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In This Issue

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CCRB Column

2015 RECAP AND FUTURE DIRECTIONS FOR *ACSM'S CERTIFIED NEWS*

By Dierdra Bycura, Ed.D., and Yuri Feito, Ph.D., MPH, FACSM

As Yuri and I finish up our first year as co-editors of *ACSM's Certified News* (*CN*), we'd like to take this opportunity to thank those who have given of their time and expertise to author articles for *CN*. Your contributions have benefited ACSM's certified professionals internationally by providing relevant and applied content. Please see the table on page 9 for the topics and audiences reached (*e.g.*, clinical versus applied practitioner) over the last year.

Moving forward, we would like to focus on creating greater synergy between the readership's interests and *CN* content. Even though prospective authors can turn to several sources (*e.g.*, current research literature, conference proceedings, trending topics from applied publications) to compose an article for submission, we believe the voice of the readership is most valuable for *CN*'s growth.

The collective voice of fitness professionals was most recently reported in *The Worldwide Survey of Fitness Trends for 2016*, written by Walter R. Thompson, Ph.D., FACSM, and published in *ACSM's Health & Fitness Journal*®.[1] This continued work (ten years running) was a culmination of survey results from fitness professionals internationally commenting on health and fitness trends. In addition, at the conclusion of the article, four fitness professionals were asked to comment on the trends reported. Their backgrounds were different with respect to levels of experience, employment type and interests in the field. This offered varied perspective on the trends identified by the survey respondents.

Examining the trends reported in *The Worldwide Survey of Fitness Trends*, reviewing insights from other professionals, and reflecting on our own practices might be an interesting place to start a potential discussion of a possible topic to include in a future issue of *CN*, which will have great appeal to other certified professionals around the world.

That said, we want to hear from you! We are currently looking for contributors for upcoming issues of *CN* and would like to work with you to share your knowledge with all certified professionals. In addition, we are in the process of creating electronic avenues to communicate with certified professionals and would love to hear how you prefer to communicate with other professionals. Stay tuned! In the meantime, please don't hesitate to contact either Yuri or me with content suggestions and article contributions!

2015 Recap and Future Directions (continued on page 9)

MANAGING EXERCISE IN PATIENTS WITH DIABETES: ANTIHYPERGLYCEMIC MEDICATION REVIEW – PART 2

By Jeff Soukup, Ph.D.

In the first of this two-part series I provided a brief review of the classifications of antihyperglycemic medications that are currently being used in the treatment of diabetes and mentioned that the major concern for exercise-induced hypoglycemia (EIH) comes when a medication increases the amount of insulin within the system (either by exogenous administration or by increasing pancreatic production) and disturbs the insulin-glucagon balance.

In addition to insulin, medications that increase the opportunity for EIH are collectively referred to as insulin secretagogues and include sulfonylureas, and meglitinides. While other antihyperglycemic medications also produce a glucose lowering effect during exercise, they should leave the counter-regulatory system intact so that hypoglycemia may be avoided. Under normal physiologic conditions, the onset of exercise is accompanied by a sympathetic nervous system response which, by the action of epinephrine, inhibits the release of insulin from the beta cells of the pancreas. At the same time, epinephrine stimulates the release of glucagon from the alpha cells of the pancreas which then acts on the liver to stimulate the release of glucose. The net result is that the increasing muscular glucose uptake caused by exercise is carefully balanced with increased hepatic glucose output caused by glucagon, and the blood glucose levels remain relatively stable as long as sufficient amounts of glucose are available for release. Conversely, when there is an excessive amount of insulin within the system that is not amenable to adequate down-regulation and glucagon release is inhibited (such is the case when insulin or insulin secretagogues are taken), there is an opportunity for muscular glucose uptake to exceed hepatic glucose output and result in a decrease in blood glucose. Under these circumstances, the counter-regulatory system will be overwhelmed and the possibility of hypoglycemia results.

When working with patients who inject insulin, it is important to understand the characteristics of the insulin that is being injected along with the patient's injection schedule. Regarding the characteristics of insulin, one must be aware of the onset, peak time, and duration of the medicine being injected. The onset refers to length of time following the injection before the insulin reaches the bloodstream and begins lowering blood glucose. The peak time refers to the length of time during which the insulin is at maximum strength and the duration is the length of time that the insulin will continue to lower blood glucose levels. There are four types of injectable insulin: rapid acting, regular or short acting, intermediate acting, and long acting. Each of these has a different onset, peak time, and duration as outlined in the table.[2]

Table 1: Injectable Insulin

Insulin Type	Onset	Peak Time	Duration
Rapid acting	5-15 min	30-90 min	3-5 hours
Regular, short acting	30-60 min	2-3 hours	5-8 hours
Intermediate acting	2-4 hours	4-10 hours	10-16 hours
Long acting	2-10 hours	6-16 hours	16-24 hours

Management of exercise in patients who take insulin requires the clinician to be aware of the insulin type, timing of injection, content and timing of meals, and in some cases, the insulin injection site. Exercising when insulin is not at its peak, injecting insulin into a non- or less-active muscle group, and exercising one to two hours after a meal will reduce the likelihood of EIH. If exercise is undertaken when the above can not be avoided, then the clinician must be prepared to check blood glucose more frequently and treat EIH with a fast-acting carbohydrate. For more information on managing blood glucose during exercise, the reader is referred to table 40-6 of the 7th edition of *ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription*.

