

fitness matters

VOLUME 13 • ISSUE 5 • SEPT/OCT 2007 • \$5.00

American Council on Exercise
A Non-profit Organization

**ACE-Sponsored
Research Study**

Human Joysticks

*Could a videogame be
the secret to making our
kids more fit and less fat?*



LETTER FROM THE EDITOR

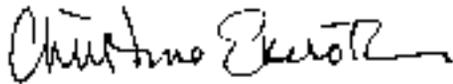
I am not a videogame person. I have brothers who are in their 30s and 40s who can spend an entire afternoon in front of a videogame while their sons' and nephews' pleas for a turn at the controls go unheard. And while I can appreciate how far the technology has come (anyone remember Pong?), I don't think I've enjoyed playing a videogame since the days of dropping my quarters into the Ms. PacMan machine at the local pizza joint some time in the 1980s.

I have a feeling I don't like videogames for the same reason I don't like playing basketball...I'm a lousy player. While my sister captained her college team, I want to quit the moment someone starts trying to slap the ball away from me. And to be good at basketball or videogames (or anything, for that matter), you've got to put in the time. I've just never had the patience to sit in front of a television screen and learn to be proficient at these high-tech games. (It's also why I can't watch a rented movie in a single sitting.)

However, a new trend in videogames requires the user to physically participate in the game. In this issue, we examine Dance Dance Revolution (DDR), the videogame phenomenon that has kids all over the world on their feet and moving. In fact, public school systems are now using DDR in the hopes that it will motivate kids to be more physically active.

Now this is a videogame I can see myself doing (albeit with no one watching—rhythm isn't my strong suit either). Or, if dancing isn't your thing, other videogame systems such as the Wii get participants on their feet to play tennis or box against a champion. Last year on Christmas morning, I called a friend at home and before I could say a word, he asked me to hold on because he was in the middle of an intense bowling match and it was his turn to go for a strike.

In most cases, technology has made it possible for us to be almost completely inert throughout our daily lives. But perhaps the tide is turning and new technologies will make it more fun than ever to be physically active. For generations raised on computers and videogames, this may be the key to breaking the inactivity habit.



Christine Ekeroth

STAFF

Publisher Scott Goudeseune

Chief Science Officer
Cedric X. Bryant, Ph.D.

Editor Christine J. Ekeroth

Art Director Karen F. McGuire

Associate Editor Marion Webb

Production Nancy M. Garcia

Mission Statement The American Council on Exercise (ACE)[®] is a non-profit organization committed to enriching quality of life through safe and effective physical activity.

As America's Authority on Fitness,[™] ACE protects all segments of society against ineffective fitness products, programs and trends through its ongoing public education, outreach and research. ACE further protects the public by setting certification and continuing education standards for fitness professionals.

This publication is not intended to provide medical advice on personal health issues, which should be obtained directly from a physician.

EDITORIAL ADVISORY BOARD

Nancy Clark, M.S., R.D., a registered dietitian with additional training in exercise physiology, is the director of nutrition services for SportsMedicine Brookline, one of the largest athletic injury clinics in New England. Clark specializes in sports nutrition, wellness and the nutritional management of eating disorders. She has authored several sports nutrition books and contributes to numerous publications.

Dale Huff, R.D., is co-owner of Nutriformance and a former area manager for First Fitness in St. Louis, Mo. He has extensive experience designing and managing personal-training programs and has worked in various clinical settings as a dietitian. He also is an ACE-certified Personal Trainer.

Steven F. Loy, Ph.D., F.A.C.S.M., is a professor of kinesiology and director of the Exercise Physiology Laboratory at California State University, Northridge. He is executive director of the Southwest Chapter of ACSM and is the wellness coordinator for the Los Angeles Fire Department. He has overseen several ACE-sponsored studies of exercise equipment.

Suzanne Nottingham is founder of Sports Energy in Mammoth Lakes, Calif. She is a well-known programming innovator for outdoor, sports and balance conditioning, and was IDEA's 2000 Fitness Instructor of the Year. She is currently the fitness director for the Double Eagle Resort & Creekside Spa in June Lake, Calif.

Michael Pratt, M.D., M.P.H., coordinates physical activity research and health promotion programs within the National Center for Chronic Disease Prevention and Health Promotion at the Centers for Disease Control and Prevention (CDC). He is board certified in general preventive medicine and public health and is a fellow of the American College of Preventive Medicine. He has published numerous articles and spoken widely on the health aspects of physical activity.

William C. Whiting, Ph.D., F.A.C.S.M., C.S.C.S.D., is a professor of kinesiology and director of the Biomechanics Laboratory at California State University, Northridge. He is a past president of the Southwest Chapter of ACSM and co-author of *Biomechanics of Musculoskeletal Injury*.

Have You Moved?

If you move or change your mailing address, please notify us immediately so we can update our records. That way you won't miss an issue of *ACE FitnessMatters*, or any other important mailings from ACE. Just give us a call at 800-825-3636, Ext. 782. www.acefitness.org

Subscription price is \$19.95 per year. ISSN 1082-0361

ACE, American Council on Exercise, *FitnessMatters* and Workout Watchdog are registered trademarks of the American Council on Exercise.

In order to give you the most unbiased information, the American Council on Exercise does not accept advertising in this publication.

ACE FitnessMatters is published bimonthly by the American Council on Exercise, 4851 Paramount Drive, San Diego, CA 92123.

© 2007 American Council on Exercise



“All the news that keeps you fit...”



Page 7

Cover Story

Human Joysticks 7

Could a videogame be the secret to making our kids more fit and less fat? New ACE-sponsored research examines the physical benefits of the popular videogame Dance Dance Revolution.

Inside This Issue

Muscle Build-Up: Optimal Nutrient Intake and Timing for Resistance Training 4

There is no shortage of solid research demonstrating that muscle-building efforts can be maximized by following specific nutritional principles. Monique Ryan, M.S., R.D., explains the specific food choices, portions and timing that allows the muscle-building process to exceed that of muscle breakdown.

