

fitness **matters**

VOLUME 14 • ISSUE 4 • JULY/AUGUST 2008 • \$5.00

American Council on Exercise
A Non-profit Organization



ACE-SPONSORED STUDY

**The Wii:
As Good
as the
Real
Thing?**



LETTER FROM THE EDITOR

I just returned from a trip overseas and with the jet lag and sleep deprivation, combined with Southern California's current heat wave, my brain feels like mush. I've been having trouble completing coherent sentences, let alone composing entire paragraphs. The only thing that has helped clear my head (other than my renewed caffeine habit) has been an early morning walk before the sidewalks start steaming.

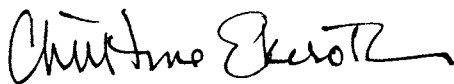
Turns out my morning exercise routine has done more for me than shake away the cobwebs—it's apparently boosting my brain power. Exciting new research is demonstrating that physical activity may actually improve the connectivity of neurons (which could boost memory) and even enhance brain size and strength as well. So, not only can exercise make you feel better and live longer, it may make you smarter as well. A summary of the latest findings appears on page 10.

If you're looking for ways to sneak in more activity into your daily routine—or that of your children—the latest ACE-sponsored research study may offer one alternative, at least for you video-game junkies. We had researchers examine the fitness benefits of the Nintendo Wii, specifically Wii Sports, to determine if it's possible to get a workout playing one of these games. Turn to page 7 for the results—if you're one of those who view video games as the hallmark of our sedentary society (a view I may share), you might be surprised to learn that even the most ardent couch potato might actually glean some fitness benefits from actively playing one of these games.

But for those of you who prefer to get your exercise the old-fashioned way—not virtually—try the "Sandblast" workout featured on pages 12–14. Sandbags are a unique alternative to traditional strength-training devices and can present a new challenge to any workout routine. While sand is required for this workout, the beach is purely optional.

Finally, in the first in an ongoing series of articles on topics related to nutrition, registered dietitian Natalie Digate Muth takes a close look at what the research has to say on the topic of meal timing. If you have a specific nutrition issue that you would like Natalie to examine, e-mail us at acepubs@acefitness.org.

Well, supposedly the heat wave is due to let up any day now, and I'm sure my jet lag will go away eventually, but it's good to know that I can try and offset the brain-drain with a little exercise. In fact, I think it's time for me to hit the road.



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.

© 2008 American Council on Exercise



“All the news
that keeps
you fit...”



Cover Story

As Good as the Real Thing?..... 7

When the Nintendo Wii was introduced in the fall of 2006, it became an instant hit, selling more than 11 million consoles. At first blush, this would seem like another sad blow to the battle between fit and fat, but thankfully the Wii is actually an exergame. This exclusive ACE study investigates the fitness benefits of Nintendo’s Wii video game system.

Inside This Issue

Nutrition Spotlight: Does Meal Timing Matter?..... 4

Traditional wisdom and at least a few popular diets warn against late-night meals and snacks. Alternately, breakfast is often hailed as an all-important diet necessity due to its ability to arouse the body’s tired metabolic machinery after a full-night’s sleep. Here we’ll explore the existing research to provide an evidence-based answer to the simple question: Does meal timing matter?

Three Moves for a Totally Toned Torso..... 6

No matter what your fitness level, these three variations on three yoga-based exercises will strengthen and tone your entire torso, from front to back.

This is Your Brain on Exercise . . 10

Even the most devoted couch potato is at least vaguely aware of the manifold virtues of exercise: lower cholesterol levels, lower risk of heart disease and diabetes, less body fat, more bone density and increased stamina and longevity. However, increasing evidence suggests exercise can pump up not only your body, but also your brain.

Sandbags are a Blast 12

A new interval workout called “Sandblast,” uses sandbags to tax the body and force it to use more muscles than traditional kettlebells, dumbbells or one’s own bodyweight.

CEC Quiz..... 15



Does Meal Timing Matter?

BY NATALIE DIGATE MUTH, M.P.H., R.D.

Traditional wisdom and at least a few popular diets, including Weight Watchers, Atkins and South Beach, warn against late-night meals and snacks.