The peak level and half-life of insulin secretagogues determine the time of maximum blood glucose lowering effect and the duration of action, respectively. For sulfonylureas, the peak levels range from one to four hours with most having peak levels of two to four hours.[1] For the meglitinides, the peak levels occur earlier and range from one to two hours. The half-life of sulfonylureas ranges from 4-10 hours while the half-life of meglitinides is one to one and one half hours. Avoidance of EIH may best be achieved by selecting exercise times that are not within the peak level range of the specific medicine. However, these medications are often taken prior to meals and if exercise is to be undertaken one to two hours thereafter, it will occur during peak level times. Once again, checking blood glucose levels before, after and sometimes during exercise will provide the best insight on how to manage the exercise session.

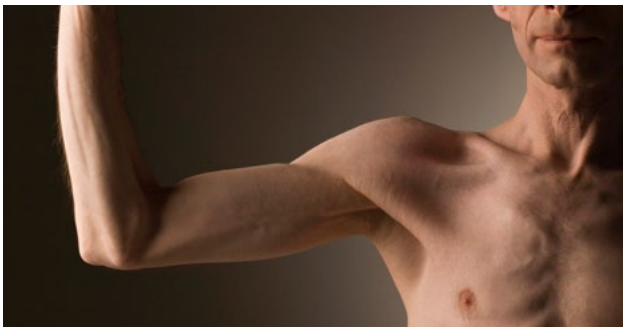
About the Author

Jeffrey Soukup received his Ph.D. in Human Performance from the University of Southern Mississippi in August 2003 after spending the previous 14 years working at Providence Hospital in Mobile, AL as a certified diabetes educator and cardiopulmonary rehabilitation exercise physiologist.

Antihyperglycemic Medication Review (continued on page 10)

MUSCLE RECOVERY FROM RESISTANCE EXERCISE

By Wayne Westcott, Ph.D.



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When a muscle experiences tissue microtrauma from a resistance training session, it initially becomes weaker and gradually remodels to a slightly higher level of strength. For example, in a classic and comprehensive study by McLester and colleagues,[4] ten previously trained young men performed eight standard strength training exercises for three sets of ten repetitions each, using the 10-repetition maximum (10RM) weight load. The mean number of repetitions performed across all of the exercises was 10.2 repetitions. After a one-day (24-hour) recovery period the mean number of repetitions completed was significantly lower than baseline, at 8.4 repetitions. Following a two-day (48-hour) recovery period the mean number of repetitions completed was almost back to baseline, at 9.9 repetitions. After a three-day (72-hour) recovery period the mean number of repetitions completed was significantly higher than baseline, at 11.2 repetitions. Following a four-day (96-hour) recovery period the mean number of repetitions completed remained at 11.2 repetitions.

The findings from this well-designed research study revealed that a standard resistance training session, in which each exercise set is performed to momentary muscular failure, resulted in lowest strength levels one day after the weight workout, a return to original strength levels two days after the weight workout, and highest strength levels three to four days after the weight workout. These results suggested that full-body, moderate-volume, high-effort resistance training sessions should be followed by 72 to 96 hours of recovery time for optimum strength development. Two exercise sessions a week would therefore be a recommended training frequency for full-body weight workouts. A split workout routine, such as chest and triceps exercises on Mondays and Thursdays, upper back and biceps exercises on Tuesdays and Fridays, leg and core exercises on Wednesdays and Saturdays, would likewise provide 72 to 96 hours of recovery time between successive training sessions for given muscle groups.

A study by Hackney and associates[2] examined the increase in resting energy expenditure following a full-body, high-volume, high-effort weight workout. A group of eight previously trained subjects and a group of eight previously untrained subjects both performed eight standard resistance exercises for eight sets of six repetitions each using the six-repetition maximum (6RM) weight load. The previously trained study participants experienced a 7.9 percent average increase in resting energy expenditure during the three-day (72-hour) period following their strength training session. The previously untrained study participants experienced a 9.2 percent average increase in resting energy expenditure during the three-day (72-hour) period following their strength training session. These results indicated that muscle remodeling processes were active for at least three days after the full-body, high-volume, high-effort weight workout.

Research by Heden and colleagues[3] revealed similar results from a full-body, low-volume, high-effort strength training session. Eight previously untrained young male participants performed ten standard resistance exercises for one set of 10 repetitions each using the 10RM weight load. Although the average completion time for this 10-set workout was just over 15 minutes, the study subjects experienced a 5.2 percent average increase in resting energy expenditure during the three-day (72-hour) period following their strength training session. These results revealed that even a relatively brief full-body weight workout, performed at a high level of intensity, was associated with a three-day increase in resting energy expenditure to accommodate muscle remodeling processes.

Based on the three studies reviewed, it would appear that, in general, muscles trained to temporary muscle failure require at least 72 hours of recovery to rebuild/build higher levels of strength. If this is the case, should the American College of Sports Medicine[1] revise its current strength training frequency guideline that recommends two to three workouts a week with at least 48 hours of recovery for the exercised muscle groups?

Not necessarily. As demonstrated in a large-scale study,[5] two or three resistance exercise sessions per week may be equally effective for increasing muscle strength in beginning participants who are training at a moderate effort level. In this study, more than 1,600 previously untrained subjects performed the same strength training program (10 standard weight stack machine exercises, one set of 8 to12 repetitions each) one, two, or three non-consecutive days a week, for a period of 10 weeks. The once-weekly strength training group experienced a relatively small lean weight (muscle) gain of 0.7 pounds. The two- and three-weekly strength training groups experienced identical increases in lean weight (muscle) of 3.1 pounds, which was significantly greater than that attained by the single-session group.