The Science Behind Interval Training 12

Several new studies examining the benefits of interval training demonstrate that in a matter of weeks, alternating short bursts of high-intensity exercise with periods of near or complete rest can enhance athletic performance,

improve cardiovascular fitness and accelerate weight loss.

Three Ways to Increase the Challenge of Traditional Exercises 14

Here are three basic exercises, but with a twist—an added challenge that will increase the intensity of your workout and improve important aspects of fitness like balance and core strength.

CEC Quiz 15

ACE's Chief Science Officer Answers Your Questions 16

Cedric X. Bryant, Ph.D., answers a reader's question about the new over-the-counter diet pill called Alli.



Page 4



Page 12



Page 14

Muscle

Optimal

Build-Up:

By Monique Ryan, M.S., R.D.

There is no shortage of solid research demonstrating that muscle-building efforts can be maximized by following specific nutritional principles. Nutritional support for resistance training focuses on actual tissue building in which muscle fibers increase in diameter, get stronger and contract more powerfully. Resistance training breaks down muscle tissue even as it stimulates muscle-fiber growth. Providing the nutritional support that allows the muscle-building process to exceed that of muscle breakdown, a condition referred to as positive protein balance, is key. Positive protein balance can be achieved through specific food choices, portions and timing.

In addition, hormones—specifically growth hormone, testosterone, insulin and insulin-like growth factor—all exert control on muscle growth. Food choices can effectively support resistance-training efforts by appropriately affecting these hormone levels and providing the body with the proper muscle-building tools.

Whole-day Dosing

Meeting the energy requirements of the overall training program is essential for optimizing muscle building. Cutting back too much on calories, even if fat loss is also a goal, is not recommended as this may compromise daily recovery and ultimately hamper muscle-building efforts. “When our research subjects resistance train three days weekly, energy requirements can go up by 400 calories per day,” says William Evans, Ph.D., a researcher on aging and performance at the University of Arkansas Medical Sciences and Veterans Administration.

While total energy intake is important, so are the relative percentages of carbohydrate, protein and fat. In fact, muscle glycogen is one fuel source utilized during resistance training, as is creatine phosphate. Muscle glycogen can also become depleted when resistance training is performed back-to-back with regular cardiovascular exercise. When resistance training is combined with endurance-training sessions lasting longer than 75 minutes, as much as 3.5 to 4.5 grams of carbohydrate per pound of body weight may be required to meet the glycogen demands of these two workouts.

Approximately 20 percent to 25 percent of your total energy intake should consist of healthy fats. Several studies have indicated that very-low-fat diets may compromise blood testosterone levels, which can contribute to a state of muscle breakdown rather than muscle building.

Protein is, of course, a major component of muscle tissue and is the macronutrient most closely associated with muscle building. “Consuming about 150 percent to 200 percent of the RDA for protein maximizes the muscle-building efforts of resistance training,” says Evans. Conveniently, these higher protein amounts can be met while consuming relatively modest portions of concentrated, quality food sources such

as lean red meat, poultry and fish. Dairy foods and eggs also add to the protein mix, as do plant foods such as lentils, beans and whole grains.

However, research indicates that the type and amount of protein you consume, as well as the timing of the protein intake, is crucial and probably the most important muscle-building nutritional strategy.

“Loss of muscle mass appears to be a lifelong process after peak growth. Thirty-year-olds have less muscle mass than twenty-year-olds, with about a 5 percent loss per decade. The decrease in metabolic rate in aging is almost entirely due to this decrease in muscle tissue. Many athletes need to resistance train to build and maintain muscle and we have seen positive results in our studies in athletes 35 years and older.”

—William Evans, Ph.D.

Nutrient Intake and Timing for Resistance Training

Protein Precision

Timing

Several studies have specifically measured the effects of consuming both protein and carbohydrate before or after weight training. "Exercise itself primes the muscle for protein synthesis, but only if amino acids are available. Providing protein within 30 minutes of weight training is the most effective practice," says researcher Robert Wolfe, Ph.D., of the University of Arkansas.

This pre-training protein and carbohydrate intake seems to produce an even higher response when compared to protein and carbohydrate consumption after resistance training. Researchers believe that as blood flow is directed to muscles during resistance training, so are the amino acids from a protein/carbohydrate drink, making them available in a greater concentration to the muscle.

Recommendation: Aim for 20 to 30 grams of high-quality protein before weight training. Whey protein often fits the bill for its amino acid profile and convenience. It can be added to milk or yogurt along with 20 to 30 grams of carbohydrate from fruit or juice.

Though consuming protein prior to weight training is very effective in promoting positive protein balance, you can still consume these protein and carbohydrate amounts after resistance training. Several studies have examined the effects of a protein and carbohydrate mixture taken either immediately following, or one or three hours after, a resistance-training workout. All the timings were found to be similarly effective in stimulating protein synthesis when compared to a placebo, with protein being the most important nutrient of the protein-carbohydrate mix. But be sure to include carbohydrate post-training, especially if the weight-training session was combined with a cardiovascular workout. Carbohydrate consumed by itself after weight training helps replenish muscle glycogen stores; however, when consumed with protein, it stimulates the hormone insulin, which in turn allows the protein in the nutritional mix to further enhance protein building.

Choices

A high-quality protein providing a good dose of essential amino acids is recommended.

Some good food combinations include dairy sources, such as skim milk and yogurt smoothies mixed with fruit, a turkey sandwich, yogurt with fruit or granola, a peanut butter sandwich, eggs with toast, or an energy bar with the right source and dose of protein. Whether real food or a supplement is consumed is often a matter of convenience.