The precaution makes sense: metabolic rate decreases during sleep and thus consuming calories at a time when metabolism is slowing could make for a calorie pile-up leading to increased fat storage and weight gain. But is this plausible theory true? Alternately, breakfast is often hailed as an all-important diet necessity due to its ability to arouse the body's tired metabolic machinery after a full-night's sleep. But does eating breakfast really promote weight loss? After all, it could just mean extra calories for the breakfast skippers who don't overindulge the rest of the day. Here we'll explore the existing research to provide an evidence-based answer to the simple question: Does meal timing matter?

The Facts: Late-night Meals and Snacks

"A calorie is a calorie is a calorie" is a familiar mantra espoused by dietitians, health professionals and other weight-loss experts. While the statement somewhat simplifies the complicated process of digestion and metabolism, for all practical purposes, it is accurate. Thus one can conclude that what really matters in the pursuit of weight loss is the relationship between calories consumed and calories expended. The goal is to eat fewer calories than are burned through resting metabolism, food digestion and exercise. This should still hold true regardless of what time of day food is eaten as long as the total number of calories consumed is unchanged.

So what does the research show? A discussion by Sullivan et al (2005) demon-

strates that the data is limited and conflicting.¹ The authors note that in a group of 15 women, those who ate more at night reported more weight gain over a two-week period than those who ate less at night; and other studies have found that night-shift workers gain more weight and are heavier than those who work during the day. Likewise, people with nighttime eating syndrome, defined as consuming more than 50 percent of one's total daily caloric intake at night, seem to gain weight more easily. But the results of these studies are difficult to interpret as many factors besides the time of day (e.g., total caloric intake, social and other differences between day and night workers, psychological eating, study size, length of follow up) influence the results. A 10-year study of more than 7,000 people, as well as several other smaller studies, showed no relationship between nighttime food intake and weight gain. To address this discrepancy, Sullivan and colleagues designed a carefully controlled study of our primate relatives. They found that the proportion of calories consumed at night was unrelated to body weight.

In the end, people desiring to lose weight would do better to focus on decreasing total caloric intake and increasing physical activity rather than imposing strict limits on nighttime eating, unless of course, they find themselves consuming excess calories at night for non-hunger-related reasons such as boredom, stress and mindless snacking in front of the television. In those cases, it is the psychology of nighttime eating—and not the underlying physiology—that disrupts well-meaning weight-loss plans.



The Facts: Breakfast

If slowed metabolism during sleep does not affect weight loss, then is it possible that revved up metabolism following breakfast facilitates weight-loss success? While no large, long-term, randomized, controlled research studies—the gold standard and most trustworthy type of study—have been done to prove that eating breakfast promotes weight loss, a large body of literature suggests that breakfast eaters are in fact thinner and healthier than breakfast skippers.² But it is probably not due to breakfast's direct effect on metabolism.

Breakfast, in particular the kind that includes high-carbohydrate and fiber-rich foods such as whole grains and fruit, appears to contribute to a lower body mass index (BMI) through increased satiety and decreased subsequent energy intake. And consuming regular small meals throughout the day, which includes a healthy breakfast, is associated with a reduced risk

of obesity, cardiovascular disease and diabetes thanks to improved blood sugar, insulin and cholesterol levels. Presumably because of breakfast's generally healthier composition than other meals, breakfast eaters typically consume more fiber, calcium, vitamins A and C, riboflavin, zinc, and iron and less dietary fat, cholesterol and calories than breakfast skippers.

Interestingly, the decreased caloric intake associated with eating breakfast seems to pay off. Among people enrolled in the National Weight Control Registry, a data goldmine of people who lost an average of 26 pounds and maintained the loss for an average of six years, 78 percent reported daily breakfast intake, a prevalence three-fold higher than daily breakfast in the general population.³ Of course, other factors could account for the apparent benefits of eating breakfast, including the possibility that breakfast eaters may be more likely to engage in other healthy behaviors (such as exercise) than non-eaters. Or, conversely, breakfast skippers may be more likely to engage in unhealthy behaviors (such as binge eating or being sedentary). Or it may be that many breakfast foods are healthy and will provide benefits regardless of what time of day they are eaten. Not surprisingly, the apparent benefits of breakfast fade when the meal composition includes more fatty foods like sausage and biscuits. More research is necessary to conclusively determine whether breakfast is essential for weight control.