Muscle Recovery (continued on page 10)

COACHING CLIENTS WITH MILD CHRONIC CONDITIONS

By Erika Jackson, MA, MCC and Margaret Moore (Coach Meg), MBA

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This article continues a valuable series for our *Coaching News* column, exploring interesting and challenging client scenarios. We describe a few strategies from our science-based coaching toolbox to help you support your clients in engaging fully in a fit lifestyle that allows them to thrive, whatever thriving means in their lives.

Client Scenario: How do I support a client with a mild chronic condition (*e.g.*, diabetes or asthma) and few symptoms, in being motivated to lead an active lifestyle to prevent the development of more life-altering chronic symptoms?

You likely entered this field because you have a natural passion for health and fitness and the connection between the two. You feel called to help people improve their health conditions and quality of life through exercise and hopefully delay, minimize, or avoid the consequences of a serious medical event. You want your enthusiasm to spill over to your clients. You have a strong, internal motivational urge to move your body and you want to help others discover that strong urge. You encourage, educate, and sometimes cheerlead with enthusiasm to inspire engagement in a fitness lifestyle.

Your passion is a wonderful trait—believing in the power of health-giving lifestyles, believing people can get fit and get healthier through a fit lifestyle. It's invigorating to feel this passion. You are grateful for the work you get to do. While your passion is energizing for your relationship with clients, making it clear that you want to help them, your passion may not always elicit their passion and motivation. Sometimes you are successful and your clients get motivated and jump onto the fitness bandwagon and stay there. Sometimes your passion may be energizing for your clients for a while, or they may engage to please you for a while, but it doesn't last if they don't discover their own passion and internal motivation. Sometimes your clients don't seem to be particularly motivated from the outset. They may not bring a lot of passion to your time together. You are working pretty hard to ignite, motivate, and excite them, while they are just going through the motions; following directions.

What coaching inquiries might help you to be more successful in generating client motivation?

Tell me about the fittest and healthiest time(s) in your life.

Let's start by digging up, unpacking, and appreciating your client's past and best experiences with being healthy and fit. Ask these questions:

- What happened to generate these times for you?
- What did you learn?
- What did good health and fitness contribute?
- What was the impact on your energy, sleeping, stress, mental productivity, creativity, and other life aspects?

This appreciative inquiry allows clients to reconnect with a positive past in order to ignite possibilities for a positive future.

Describe someone you know and admire who has a chronic condition and has turned it into an opportunity to get more fit and healthier.

Most human behavior is learned through modeling; from birth we are attuned to the models in our lives for behaviors for everything from walking to conducting ourselves in social settings. We take our cues from role models and, when they are effective, can adopt the "If he can do it, I can do it!" attitude as a result.

There is an important distinction to make here, however. Behavior change is better influenced by *role models* than by *inspirations*. An inspiration seems untouchable. Like an Olympian, or an astronaut, or even you as a fitness expert, success of these role models is so far out of reach that it inspires awe, but not confidence. The success of inspirational role models may seem too unlikely for us to believe that we could do it too.

A role model is one or more persons with whom we feel a kinship. We see similarities in their character, in their stories and in their struggles. We see their humanity, along with their success. In other words, we can see ourselves in our role models, and therefore, our true potential to be like them.

Coaching News (continued on page 11)

EFFECTS OF LOW-VOLUME HIGH-INTENSITY INTERVAL TRAINING ON FITNESS

By Edward Davila, MS, and Leah Vogel, BS

Learning Objectives

1. To understand what low-volume high-intensity interval training is.
2. To describe the acute and chronic physiologic adaptations induced by low-volume high-intensity interval training.
3. To understand why low-volume high-intensity interval training may be a useful strategy to promote exercise adherence and health.
4. To have a better understanding on how to prescribe low-volume high-intensity interval training.

Engaging in regular physical activity (PA) is a well-documented strategy to reduce disease risk, improve cardiorespiratory fitness (CRF), improve quality of life (QOL), and reduce risk of certain cancers (*e.g.*, colon, breast).[11,3] Not only can regular PA induce positive physical health benefits, it also can lead to improvements in depression/anxiety, enhanced feelings of energy and well-being, and improved cognitive function.[3] However, despite the overwhelming and rapidly expanding body of literature to support the use of regular PA to prevent and/or reverse chronic disease and premature death, most adults fail to meet the minimum recommended guidelines.[4]

Many studies report that the most common reason for not exercising is "lack of time."[4] In response to this commonly reported barrier, research on exercise prescription strategies that yield similar health benefits to continuous endurance-based exercise with minimal time commitments have become exceedingly popular.[4] Moreover, these low time-commitment interventions, which generally consist of low-volume high-intensity exercise intervals, have led to as good, if not greater physiologic adaptations when compared to a more contemporary moderate-intensity continuous exercise training (MCT) approach.

High-Intensity Interval Training

High-intensity interval training (HIIT) has gained considerable attention as a promising, "time-efficient" exercise prescription strategy in a variety of populations. Typically, HIIT protocols involve a series of repeated bouts of higher intensity exercise interspersed with shorter periods of low-to-moderate intensity recovery periods.[7,1] Both acute and chronic effects of HIIT have been documented (Table 1).