Protein supplements are currently available in a variety of

forms. Whey protein, which is the component of milk that is separated when making cheese and other dairy products, is a high-quality, easily digested protein (whey protein isolate is a lactose-free form). Casein is also a high-quality protein, and is a key ingredient in many sport supplements. Soy protein, particularly soy protein isolate, is a lactose-free, high-quality vegetarian protein. Often only one scoop of many of these concentrated protein products is required for the 15- to 20-gram dose. Some products include carbohydrate in the mix, while other pure protein supplements can be mixed with juice.

Other Considerations

Good hydration is also important for weight training so begin all resistance-training sessions in a well-hydrated state. During workouts, aim to drink 4 to 8 ounces of fluid for every 15 to 20 minutes of activity. You may even find that a sports drink provides some needed fuel toward the end of your workout. Although creatine phosphate is your primary fuel source when you weight train, muscle glycogen can also become depleted. After training, replace weight loss with fluid, about 20 ounces for every pound lost.

Gains in muscle mass and strength takes hard work and the right nutrition plan. Consuming small, frequent doses of high-quality protein combined with carbohydrate, both before and in the hours after your weight-training session, is your most effective nutrition strategy. Plan for these snacks within the context of a balanced diet that provides adequate total protein and carbohydrate for recovery from all training sessions. 

Monique Ryan, M.S., R.D., is owner of Personal Nutrition Designs

with programs at monique.ryan.com.

She is the author of

Sports Nutrition for Endurance Athletes, 2nd edition (VeloPress)

and Performance Nutrition for Team Sports (Peak Sports Press) available at VeloGear.com.



RESEARCH PRESENTED IN JULY AT THE PROCEEDINGS

of the National Academy of Sciences suggests that caffeine, when combined with exercise, may offer protection against skin cancer.

A team of researchers at Rutgers University chose hairless mice as their subject because exposing the mice to ultraviolet-B light causes some skin cells to become precancerous. Because the DNA of these cells is damaged, the cells should self-destruct (a process called apoptosis), but not all do and those that survive can become cancerous.

The hairless mice were divided into four groups: one group was given caffeinated water, another was given access to running wheels, a third group had both and the control group had neither. When compared to the control group, all three groups showed an increase in apoptosis in damaged cells. However, the mice that ran and drank caffeine had a 400 percent increase in apoptosis, compared to 95 percent for the caffeine-drinking mice and 120 percent for the exercise-only mice.

“The most dramatic and obvious difference between the groups came from the caffeine-drinking runners, a difference that can likely be attributed to some kind of synergy,” said lead researcher Allan H. Conney, Ph.D., while present-

Caffeine and Exercise May Protect Skin from Cancer



ing his team’s findings. Exactly what that synergy is remains to be determined. “We need to dig deeper into how the combination of caffeine and exercise is exerting its influence at the cellular and molecular levels, identifying the underlying mechanisms.”

Conney and his team originally examined the effects of green tea in the prevention of skin cancer. They discovered that while regular green tea showed a protective effect, decaffeinated green tea did not.

According to the National Cancer Institute, more than one million new cases of skin cancer are diagnosed each year. Therefore, regardless of your caffeine consumption or workout schedule, wearing sunscreen is still strongly recommended. 



Pounds for Dollars (or Euros)

CELEBRITY SPOKESPEOPLE AREN'T THE ONLY

ones being paid to lose weight. The mayor of the northwestern Italian town of Varallo is offering its citizens 50 euros (\$70) to lose weight, with a 200 euro (\$280) bonus if they keep the weight off for five months. Men must lose 9 pounds and women must lose 7

pounds to be eligible for the stipend. The European Union estimates that 35 percent of Italians are overweight or obese, a figure that has increased as healthy Mediterranean diets have been replaced with diets high in fat and sugar. Mayor Gianluca Buonanno, who hopes to lose about 13 pounds of his own, says many of the town’s 7,500 citizens have already signed up for the new program. 



Human

BY MARK ANDERS

Joysticks

Could a videogame be the secret to making our kids more fit and less fat?

I remember the first time I saw someone playing Dance Dance Revolution. My wife and I were leaving a movie when we noticed some commotion coming from the theater's arcade. A crowd of teenagers was huddling around a lanky boy as he methodically stamped out footwork on a small platform with disco lights. Electronic dance music pumped out of the arcade console while the kid did his best to follow along with his feet as colored directional arrows scrolled quickly up the screen. Two things struck me: how excited the onlookers were and how much the kid playing the game was sweating. That was at least six or seven years ago. Since then Dance Dance Revolution, also known as DDR, has become a certified videogame phenomenon. It was first introduced in Japan in 1998 and since then 90 official DDR versions have been released internationally, including both arcade and home-based videogames. Countless fan Web sites are devoted to the game and DDR tournaments feature semi-pro players. It's even registered as an official sport in Norway.

Continued on page 8

Somewhere along the way a public school teacher in West Virginia had an “Aha! moment” similar to mine at the theater’s arcade and decided it would be a great way to get kids at her school excited about exercise. It worked: Earlier this year the state of West Virginia announced that all of their 765 public schools plan to bring the videogame into their curriculum within the next two years. Other states have followed suit and some sources estimate that 1,500 schools in the U.S. will be using DDR to boost physical education by the end of the decade.

Now you don’t have to be an exercise scientist to see that DDR provides some sort of a workout, but given the growing trend toward using it in schools, the American Council on Exercise decided to study the videogame to quantify its potential physical benefits.

“Kids have really just forgotten how to play and how to have fun with movement,” says ACE’s chief science officer Cedric X. Bryant, Ph.D. “I think DDR can be an option for many kids, because it’s fun and engaging and it really will activate them. That’s why we wanted to look and see what one could expect in terms of how beneficial it might be for improving fitness.”

The Study

To test the efficacy of DDR, a team of exercise scientists at the University of Wisconsin, La Crosse, led by John Porcari, Ph.D., and Anna Norlin, M.S., recruited 24 volunteers, male and female, ages 12 to 25 years. Half the volunteers were under the age of 18 and enlisted from the local La Crosse Boys & Girls Club, while the older portion was made up of University students.

