understand normal physiological responses to PA (e.g., increased heart rate and blood pressure during activity) so that the client sees these responses as positive reasons to continue the program rather than debilitating reasons to quit.

Summary

The Health Belief Model, Theory of Planned Behavior, Transtheoretical Model, and Social Cognitive Theory are some of the theories which have been used to describe behavior, including PA participation. Each of the theories is defined by specific constructs which may overlap from one theory to another. It is unlikely that one theory can fully explain PA behavior, and it has been suggested that it may be most effective to integrate factors from several behavioral theories to facilitate behavioral change. The exercise professional who understands the psychological processes which influence behavior will be better prepared to help a client initiate and maintain a program of physical activity.

(A Part 2 will discuss client-centered counseling and practical techniques which support the theoretical basis of behavior change.)

About the Author

Sherry Barkley, Ph.D., CES, RCEP, FACSM is an assistant professor and chair of the HPER Department at Augustana College, Sioux Falls, SD. Sherry is fast-past-sher of the NACSM. Her interest in behavioral theory and motivational techniques is triggered by many years of experience in the clinical setting, working with clients to make positive lifestyle changes.

References


Why Weight? (continued from page 7)

Teaching youth about their bodies, promoting safe training procedures, and providing a stimulating program that gives youth a more positive attitude toward resistance training and physical activity are equally important. Since there is not one “optimal” combination of sets, repetitions, and exercises that will promote favorable adaptations in muscular strength and body composition in all youth, program variables need be altered over time to achieve desirable outcomes. Clearly, resistance training programs for overweight youth need to be individualized and based on health history, training experience, personal goals and time available. Table 2 summarizes general resistance training guidelines for youth.

As fitness professionals continue to embrace the challenge of working with overweight youth, creative interventional techniques and effective motivational strategies will be needed to increase the likelihood for successful outcomes. Our observations suggest that resistance training gives overweight youth an opportunity to feel good about performance and improve health, fitness, and quality of life while fostering new social networks. While additional research is needed to substantiate the effects of resistance training on cardiovascular disease risk factors in overweight youth, current findings indicate that resistance training may offer observable health and fitness value to youth regardless of body size provided the exercise program is well-designed, sensibly progressed, and supervised by qualified fitness professionals.

About the Authors

Avery D. Faigenbaum, EdD, FACSM, is a professor in the Department of Health and Exercise Science at The College of New Jersey, where his research focuses on the role that resistance exercise plays in the health and fitness of children and adolescents.

Jill A. Bush, PhD, FACSM, is an associate professor in the Department of Health and Exercise Science at The College of New Jersey, where she researches the role of physical activity and dietary intake on risk factors for chronic diseases and obesity and healthy eating habits in children and young adults.

References


Why Weight? (continued on page 13)
Shuttle Walking Test (continued from page 3)

*The ISWT kit is available by contacting Sally J. Singh, PhD at: Department of Respiratory Medicine, Glenfield Hospital NHS Trust, Groby Road, Leicester LE3 9qp, UK or by email at: leslie.shortt@uhl-tr.nhs.uk.

# About the Author

Peter Ronai, M.S., FACSM, RCEP, CES, CSCS-D, is a clinical associate professor in the Exercise Science Department at Sacred Heart University in Fairfield Connecticut. He is a clinical exercise physiologist and previously was manager of Community Health at the Ahlbin Rehabilitation Centers of Bridgeport Hospital in Connecticut. He is a Fellow of the American College of Sports Medicine (ACSM). He is past-president of the New England Chapter of ACSM (NEACSM), past member of ACSM, Registered Clinical Exercise Physiologist (RCEP), Practice Board, Continuing Professional Education Committee, and current member of the ACSM Publications sub-committee. He is also the special population's column editor for the National Strength and Conditioning Association’s Strength and Conditioning Journal (SCJ) and co-editor of ACSM's Certified News. He is also ACSM Program Director certified.

# References

Mental Health (continued from page 9)

Conclusion

Compared to the numerous studies of resistance training effects on physical health, there are relatively few studies of resistance training effects on mental health. However, an extensive review of the available literature led O’Connor, Herring, and Caravalho to conclude that the mental health benefits associated with strength training include reduced anxiety symptoms in healthy adults, increased cognition in older adults, decreased symptoms of depression in patients diagnosed with depression or fibromyalgia, and improved self-esteem.18 It would appear that there is indeed a mind/body connection, and that the positive effects of resistance exercise on physiological factors and physical health may extend to psychological factors and mental health.

About the Author
Wayne L. Westcott, Ph.D., teaches exercise science and conducts fitness research at Quincy College in Quincy, MA.

References
As ACSM strengthened its certification program, we knew that continuing education would be paramount. Health and fitness professionals need to keep up with the latest in their field, and we have provided two outstanding resources. Starting decades ago with ACSM’s Certified News, then adding ACSM’s Health & Fitness Journal®, we have been providing cutting edge articles and CECs to thousands of eager participants around the world. We are extremely excited to announce that we will now be offering the convenience of gaining instant credits through our new online learning platform. This will make all of your re-certification efforts easy and fast!

**Benefits of the CEC online learning platform include:**

- Online access 24/7 to ACSM CEC tests and credits
- Instant payment and email notification online (No more waiting 4 to 6 weeks for credits through the mail)
- Immediate credit certificates issued online with passing grade
- Past issues of eligible CEC Self-Tests available online

**Instructions:**

To take the CEC quiz(zes) for instant results and a printable certificate that you can immediately use for your certification(s), please do the following:

- Go to www.onlinelearning-acsm.org
- Select the self-test(s) you would like to take from the options available on the site and pay the processing fee.*
- Read the designated feature issue carefully.
- Take the online test
- Print your certificate(s) for your files

*If accessing a self-test from ACSM’s Health & Fitness Journal® you will need an access code that can be found printed in each issue of the journal. A subscription to the journal is required.

For questions on the new online education platform, please email onlinelearning@acsm.org.

Check out ACSM’s New Online Learning Platform Today!

www.onlinelearning-acsm.org