High-intensity interval training has been shown to improve anaerobic and aerobic capacity, increase skeletal muscle capacity for fatty acid oxidation and glycolyic enzyme content, improve insulin sensitivity and acutely impact hormonal response.[1] Further, after a single bout, HIIT has been shown to lead to enhanced cardiac vagal modulation and decreased number of premature ventricular contractions which, in turn, decreases the likelihood of potentially lethal ventricular dysrhythmias.[6]

Table 1. Acute and Chronic Responses of HIIT

Acute	Chronic
↑ Heart Rate	↑Aerobic Capacity
↑ Cortisol	↑Anaerobic Capacity
↑ Catecholamines	↑Insulin Sensitivity
↑ Growth Hormone	↑Skeletal Muscle Capacity for Fatty Acid Oxidation and Glycolyic Enzyme Content
↑ Plasma Lactate	
↑ Plasma Glucose	
↑ Glycerol	
↑ Cardiac Vagal Modulation	
↓ PCr, ATP, Glycogen Stores	

NOTE: PCr = Phosphocreatine; ATP = Adenosine Triphosphate

Low-volume high-intensity interval training protocols are safe and time-efficient strategies that have been used in both healthy and chronic diseased populations.[2,9] In fact, interval exercise training has been shown to create superior improvements in CRF compared with MCT in patients with cardiovascular disease (CVD) and also has been demonstrated as superior to MCT in reversing risk factors of metabolic syndrome.[8,10] Further, research shows that after a short-term HIIT intervention of two weeks, insulin sensitivity increased by 25 percent at 24 hours following the HIIT intervention but had returned to baseline 72 hours post-exercise.[1]

In healthy populations, the intermittent method of HIIT allows for less fatigue due to the frequent periods of lower intensity exercise or rest. Consequently, this leads to a greater physical effort during the high-intensity exercise interval.[7] For example, in athletes the greatest improvements in peak oxygen consumption (VO_2) are demonstrated when high-intensity exercise training (*i.e.*, 90 to 100 percent HRR) is integrated into the training program.[12]

In addition, HIIT has been shown to repeatedly stress the adenosine triphosphate phosphocreatine (ATP-PC) and glycolysis energy systems, which increases the energy capacity of skeletal muscles and has even been shown to induce skeletal muscle remodeling towards a more oxidative phenotype.[7,5] As a result, HIIT has been shown to lead to improved exercise capacity, lower lactate accumulation, increased capacity for whole-body and skeletal muscle lipid oxidation and to cause increases in peroxisome-proliferator activated receptor γ coactivator (PGC)

Interval Training (continued on page 12)

HEALTHY NUTRITION FOR CARDIOVASCULAR DISEASE PREVENTION AND TREATMENT

By Lyndsey M. Hornbuckle, Ph.D., RD

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Cardiovascular disease (CVD), sometimes referred to simply as heart disease, affects approximately 83.6 million Americans (more than one-third of the population) and is a leading cause of morbidity and mortality in the United States.[4] CVD encompasses multiple issues that can occur in the heart and/or blood vessels that are often linked to atherosclerosis. Atherosclerosis is a condition that results from the accumulation of plaque in the artery walls, ultimately narrowing those arteries and restricting blood flow in the body. If a blood clot forms in the restricted artery, a myocardial infarction (also known as a heart attack) or a stroke can occur, resulting in permanent damage to the cardiac muscle or brain cells.[1] In serious cases, either event can result in death. Congestive heart failure, cardiac arrhythmias, and problems relating to the valves of the heart are additional conditions that are considered types of CVD.[1]

Survivors of myocardial infarctions and strokes, as well as individuals diagnosed with CVD and conditions linked to CVD such as atherosclerosis, hypertension, and diabetes, are often advised by their health care professionals to make immediate lifestyle changes and to maintain these changes in order to minimize future risk of a cardiac event. The American Heart Association has identified dietary improvement as a critical change necessary in the strategy to prevent CVD risk.[6] This article will review major dietary "culprits" that contribute to CVD and strategies to reduce each of them. When these culprits are appropriately managed, reductions in CVD and CVD risk often follow. In addition, the article will review dietary "helpers" that, when consumed as recommended, serve as a form of defense against particular contributors to CVD.

Culprit: Sodium

Hypertension, or high blood pressure, is commonly linked to CVD and has been shown to be the leading cause of CVD worldwide.[5] In general, research has shown that as sodium intake increases, blood pressure increases.[6] Although sodium is an essential nutrient, most individuals only need it in small quantities. The majority of Americans consume an excess of sodium because it is found in large quantities in processed and preserved foods (canned items, frozen meals, etc.), which are widely available in the United States. Studies show that a reduction in sodium intake can both prevent hypertension and assist in blood pressure control,[6] as well as reduce myocardial infarctions, strokes, and the annual number of deaths from any cause.[2] The United States Departments of Agriculture (USDA) and Health and Human Services (HHS) recommend 2,300 mg/day of sodium (the amount found in one teaspoon of table salt) as the tolerable upper intake level for adults, with 1,500 mg/day considered the adequate intake. The adequate intake is particularly recommended for individuals 51 years of age and older, African-Americans, and those who are already diagnosed with hypertension. Interestingly, recent data has shown that the average intake for Americans two years of age and older is 3,400 mg/day.[11]

The Dietary Approaches to Stop Hypertension (DASH) diet is a well-established eating plan that emphasizes the abundant consumption of fresh fruits, fresh vegetables, whole grains, and low-fat dairy products as a way to naturally reduce sodium and total fat consumption without specific restrictions. The DASH eating pattern is often the go-to line of dietary defense against hypertension, because adherence to the DASH diet has been linked to decreases in both systolic and diastolic blood pressure[7] and lower CVD and stroke risk.[8] Patients and clients can "DASH" to control or lower their blood pressure by consuming the following:

- two to three servings/day of low-fat/nonfat milk or dairy products
- four to five servings/day of fruit (preferably fresh)
- four to five servings/day of vegetables (preferably fresh and seasoned without salt)

Healthy Nutrition (continued on page 13)

IS HIGH-INTENSITY INTERVAL TRAINING A "MAGIC BULLET" FOR THE TREATMENT OF OBESITY?