Though previous experience with DDR wasn’t required, researchers sought out teens from the Boys & Girls Club because the organization has its own DDR unit and many of the kids there were already familiar with the game. “Whenever we do a study, whether it’s elliptical machines or a videogame, we want the volunteers to be proficient at it,” says Porcari. “There’s a little bit of a learning curve with DDR, so we decided to use kids who were already playing it.”

Still, all study participants, regardless of their DDR experience, were required to practice a pre-determined four-song dance sequence for up to six hours

WAY BEYOND THE THUMB

A quick look at a pair of videogame systems that, like DDR, eliminate conventional hand controllers in favor of more full-body interaction.

- **Wii** (\$375; wii.nintendo.com) is a popular game system from Nintendo that uses a wireless controller about the size of a TV remote that senses the player’s motions. For instance, in a tennis game you swing the controller like a racket; for golf, it’s your club.
- **EyeToy** (\$30; eyetoy.com) uses a special USB camera to capture a live image of the player and literally puts him or her into the onscreen action (works with Sony PlayStation game system, which runs about \$150). By moving arms and legs players can manipulate the action in a series of sports games, workout programs and even the latest DDR games.

long practice sessions or until they could demonstrate proficiency. Researchers used a home-based version of the game called DDR Extreme 2 (\$35; musicineverydirection.com) for Sony PlayStation 2 (\$150; playstation.com) with a \$40 dance pad, similar to those used in the West Virginia public school system.

Prior to beginning the actual study, each volunteer was given a maximal exercise test on a treadmill while oxygen consumption and heart rate were constantly monitored. A survey of their ratings of perceived exertion (RPE) was also taken. Once a fitness baseline was established and each participant was proficient at all three of the game’s modes (light, standard and difficult), DDR testing began. Following a five-minute warm-up on light mode, participants followed the same dance sequence that was used during practice sessions while researchers continuously monitored their oxygen uptake, heart rate and RPE. Data were collected for all three modes.

The Results

Across the board (male or female, teen or adult—it made no difference) all subjects showed a marked increase in exercise intensity as they participated in each increasingly difficult mode in the DDR game (see Table 1).

“In the light mode, DDR is probably suitable for a good warm-up because it’s just not that intense,” Porcari notes, “but the standard and difficult modes gave the test subjects a tremendous workout.”

In particular, the standard mode elicited an average heart-rate (HR) response of 68 percent of HR max and 46 percent of $\dot{V}O_2$ max with an average RPE of 13. Meanwhile the difficult mode garnered an average HR response of 76 percent of HR max and 56 percent of $\dot{V}O_2$ max for both groups of subjects with an average RPE of 15. All in all, DDR’s standard and difficult modes are considered intense enough to maintain and improve cardio respiratory endurance as defined by fitness industry guidelines.

As for calorie burning, DDR on the light mode burns 5.9 kcal/min, which is comparable to an easy walk on a treadmill. The adult subjects burned an average of 7.7 kcal/min on standard mode and 9.4 kcal/min on difficult mode. “When you compare it to cycling, DDR is equivalent to riding about 12 to 14 miles an hour,” he says. “It’s also very



similar to the benefits people get with high-impact aerobics.”

Though both the teenage study subjects and the adults proved to be getting an equally good workout from DDR, researchers noted that the older participants burned more calories, which can be attributed to differences in body weight since the adults averaged about 25 pounds heavier than the teenage subjects.

The Bottom Line

Not all videogames are for couch potatoes. Looking at the caloric expenditure data, researchers note that DDR is comparable to many other aerobic activities and could result in significant weight loss if used regularly. And since it's viewed as a fun alternative to traditional fitness regimes, long-term exercise adherence could be boosted as well. This is great news for the growing number of overweight kids, especially as cash-strapped school systems continue to drop physical education from their curriculums.

“It really does serve as a viable option for physical activity for kids,” says Bryant. “DDR allows us to take advantage of, and capitalize on, children’s love for videogames and use it as a vehicle to help encourage them to be more active.”

Though our researchers didn’t test participants’ psychological responses to DDR, both Porcari and Bryant believe the game provides an equally good brain workout as it requires players to concentrate and react quickly to the changing patterns on the screen.

And DDR isn’t just for kids. “We were somewhat surprised that the adults were getting just as good a workout as the teenagers even though the kids seem to be better at it,” says Porcari.

Whether parents use it as an interactive family fitness activity or simply a fun new addition to their own exercise routines, DDR has real potential to bolster the fitness levels of adults as well.

Isn’t it ironic that a videogame might be just the thing to rescue our children from a lifetime of obesity? If DDR catches on with public school administrators across the nation, just as it has in West Virginia, and with families who commit to turn their TVs into virtual exercise machines, then we stand a real chance of reversing the obesity epidemic and creating a population of kids who are getting fitter, not fatter. 

This study was funded solely by the American Council on Exercise (ACE) and conducted by, John P. Porcari, Ph.D., and Anna Norlin, M.S., at the La Crosse Exercise and Health Program of the University of Wisconsin, La Crosse.