It's a Wrap

Based on the best available evidence to date, here are a few simple recommendations on how to time your meals for optimal weight-loss success:

Let hunger be your guide. If you get home at 8:30 pm after a long day's work, you can eat a wholesome balanced dinner without sabotaging your weight-loss efforts. On the other

hand, if you always find yourself settling down at 9:00 pm with a bag of chips to watch your favorite primetime show, a self-imposed late-night eating ban might help prevent you from consuming a few hundred excess calories.

Eat a healthy breakfast. A healthy breakfast including whole grains and fruit can help you start your day off right and prevent a junk-food splurge later in the day. However, if you're a non-breakfast-eater now, and you commit to adding breakfast to your daily routine, make adjustments to your other meals and/or exercise more so that you maintain energy balance.

Create a calorie deficit. The most effective means to lose weight is to consume fewer calories than you expend. Adding even a short bout of physical activity to your routine, or cutting out something as small

as a can of regular soda each day, can make a big difference over time.

In sum, the key to weight control seems not to depend on the time of day that you eat, but rather what and how much. The goal is to make healthful nutrition and physical-activity changes that can be incorporated into a permanent lifestyle transformation. **A**

Natalie Digate Muth, M.P.H., R.D., is a registered dietitian and an ACE-certified Personal Trainer and Group Fitness Instructor. She is currently pursuing a medical doctor degree at the University of North Carolina at Chapel Hill. She is also an ACE Master Trainer and freelance nutrition and fitness author.

References

1. Sullivan, E.L., et al. (2005). Evidence in female rhesus monkeys (*Macaca mulatta*) that nighttime caloric intake is not associated with weight gain. *Obesity Research*, 13, 12, 2072–2080.
2. Timlin, M.T. and Pereira, M.A. (2007). Breakfast frequency and quality in the etiology of adult obesity and chronic diseases. *Nutrition Reviews*, 65, 6, 268–281.
3. Wyatt, H.R., et al. (2002). Long-term weight loss and breakfast in subjects in the National Weight Control Registry. *Obesity Research*, 10, 2, 78–82.



Letters to the Editor

Re: "Cue the Gluttony," March/April 2008

Without wishing to take up more space dwelling on this subject still, I'd like to appeal for more compassion for those whose obesity has little to do with willpower or wrong choices. If one has to hold down two, or even three, jobs to make ends meet, and has neither time nor money to spare for the right choices, one may well be forced to settle for cheap fast food. Some fast food restaurants now offer salads as well, but when one's low on energy after a hard day's work, it's far more likely that one would go for the burger rather than the salad. How does one squeeze time for exercise when one barely has time to sleep? There are many people stuck in this kind of situation and the solution is much more complex than a matter of willpower and choice.

—Angela Tam



This is a fantastic article and spot on in the respect that our food environment is saturated with poor choices and excessive opportunities to eat highly processed, high-calorie and low-nutritive foods anytime, anywhere. In fact, the nature of our consumer society is often fairly aggressive in persuading us to do so.

There are other compelling factors that challenge "personal responsibility" as the solution to obesity and other diet-related illnesses. Some of these include the poor quality, addictive ingredients widely used in packaged, prepared and restaurant foods, national food policy that favors such products, and weight-loss strategies that teach deprivation rather than nourishment.

As long as we, as a society, continue to subsidize, market and consume large amounts of food that trigger cravings for more and are essentially devoid of nutrients, we will have a hard time getting our national waistline and healthcare costs under control.

Thank you for running this article. I think a shift in perspective is the first thing we need in order to effectively address our country's overwhelming weight and health problems.

—Jennifer Moiles, H.H.C., A.A.D.P.