By Emily J. Sauers, Ph.D.

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Objectives

1. Define high-intensity interval training.
2. Identify why high-intensity interval training is an appealing mode of exercise to many.
3. Identify health-related benefits to high-intensity interval training as they relate to obesity.
4. Identify limitations to using high-intensity interval training as a method to aid in weight loss.

Over the years, it has become evident that the majority of adults in the United States do not meet current physical activity guidelines[4] of 150 minutes of moderate intensity exercise per week.[1] A clear link exists between physical activity status and obesity, as well as cardiovascular and metabolic disorders. With obesity rates in the United States at 34.9%[4], it is clear that health-related professionals have a duty to increase activity and reduce obesity in the majority of adults.

A leading reason reported by many adults for not participating in exercise programs is a perceived lack of time. High-intensity interval training, or HIIT, has sparked optimism in many because it is perceived as a time-efficient method to increase cardiorespiratory fitness levels and induce weight loss. In fact, HIIT has become such a popular concept that it is ranked second among ACSM's Top Fitness Trends for 2015.[6] HIIT involves short duration, high-intensity exercise followed by a low-intensity (active) or passive recovery; typical ratios for work to recovery are from 1:2 to 1:5. This cycle is repeated typically between four and eight times in a single workout, typically making an exercise session less than 30 minutes. Recent studies have determined that HIIT improves cardiovascular functioning by reducing heart rate and increasing stroke volume during submaximal exercise bouts.[9] Demonstrated improvements in metabolic functioning include improved insulin sensitivity independent of weight loss.[6] Aerobic capacity has consistently been shown to increase in response to HIIT.[3,9] Many of the demonstrated benefits of HIIT address concerns for an obese population. However, in terms of weight loss and improved comorbidities, is HIIT truly an effective exercise protocol for an obese individual?

A study by Sijie compared the effects of 12 weeks of HIIT training with moderate intensity continuous training (MICT) in overweight young women. Following a ten minute warm up, the HIIT group completed 5x3 minute intervals at 85 percent $\dot{V}O_{2\,max}$, with three minute active recoveries at 50 percent $\dot{V}O_{2\,max}$. The MICT group completed a similar ten-minute warm-up and completed 40 minutes at 50 percent $\dot{V}O_{2\,max}$. All sessions were completed on an outdoor track. The researcher found that, compared to MICT, HIIT produced greater improvement of body fat, waist-to-hip ratio, resting heart rate, left ventricular ejection fraction, $\dot{V}O_{2\,max}$, and ventilatory threshold.[7] While this seems promising, the aforementioned protocols were not isocaloric. Therefore, it has not been demonstrated as a reliable method in determining if the effects seen were due to a higher stimulus in the HIIT group or if they may be attributed to the difference in training protocol. This brings up a common concern found in much of the literature; it is often difficult to compare protocols that have substantial differences between the stimulus and overall caloric expenditure. This is especially important concerning a population whose primary goal is weight loss. The aforementioned study utilized an outdoor track to complete all exercise sessions. While this mode does provide some difficulty when conducting investigative studies (effort, motivation, collection of data, etc.), a real-world mode of exercise is being utilized which is certainly applicable to an obese population.

A study by Lunt recruited middle-aged obese men and women who were randomized into the following exercise groups: low-intensity walking (WALK), aerobic interval training (AIT), and maximal volitional intensity training (MVIT). The WALK group completed 33 minutes of walking at 65-75 percent of HRmax. The AIT group completed four minutes of jogging at

Magic Bullet (continued on page 14)