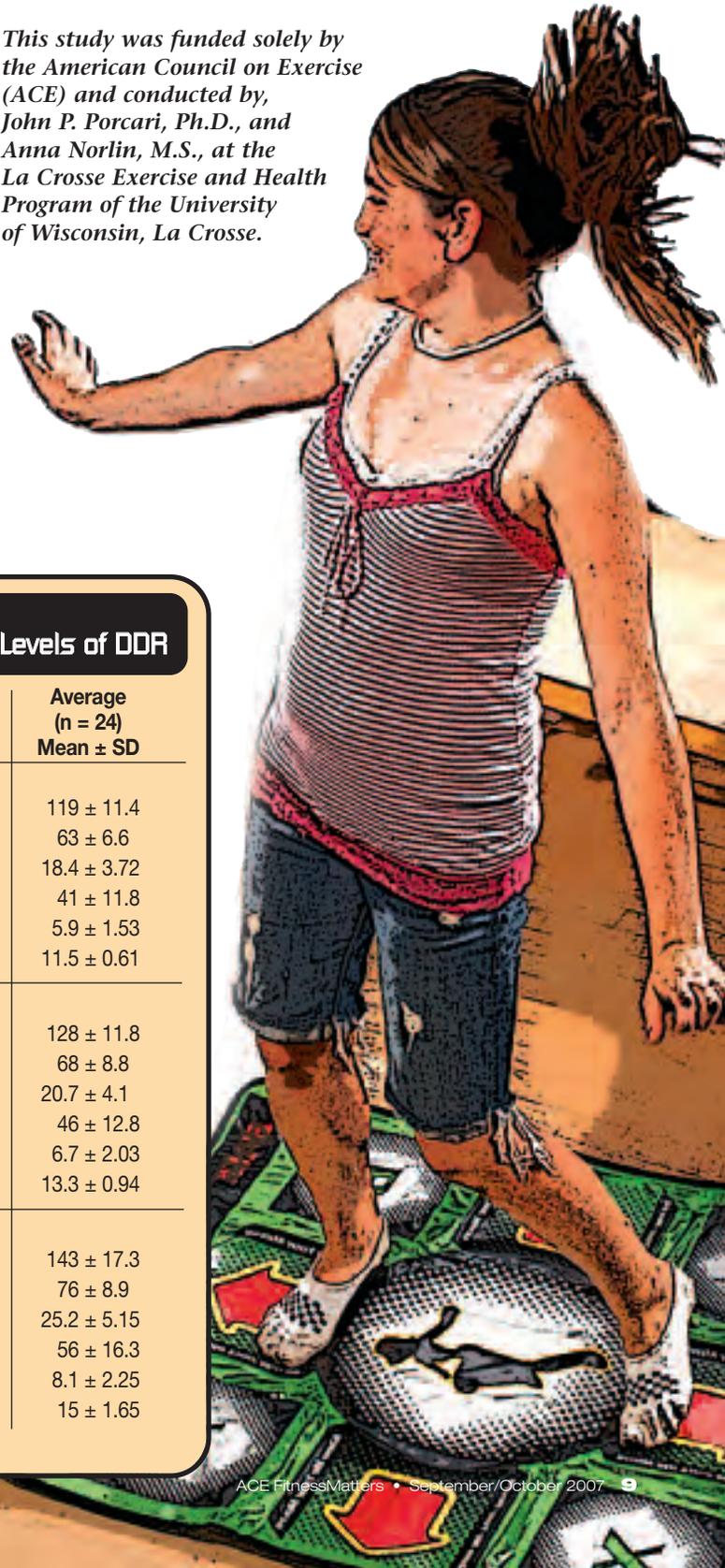


TABLE 1
Physiologic Responses in Subjects (n = 24) to Three Levels of DDR

	Teenage Subjects (n = 12) Mean ± SD	Adult Subjects (n = 12) Mean ± SD	Average (n = 24) Mean ± SD
Light Mode			
HR (bpm)	120 ± 10.7	117 ± 12.0	119 ± 11.4
% HR max	64 ± 6.6	62 ± 6.7	63 ± 6.6
$\dot{V}O_2$ (ml/kg/min)	19.1 ± 4.75	17.7 ± 2.68	18.4 ± 3.72
% $\dot{V}O_2$ max (ml/kg/min)	45 ± 14.4	37 ± 9.2	41 ± 11.8
Kcal/min	5.5 ± 1.48	6.2 ± 1.58	5.9 ± 1.53
RPE	11.0 ± 0.52	12.0 ± 0.70 *	11.5 ± 0.61
Standard Mode			
HR (bpm)	127 ± 11.1	128 ± 12.4	128 ± 11.8
% HR max	68 ± 9.53	67 ± 8.09	68 ± 8.8
$\dot{V}O_2$ (ml/kg/min)	20.1 ± 4.36	21.3 ± 3.75	20.7 ± 4.1
% $\dot{V}O_2$ max (ml/kg/min)	47 ± 14.3	45 ± 11.3	46 ± 12.8
Kcal/min	5.7 ± 1.52	7.7 ± 2.54 *	6.7 ± 2.03
RPE	13.0 ± 0.76	13.7 ± 1.12	13.3 ± 0.94
Difficult Mode			
HR (bpm)	142 ± 18.9	144 ± 15.6	143 ± 17.3
% HR max	75 ± 7.4	76 ± 10.3	76 ± 8.9
$\dot{V}O_2$ (ml/kg/min)	23.6 ± 5.12	26.7 ± 5.18	25.2 ± 5.15
% $\dot{V}O_2$ max (ml/kg/min)	55 ± 17.0	56 ± 15.6	56 ± 16.3
Kcal/min	6.7 ± 1.91	9.4 ± 2.58 *	8.1 ± 2.25
RPE	14.5 ± 0.75	15.5 ± 1.65	15 ± 1.65

* Significantly different than teenage subjects (p < .05)

New studies validate health
and performance benefits
of time-efficient workouts

The Science Behind Interval Training

Remember high school gym class? O.K., you'd rather not. I don't blame you. I'll recall my own ninth-grade experience. My gym teacher—who doubled as the football coach—would make us run up the bleachers, then walk down, repeatedly, until we were nauseous. And we cursed him up and down.

BY JIM GERARD

Well, I didn't know it at the time, but he was subjecting us to interval training, the benefits of which the athletic community has known for decades, but which may spread to the public due to a spate of new scientific studies.

These findings demonstrate that in a matter of weeks, alternating short bursts of high-intensity exercise with periods of near or complete rest can enhance athletic performance, improve cardiovascular fitness and accelerate weight loss. Intervals do this by raising the body's potential to burn fat.