2015 Recap and Future Directions (continued from page 2)

Table 1: *ACSM's Certified News* 2015

	Author	Title
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CCRB Column	Bill Simpson, Ph.D., FACSM	ACSM Certification – Progress for ACSM Certifications: 2015 and Beyond
Clinical Column	Jeff Soukup, Ph.D., ACSM CES	Understanding Pacemaker Settings – Part 1
Health & Fitness Column	Wayne L. Westcott, Ph.D.	Selection of Strength Training Exercises
Coaching News	Erika Jackson, M.A., MCC, Margaret Moore (Coach Meg), MBA	Health Coaching and Cultural Sensitivity
Tips & Tools	Penelope Dianne Steen	Customer Service for the Certified Professional
Clinical Feature	Jenna Brinks, M.S., Anne Davis, RN, and Barry A. Franklin, Ph.D., FACSM	Enhanced External Counterpulsation
H&F Article	Nicholas T. Lionetti, B.S., and Julie B. Wagaman, B.S.	Body Weight and Suspension Exercise for the Older Adult
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Clinical Column	Jeff Soukup, Ph.D., ACSM CES	Understanding Pacemaker Settings – Part 2
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Coaching News	Erika Jackson, M.A., MCC and Margaret Moore (Coach Meg), MBA	NCCHWC National Health Wellness Coaching Cert Launch in 2016
Tips & Tools	Peter Ronai, M.S., ACSM RCEP, CES, PD, CSCS-D, FACSM	Online Tips and Tools for Exercise Professionals
Clinical Highlight	Nicole M. Hafner, M.S., RCEP, HFS; Paul M. Gallo, Ed.D., ATC, CES, HFS, CSCS	The Evidence-Based Effects of Resistance Training on Sarcopenia in Older Adults
H&F Feature	Lyndsey Hornbuckle, Ph.D., RD	Nutritional and Lifestyle Strategies for Diabetes Prevention and Management
Wellness Spotlight	The article listed was not included in 2015-2	
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Clinical Column	Jeff Soukup, Ph.D., ACSM CES	Managing Exercise in Patients with Diabetes: Part One – Antihyperglycemic Medication Review
Health & Fitness Column	Wayne L. Westcott, Ph.D.	The Up and the Down: Concentric and Eccentric Muscle Actions
Coaching News	Erika Jackson, M.A., MCC and Margaret Moore (Coach Meg), MBA	Helping Clients Thrive Online Tips and Tools for Exercise Professionals: Human Kinetics Webinars
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Clinical Highlight	Chris Repka, Ph.D.	Physiological Benefits of Exercise in Cancer Patients
H&F Feature	Jim White, Ph.D., CCEP, CSCS	Returning to the Wild: Tailoring Exercise Programs for an Outdoorsperson Diagnosed with Chronic Disease
Wellness Spotlight	Carol Michaels	Mindful Exercise Programming for the Cancer Patient
2015 Fourth Quarter [2015, Vol 25 (4)]		
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Clinical Column	Jeff Soukup, Ph.D., ACSM CES	Exercise-induced Hypoglycemia: Medications and Timing
Health & Fitness Column	Wayne L. Westcott, Ph.D.	Muscle Recovery From Resistance Exercise
Coaching News	Erika Jackson, M.A., MCC and Margaret Moore (Coach Meg), MBA	Coaching Clients with Mild Chronic Conditions
Tips & Tools	The article listed was not included in 2015-4	
Clinical Feature	Lyndsey Hornbuckle, Ph.D., RD	Healthy Nutrition for Cardiovascular Disease Prevention and Treatment
H&F Article	Edward Davila, M.S., ACSM-RCEP, EP-C and Leah Vogel, BS, ACSM-EP-C	Effects of Low-volume High-Intensity Interval Training on Fitness
Wellness Feature	Emily J. Sauers, Ph.D., CES	Is High-Intensity Interval Training a Magic Bullet for the Treatment of Obesity?

About the Authors

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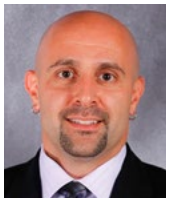

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Antihyperglycemic Medication Review (continued from page 3)

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Muscle Recovery (continued from page 4)

These research results suggested that two and three non-consecutive strength training sessions per week may produce similar rates of muscle development in beginning exercisers who are not performing high-volume or high-intensity workouts.

Summary

Studies show that high-volume and/or high-intensity resistance training sessions may require at least 72 hours of recovery time for optimum muscle remodeling and strength development. However, beginning exercisers who perform low-volume and moderate-intensity resistance training appear to attain similar gains in lean (muscle) weight with two or three weekly workouts.

About the Author

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Coaching News (continued from page 5)

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What are you most passionate about? What do you treasure most in your life?

Health and fitness is not the end goal for most people, it's the means to the end that people most desire. Ask these questions:

- What are you passionate about in your life?
- What do you treasure most?
- What do you most enjoy, or look forward to?
- What do you most want to have happen in your future?

Watch for your clients' eyes to sparkle, faces to light up, when they discuss what makes life most worth living. This is the energy of their life force, the energy needed to power up positive change.

How might a higher level of health and fitness help you live a life you treasure?

Now is an opportunity for your clients to connect the dots between their best experience of being fit and healthy and how greater fitness might enable them to have more of what they love most or more of what they want most for the future. After fully exploring the positive side, you might also ask:

- What would your life be like if your medical condition got more serious?
- How would it impact the things you are most passionate about or care most about?"

What are the most important reasons for you to get more fit and healthier?

Humans generally struggle to change behavior if the good reasons to change don't clearly outweigh the good reasons to not change. In today's world where we often feel overwhelmed and have no time to pause and reflect more deeply, our self-awareness may be shallow. Have your client develop a list of all of the good things that would likely happen if she or he was to get more fit and healthier. Get out of sales and into fishing, as motivational interviewing trainer Robert Rhode says. Dig deeper with these questions:

- What else would happen?
- What would that be like?
- What would you be like?
- What is good about that?"

What source of motivation will help you most in moments of planning and decisions, choosing between a healthy and less healthy option?

Your clients are faced daily with dozens of decisions that impact their fitness and health: Take the stairs or not? Eat the apple and not the cookie; and on and on. Ask your client to explore and prioritize his or her most potent source or sources of motivation, the ones that are most likely to generate a health-giving choice when brought to mind in the moment of making a plan or decision. Your client's greatest kind of motivation is the one that works best and reliably in the many moments of daily life when she or he plans and makes decisions. Then explore: How could you break out of automatic pilot and notice that this is one of those health-generating moments, and bring your best motivation, summon a good intention into mind just as the moment of choice arrives?

Onward and upward…

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Interval Training (continued from page 6)

-1α, which is an intensity-dependent regulator of mitochondrial biogenesis.[5,13]

Moreover, acute low-volume Wingate-based HIIT has been shown to induce increases in PGC-1α several fold when measured three hours post-exercise, which is comparable with increases observed following a bout of continuous endurance-based exercise training.[5]

Furthermore, due to the intermittent nature of HIIT, this exercise strategy permits stroke volume (SV) to reach higher levels repeatedly during a bout of HIIT as opposed to one time during a bout of MCT.[7] As a result, these repeated bouts of high cardiac stress may result in improvements in maximal SV.[7] Thus, HIIT has the potential to improve exercise capacity through both centrally and peripherally mediated mechanisms.

High-Intensity Interval Training Protocols

Depending on the interval training protocol prescribed, the subsequent effects of interval training stimulus can vary. To date, there is no standardized approach to prescribing this type of exercise training. In fact, many different HIIT protocols have been utilized in the literature ranging from 2 to 15 weeks. The protocol most commonly used in research has been the Wingate test (30 s of all-out sprint).[1] This protocol consists of 30 s of all-out sprint intervals repeated four to six times interspersed by four minute recovery periods.[1] This Wingate protocol amounts to approximately three to four minutes of exercise per session and is typically performed three times a week for two to six weeks.[1] However, due to the high intensity of this protocol, it may not be suitable for individuals not accustomed to exercising at this intensity. In response to this, other less intense HIIT protocols have been evaluated. In 2011, Boutcher summarized the effects of different HIIT protocols on fitness, insulin resistance, fat loss, and skeletal muscle adaptations.[5] Table 2 highlights a few examples of the reviewed protocols.

Table 2. Examples of Evidence-Based Low-Volume HIIT Protocols*

Mode	Intervals	Reps	Frequency	Effort
CE (WM)	30 s sprints	3-4 of cycle sprints per session	3x/wk for 2-6wks	All-out
CE	8 s sprint followed by 12 s low intensity cycling for 20 min	60 8 s sprints	45 sessions in 15wks	All-out
CE	15 s cycle sprint followed by 15 s of low intensity cycling for 20 min	4-6 30 s sprints	6 sessions in 2 wks	All-out

*NOTE: * = Boucher, 2011; CE = Cycle Ergometer; WM = Wingate Method*

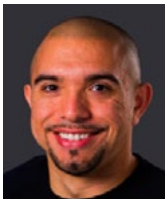
Although the less intense HIIT example protocols in Table 2 consist of lower sprint times during the work bouts and allow for more recovery, they all still require maximum efforts during the work phases (*i.e.,* all-out). Albeit in cardiac patients, Keteyian[7] has reported using a moderate-intensity interval training (MIIT) method consisting of four work bouts lasting four to five minutes at 70-80 percent heart rate reserve (HHR) separated by three minutes recovery bouts at 60-70 percent HRR.[7] Theoretically, utilizing MIIT in a non-cardiac population may be an effective strategy to improve exercise tolerance and progress to using HIIT, particularly in a sedentary and obese population.

Summary

Considerable evidence supports the use of low-volume HIIT as a safe, effective, and time-efficient strategy for inducing favorable central and peripheral physiologic adaptations. Given that the most commonly reported barrier preventing individuals from engaging in regular PA is "lack of time," the nature of low-volume HIIT may be an attractive method for fitness professionals prescribing exercise training for fitness improvements and weight loss. However, the optimal intensity, length, and work-rest ratio with consequent adaptations still needs to be evaluated. Furthermore, nearly all published protocols utilize a cycle ergometer. As such, less is known about the impact of using other exercise modalities (*e.g.,* rowing, stair climbing) with HIIT training.

Regardless, HIIT to promote regular PA appears to be a viable solution to overcome the "lack of time" barrier. Moreover, the utilization of HIIT has been shown to induce similar, if not superior, adaptations in healthy and diseased populations when compared to contemporary MCT. Ultimately, an appropriately prescribed and supervised HIIT intervention may assist in promoting PA compliance, improving fitness, and improving overall quality of life.

About the Authors



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- seven to eight servings/day of whole grains (whole wheat breads and pastas, brown rice, etc.)
- two servings/day or less of lean meat, fish, or poultry (three oz. of cooked meat = one serving)
- four to five servings/week of nuts, seeds, and dried beans

Helper: Fiber

Dietary fiber is a non-digestible form of carbohydrate that is found naturally in plants.[11] Dietary fiber intake is important because it has been associated with lower risk of CVD[10] and more favorable CVD-related health issues, including abdominal obesity, hypertension, blood lipids, metabolic syndrome (a collection of several CVD risk factors), and stroke.[3,9,11] Both forms of dietary fiber (insoluble and soluble) play a role in overall health, yet soluble fiber is of particular importance when considering the health of the heart and blood vessels. Insoluble fiber is considered dietary "roughage" that cannot be dissolved in water and promotes regularity in the gastrointestinal system. However, soluble fiber forms a thick gel during digestion because it is soluble in water. This type of fiber reduces the rise of blood lipids and slows the emptying of the stomach, which encourages a feeling of fullness and can have a positive effect on weight control.[10] *The Dietary Guidelines for Americans* recommends a dietary fiber consumption of 25 g/day for women and 38 g/day for men. The majority of Americans do not consume enough daily fiber, with a more typical daily intake being 15 g/day.[11] Remind patients and clients to actively seek out a couple of these great sources of dietary fiber each day:

- Beans, peas, and lentils
- Fresh fruits and vegetables
- Whole grains
- Bran products
- Nuts
- Cereals

Culprit: Saturated and Trans Fats

Dietary fat is present in many animal and plant sources. Because fat does have positive physiological effects (assists with the absorption of fat-soluble vitamins, concentrated source of energy, internal insulation, etc.), it is recommended that adults consume approximately 20-35 percent of their total daily calories from fat sources. However, high intakes of saturated and trans fat are associated with elevated blood lipids, including total cholesterol and low-density lipoproteins, which are risk factors for CVD.[6,11] Note that these types of fats can be identified by their solid structure when at room temperature (such as butter, some types of margarine, and the visible fat on meats). To reduce CVD risk, the American Heart Association suggests that less than seven percent of total caloric intake come from saturated fat, less than one percent come from trans fat, and less than 300 mg of cholesterol be consumed daily.[6]