G. Gregory Haff, Ph.D., assistant professor of exercise physiology at the West Virginia School of Medicine in Morgantown, W.V., says that, "Until now, the average person who exercised felt that aerobics was the only way to burn fat. These new studies prove that interval training has both health and performance benefits, which only validates what most coaches already knew." Plus, interval training is time-efficient, which makes it the perfect option for today's "crazy-busy" professionals.

The two most recently published studies, both in the *Journal of Applied Physiology*, are a watershed in the demonstration of the beneficial effects of interval training. In a 2005 study conducted by researchers at McMaster University in Hamilton, Ontario, six of eight reasonably fit collegiate men and women who used

interval training while cycling—sprinting for 30 seconds and stopping or peddling gently for four minutes—doubled their endurance after just two weeks. The control group of eight, which eschewed intervals, did not improve their endurance.

A second study, published in April 2005, revealed that eight women in their early 20s doing cycling intervals (10 four-minute, full-speed sets followed by two minutes of rest) for two weeks were able to burn 36 percent more fat when they cycled for an hour at a moderate pace. They also were able to increase their cardiovascular fitness by 13 percent.

Haff adds two more studies to the rapidly growing pile of interval-training literature: The first, conducted in 2006 by Martin J. Gibala, Ph.D., and researchers at McMaster, showed that four to six sets of 30-second maximum-effort sprints alternating with four-minute recoveries, compared favorably to 60 to 90 minutes of continuous training. And a not-yet-published Australian study revealed that a group of obese people burned more fat doing eight-second bicycle sprints followed by twelve-second rest stops for 20 minutes than they did doing 60 minutes of low-intensity continuous aerobic work.

If all that wasn't sufficient evidence, Haff says that a study conducted on rats showed that interval train-



ing improved their fat metabolism while swimming.

Haff explains the physiology behind interval training: “The greater disturbance you create in the workout, the greater your consumption of oxygen after exercise. Interval training is anaerobic, utilizes fast-twitch muscle fibers and burns energy rapidly. The type of energy it uses is from carbohydrates, because fat doesn’t give you energy that can be tapped immediately. However, the anaerobic exercise you have done will help you burn more fat after your workout.”

One of the many advantages to interval training is that it works its magic regardless of a person’s conditioning level—from couch potatoes to elite athletes. Haff says, “With obesity increasing in society, interval training gives us another avenue with which to motivate people, one they might enjoy more than long, monotonous workouts on a treadmill.”

Steven E. Gaskill, Ph.D., a researcher at the Human Performance Lab at the University of Montana, adds that, “One of the ways to avoid metabolic syndrome—the set of risk factors for cardiovascular disease—is to do short bouts of high-intensity exercise. And with interval training, a deconditioned person is able to do vigorous exercise and quickly increase their endurance when they go at a moderate pace.”



There is no exact ideal work-to-rest formula for constructing your interval workout. Most coaches recommend one to four minutes of maximum effort (long and strenuous enough that you become out of breath, which is usually at 80 percent to 85 percent of your maximum heart rate), followed by five to 10 minutes of recovery. “The shorter your rest interval, the greater your cardiovascular benefit,” says Haff.

Patty Freedson, Ph.D., chair of the department of kinesiology at the University of Massachusetts in Amherst, says that the structure of your interval workout should be tailored to your sports and exercise goals. “If you want to improve your performance at a sport that requires short, propulsive spurts, such as football or soccer, you should do shorter high-intensity intervals of power moves, but with more repetitions. If you’re an endurance athlete, use longer intervals and fewer reps.” Joggers can alternate walking and sprinting; swimmers can complete a couple of fast laps, then four more slowly.

For the deconditioned and those unaccustomed to interval training, Gaskill recommends that they start with a combination of longer, moderate-intensity intervals followed by very short periods of high intensity—one to three minutes. “Push yourself reasonably hard and do what athletes call ‘pickups,’ where you run, say, at a moderate pace and then slightly increase it.”

A good rule of thumb for gauging the length of intervals is that you should rest long enough to feel confident you can complete the next interval. Once you get used to interval training, you can vary the intensity, and learn how many recovery days your body needs before the next interval session.

Coaches and other experts feel that two interval sessions per week is sufficient and advise that, ideally, interval work should not be performed on consecutive days. More than 24 hours between such taxing sessions will allow the body to recover and help avoid burnout.

People with heart disease should consult a physician before starting interval training. The deconditioned can walk for five minutes, then rest and repeat without overexerting themselves.

Gaskill feels that running and cross-country skiing (or the gym machines that simulate them) are the most efficient ways to interval train. But for those who aren’t into the outdoors, or who want an interval workout program they can do at home, Todd Durkin, 2005 ACE Trainer of the Year and the owner of Fitness Quest 10 in San Diego, devised the following regimen on pages 12 and 13.

With interval training, a deconditioned person is able to do vigorous exercise and quickly increase their endurance when they go at a moderate pace.

INTERVAL TRAINING WORKOUT

This workout should take 45 minutes, and Durkin recommends that you do it no more three times a week, and not on consecutive days. After completing the workout, you can do additional work, whether weights or cardio, but this five-station, whole-body workout is challenging enough on its own.



DYNAMIC WARM-UP (10 minutes)

Do one to two sets of the following exercises:

Jumping Jacks: Perform 20 jumping jacks while keeping ankles dorsiflexed (flexing the ankle so that the foot moves toward the shin).

Pogo Hops: With legs straight and ankles dorsiflexed, bounce on the balls of your feet for 15 to 20 seconds to warm up the entire lower body.

Gate Swings: Starting with your feet wider than shoulder-width and your toes angled outward, bend your knees to 90 degrees and place your hands on the inside of your knees. Jump up so that your feet come in close to one another, but don't allow them to touch. Jump back out and use your hands to stretch your groin on the way down. Repeat 10 to 15 times.

Skip: For 15 to 20 yards.

Carioca: Run laterally in a grapevine pattern approximately 15 to 20 yards.