Helper: Omega-3 Fats

Fats on the opposite end of the spectrum are omega-3 fats which have been linked to a reduction in cardiac deaths in individuals with and without CVD.[6,11] Incorporating food sources of omega-3 fats and other unsaturated fats like vegetable oils also may help displace some of the more harmful fat sources in the diet mentioned above. Although the average United States intake of seafood overall is approximately 3.5 ounces/week, approximately eight ounces/week of a seafood species high in omega-3 fats is the recommendation for cardiac benefit[11]. Some seafood varieties that are high in omega-3 fats include:

- Salmon
- Anchovies
- Sardines
- Tuna
- Trout
- Oysters

Culprit: Alcohol

Approximately half of United States adults are regular drinkers,[11] which include women who consume one drink per day and men who consume two drinks per day. Although moderate alcohol intake has been linked to a reduced risk of CVD and a lower number of cardiovascular events, drinking in excess has no benefit, and in fact increases the risk of hypertension, stroke, and type 2 diabetes.[11] For this reason, the American Heart Association recommends that if you do choose to consume alcohol, it should be done so in moderation. Specifically, the following parameters should be applied:

- No more than one drink per day for women or two drinks per day for men, ideally done so with meals
- Note: one drink is defined as 1.5 fluid ounces (about one shot) of 80 proof liquor, four fluid ounces of wine, or 12 fluid ounces of beer[6]

The dietary suggestions presented in this article can likely be most helpful if utilized to formulate prevention tactics in order

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to coach patients and clients into a healthy lifestyle before a cardiac event or clinical diagnosis related to CVD occurs. Individuals also should keep in mind that a general balance of caloric intake and physical activity will help them achieve and/or maintain an appropriate body weight, which also can reduce CVD risk. However, as an exercise professional, be aware that it is only appropriate to give general parameters for healthy eating. If a patient or client requires specific diet evaluation or therapy, it is critical to refer them to a registered and licensed dietitian who has obtained the clinical training to provide a diet prescription. This is the safest option for both the exercise professional (from a liability standpoint) and the patient or client, who deserves specialized treatment from a professional specifically trained to provide diet therapy. This is particularly important when working with a clinical population where food-drug interactions must be considered. Qualified diet professionals in your area can be located through the Academy of Nutrition and Dietetics[5] website at www.eatright.org. Incorporating diet professionals into your practice will only enhance your patient's or client's health benefits and/or training results, allowing everyone to obtain the common goal of achieving optimal health and wellness for the individual of interest. So bring on the teamwork!

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Magic Bullet (continued from page 8)

85-95 percent of HRmax with three minutes of active recovery at 65-75 percent HRmax. The MVIT group completed 30 seconds of all-out exercise with four minutes of low-intensity recovery. All sessions took place in a local park three times per week for 12 weeks. The investigators determined there were no significant differences after training between groups in body mass index, $\dot{V}O_{2\,max}$, waist circumference, body fat, blood pressure, insulin resistance, or high density lipoproteins. There was a greater decline in total cholesterol and a trend toward lower triglycerides in the WALK group, but that was attributed to a reduced energy intake in that group.[2] This study is of particular interest because it has clear applications. Compliance with this study was a clear limitation. The WALK group should have (in theory) exercised 144 minutes/week but exercised 166 minutes. The AIT group should have exercise 120 minutes/week but actually exercised 74 minutes/week. The MVIT group should have exercised 90 minutes/week but only exercised 45 minutes/week.[2] This study illustrates what may be a larger issue than simply the effectiveness of HIIT on weight loss. A bigger challenge to practitioners appears to be increasing compliance and the amount of time spent in exercise every week.

Perhaps the most reasonable method is to eliminate the notion that HIIT is a "magic bullet" approach to weight loss. Instead, it may be more reasonable to combine both continuous aerobic exercise and HIIT when designing exercise prescriptions to target weight loss. A study by Roxburgh assessed this idea in overweight/obese moderate-risk men and women. In this study, participants attended five exercise sessions per week for 12 weeks. Those in the continuous, moderate intensity group (CMIET) completed 15 minutes on a cycle ergometer and 15 minutes walking on a treadmill at 45-60 percent heart rate reserve. A second group completed four days of continuous moderate-intensity exercise and one day of HIIT (CMIET+HITT). The continuous training bouts were the same as the CMIET group. The HIIT day consisted of 8-12 60-second intervals at 100 percent $\dot{V}O_{2\,max}$ with 150 seconds of active recovery on a treadmill. Roxburgh found that the inclusion of HIIT did not yield any clinically significant differences in physiological measures when compared to the CMIET group, despite similar energy expenditure.[6] However, what is interesting to note is that the compliance for continuous exercise sessions was 87.5 and 86.5 percent in the CMIET+HIIT group and CMIET group respectively. The HIIT training session had 100 percent

compliance.[6] Granted, sample size is a primary limitation in this investigation, but the compliance to HIIT in an overweight/obese group is encouraging. For effective weight loss, ACSM recommends individuals exercise most, if not all, days of the week.[1] It seems that adding variety through HIIT may encourage participants to meet these requirements more so than just continuous exercise training.

While the health benefits of HIIT are clear, discretion must be used in applying this training method to the obese population. This is an interesting tactic in theory, but a good amount of research is still needed to determine appropriate protocols and modes for the obese population. While it appears that exclusive HIIT may not elicit the direct weight loss benefits that are commonly cited in popular media, clear benefits to the obese population do exist. Indirectly, weight loss success may be increased simply by increasing the amount of time spent in physical activity. Adding variety and enhancing compliance is an important component to exercising among the obese population. This understated benefit may in fact be one of the key benefits of HIIT in this population.

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