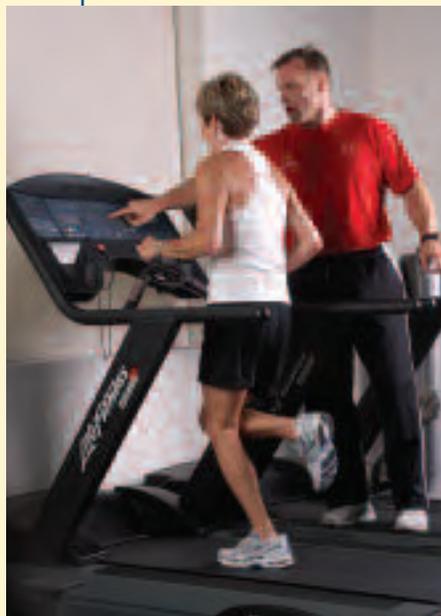


INTERVAL CIRCUIT—Rest for 30 to 45 seconds between each combination and for one to three minutes between stations.

STATION 1:

Treadmill Sprints/Push-ups

Run as hard as you can on a treadmill for 45 seconds, then do as many push-ups as you can. Repeat this combination two more times.



STATION 2:

Pull-ups/Squat Jumps/Walking Lunges with Medicine Ball Rotation

Pull-ups: Do as many pull-ups as possible using your own body weight. **Squat Jumps:** Next, perform squat jumps. With your feet slightly wider than shoulder-width, squat down so that your upper leg is parallel to the ground and then jump up as high as you can. Perform 15 repetitions. **Walking Lunges:** Immediately pick up a 5- to 15-pound medicine ball (as much as you can comfortably lift) and as you do a leg lunge rotate the ball to the side of the lunging leg. Then switch to the other leg. Do 10 reps per side. Rest for 30 to 45 seconds and then repeat the entire combination.





STATION 3:

Stability Ball Triceps Superset/Skater Plyos

Triceps Superset: Perform 10 repetitions of each of the following exercises. Pick up a weighted bar and rest your upper back and neck on a stability ball. Lift your hips toward the ceiling so your knees are bent 90 degrees. Start with **Lying Triceps Extensions:** Keep your upper arm perpendicular to the ground and bend your elbows so that the bar comes down near your ears. Then extend your arms toward the ceiling. Immediately go into a set of **Lying Pullovers:** Bring the bar down near your upper chest and, keeping your elbows at 90 degrees near your rib cage, extend the bar behind your head as far as you can in a comfortable range of motion. Using your lats and arms, pull the bar back into starting position. Follow this exercise with the **Bench Press:** Press the bar from your upper chest up toward the ceiling with your palms facing in toward one another.

After completing 10 repetitions of each triceps exercise, stand up in an open space and move into **Skater Plyos:** Lunge by moving your left leg back and behind your right leg while your left hand goes in front of your right foot. Then switch legs and hands quickly, with a lateral hopping motion. "You should look like a speed skater while doing this exercise, staying low to the ground and exploding powerfully," Durkin says. Do as many repetitions as you can in 30 seconds.

Repeat both the Triceps Superset and the Skater Plyos.



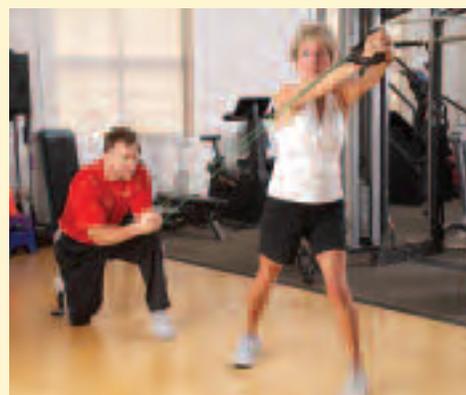
STATION 4:

BOSU Ball Core Crunches with Rotation/Rotational Woodchops

BOSU Ball Core Crunches with Rotation: Lie face up on a BOSU ball with your back completely supported, your right leg on the ground and your left leg extended straight out. Hold a light medicine ball (4 to 8 pounds) above your head and right shoulder. Bring the left knee in toward the chest and crunch the elbow toward your left knee so that the opposite knee and elbow meet near the middle. Do 15 repetitions and then switch sides.

Rotational Woodchops: Wrap tubing or a sport cord (an adjustable pulley or a functional trainer station at your gym will also work) around something at ground level such as the bottom of a bedpost. (Or have a partner hold the cord securely.) Hold both handles in one hand, one hand over the other. Turn perpendicular to the cord, squat down and then extend and rotate up and away from the bottom post as high as you can. Perform 15 repetitions per side.

Repeat the combination of crunches and woodchops.



STATION 5:

Single-leg Squat/Cycle Sprint

Single-leg Squat: Stand next to a step-bench. Balance on one leg on the bench and extend the other leg next to the bench. Slowly lower the leg on which you are balancing as if you were to sit down on the bench. Drive powerfully through the foot that is on the bench to extend your knee and hip so that you can stand straight up. Perform 10 repetitions and then switch sides.

Cycle Sprint: Immediately find a cycle or spinning bike and pedal as fast as you can for one minute. (An alternative would be to jump rope for one minute.) Repeat the squat/sprint cycle one more time.



COOL-DOWN

(5 to 10 minutes)

Finish your workout with a gradual cool-down that includes gentle stretches for all the major muscles of the body. 

3 Ways

to Increase the Challenge of Traditional Exercises

Several years ago we surveyed ACE-certified Fitness Professionals to learn what they considered to be the exercises they simply couldn't do without. Not surprisingly, several tried-and-true favorites topped the list: squats, push-ups and crunches. If you did nothing else, these exercises would go a long way toward increasing your fitness. But doing the same exercises all the time can get boring. Here are those same basic exercises, but with a twist—an added challenge that will increase the intensity of your workout and improve important aspects of fitness like balance and core strength.



Single-leg Squat

ACE-sponsored research determined that one of the best exercises for targeting the glutes is the single-leg squat. Here we add an additional balance challenge by picking up an object and setting it down. For an easier challenge, pick up a small towel. Increase the challenge by picking up a coin or other small object. Complete eight to 15 repetitions and switch to the other leg.



Push-up With Side Plank

Assume a push-up position with hands on the floor, directly beneath the shoulders, and head in a neutral position. Tighten the core and bend the elbows to lower the chest toward the floor. Push back up to the starting position, shift the weight to the right hand and the outside of the right foot. Rotate the body to the right and extend the left arm toward the ceiling. Be sure to keep the hips lifted and use the core muscles to maintain balance. Rotate back to the push-up position and repeat, alternating right and left. Complete a total of eight to 15 repetitions.



Ball Crunches With One Leg Lifted

Again, ACE-sponsored research suggests that a stability ball crunch is an extremely effective abdominal exercise. In fact, it works the entire core. To increase the intensity of a basic crunch, lift the right foot and cross it over the left knee. With the hands lightly touching the sides of the head, lift the chest up as you contract the abdominals. To recruit the obliques, angle your crunch toward the right knee. If needed, place the right hand on the floor for balance. Complete eight to 15 repetitions and repeat on the other side.





To earn 0.1 continuing education credits (CECs), you must carefully read this issue of ACE FitnessMatters, answer the 10 questions below, achieve a passing score (a minimum of 70 percent), and complete and return the credit verification form below, confirming that you have read the materials and achieved a minimum passing score.

Circle the single best answer for each of the following questions.

- 1. Which of the following is a documented unpleasant side-effect of the over-the-counter weight-loss drug Alli?
2. According to recent research, which of the following is a benefit associated with interval training?
3. When resistance training is combined with long-duration aerobic exercise sessions, how many grams of carbohydrate per pound of body weight per day need to be consumed to meet the glycogen demands of the workouts?
4. Compared to adult DDR participants, teens displayed significantly lower...
5. According to research conducted at the University of Wisconsin-La Crosse, Dance Dance Revolution "workouts" performed in the difficult mode yield energy expenditure levels equivalent to cycling at...
6. How many ounces of replacement fluid should an individual consume if they lost 3 pounds during a workout?
7. What is the typical amount of muscle mass lost per decade starting at age 20?
8. During interval training, the shorter the rest interval, the greater the...
9. Which of the following is the recommended target level for protein intake before a strength-training workout?
10. Resistance training three days per week may result in what level of increase in daily caloric requirements?

Answer Key: 1. B 2. C 3. D 4. C 5. A 6. A 7. C 8. B 9. B 10. B

Evaluation of credit offering:

- 1. Was material New Review for you?
2. Was material presented clearly? Yes No
3. Was material covered adequately? Yes No
4. Will you be able to use the information learned from this credit offering in your profession? Yes No
If yes, how? _____

Please attach business card, or type or print legibly:

Name: _____
Address: _____
City: _____
State: _____ ZIP: _____ Country: _____
E-mail: _____ (e-mail required for electronic CEC confirmation receipt)
Business Phone: _____
Fax: _____
ACE Certification #: _____
Degree/Major/Institution: _____

I attest that I have read the articles in this issue, answered the test questions using the knowledge gained through those articles and received a passing grade (minimum score: 70 percent). Completing this self-test with a passing score will earn you 0.1 continuing education credit (CEC).

Signature: _____ Date: _____

Change my address as shown at left. Effective date: _____

To receive ACE Credits, mail this page, with a \$15 Processing Fee for ACE-certifieds or \$25 for non-ACE-certifieds, to the following address: ACE Correspondence Courses, American Council on Exercise, 4851 Paramount Drive, San Diego, CA 92123

Payment Method:

- I've enclosed a check or money order made payable to the American Council on Exercise.
 Please bill my credit card:
 American Express® VISA® MasterCard®

Card Number _____

Exp. Date _____

Signature _____

An additional \$25 fee will be assessed on any returned checks.

Expires October 31, 2008

FM



Simply taking the pill without altering one's lifestyle will produce little or no noticeable results.

Q: WHAT CAN YOU TELL ME ABOUT THE RECENTLY APPROVED OVER-THE-COUNTER DIET PILL?

A: In June, Alli (pronounced ally) became the first Food and Drug Administration–approved over-the-counter diet pill. It is a half-strength version of the prescription weight-loss drug Xenical (Orlistat). For best results, Alli should be taken before every meal that contains fat. It works by decreasing the amount of fat absorbed by the gastrointestinal tract during the digestive process. Research has shown that when individuals used Alli in combination with diet and exercise they lost up to 50 percent more weight on average than if they had only dieted and exercised. For example, if you would normally lose 8 pounds over a six-week period, taking Alli may help you lose approximately 12 pounds over that same period of time.

As with any drug, Alli has several documented side-effects including excessive flatulence with an oily discharge, frequent and difficult-to-control bowel movements, and

loose stools. These side-effects appear to be related to your diet. If you consume too much fat after taking Alli, you will be more likely to experience the unpleasant side-effects associated with its use. (Note: The Alli starter kits recommend that users consume a low-fat, reduced-calorie diet of meals containing no more than 15 grams of fat.) Those individuals hailing Alli as the next magic bullet for weight loss should bear in mind that most weight-loss experts contend that without the contributory effects of diet and exercise, Alli's beneficial weight-loss effects will be very limited. Simply taking the pill without altering one's lifestyle (i.e., exercising regularly and adhering to a low-fat, reduced-calorie diet) will produce little or no noticeable results. Again, in the words of noted economist Adam Smith, "There's no such thing as a free lunch." 

Do you have a question for Dr. Bryant, or would you like to respond to this issue's column? Please send your comments and questions to acepubs@acefitness.org.



4851 Paramount Drive
San Diego, CA 92123

Non Profit Org. U.S. Postage PAID Permit No. 15 St. Joseph, MI
--