Three Moves for a Totally Toned Torso

You've heard it a million times—a strong core is the foundation of a strong body. And a growing awareness of the importance of core training has fueled the popularity of stability ball training, Pilates and yoga, among others. Here, we borrow three core-strengthening moves from yoga and offer three variations to suit every fitness level. Don't move on to the next challenge until you have mastered the previous variation, and avoid poses that cause pain or strain weak areas, such as the neck or wrists.



Side Plank (one elbow, one hand, with top leg extended)

Beginner: Begin on your side, one foot on top of the other and the elbow directly beneath the shoulder at a right angle. Contract the core muscles and lift your body into a bridge pose. Hold for 20 to 30 seconds. **Intermediate:** Place the hand directly beneath the shoulder and extend the upper arm. **Advanced:** Slowly raise the top leg without allowing the hips to sway forward or back.



Boat (one leg up, knees bent, knees extended)

Beginner: From a slightly reclined position, bend the knees about 90 degrees and place the feet on the floor. Contract the abdominals and lift one foot off the floor while keeping the knees together. Lift the arms to parallel with the floor. Hold for 20 to 30 seconds and repeat with the other leg. **Intermediate:** Lift both feet off the floor while keeping the knees bent. Lift the chest and don't allow the back to roll down to the floor. **Advanced:** Straighten both legs and lift the arms up toward the feet while balancing on the sit bones.



Bridge (hands clasped, modified backbend, full backbend)

Beginner: Lie on the floor with knees bent and feet parallel and drawn in toward the buttocks. Lift the hips off the floor and squeeze your shoulder blades together. Clasp the hands together and extend the arms along the floor while contracting all the muscles along the backside of the body. Hold for 20 to 30 seconds. **Intermediate:** Bring your hands along either side of your head, fingers pointing toward the feet, and extend the arms until you are balancing on the top of your head (don't do this pose if you have any neck problems). Use the muscles of the legs and buttocks to keep the hips lifted. **Advanced:** Straighten the arms and lift the body into a full backbend. Let the head hang—don't strain the neck. Hold and lower down slowly.





As Good as the REAL THING?

By Mark
Anders

t all really started going downhill with TV remotes. Those little handheld devices saved us the trouble of getting off the sofa to change the channel and successfully sucked yet another tiny bit of movement from our daily lives. Then came video games, which gave Americans, especially our kids, more reason to keep their rear ends firmly planted on the couch. In fact, people in this country now spend an average of 19 to 25 hours per week watching TV and playing video games.

**Study
by John
Porcari,
Ph.D.,
Karel
Schmidt
and Carl
Foster,
Ph.D.**

In the fall of 2006, a new video game system called the Nintendo Wii hit the streets. It became an instant hit and is now a full-fledged craze, selling more than 11 million consoles in the Americas alone since its release. At first blush, this would seem like another sad blow to the battle between fit and fat, but thankfully the Wii is actually an exergame. That is, it's a video game that requires players to use actual physical movements to manipulate the action.

Employing a wireless handheld controller (about the size of a TV remote, ironically) with acceleration sensors and an infrared camera built into the console, the Wii senses players' motions and translates them into on-screen movement. For instance, in Wii Tennis you swing the controller like a racket; for Wii Golf, the controller is your club.

"When my brother-in-law and sister first got Wii they were saying, 'Oh we're getting a workout from it.' I thought they were just being ridiculous, but then I played it," says Karel Schmidt, a graduate student in clinical exercise physiology at the University of Wisconsin, La Crosse. "There were certain games that I could tell right away I was working harder than I would've been if I was playing a normal video game."

But just how hard was she really working? That very question is what motivated Schmidt and others to study the exercise benefits of Wii for this exclusive American Council on Exercise-sponsored research.

The Study

To test the potential fitness benefits of playing Wii, a team of exercise scientists at the University of Wisconsin, La Crosse Exercise and Health Program, led by John Porcari, Ph.D., and Schmidt, recruited 16 volunteers—eight men, eight women—all between the ages of 20 to 29 years old.

First, all volunteers were given an exercise test on a motorized treadmill to determine each subject's maximal heart rate and maximal oxygen uptake (i.e., $\dot{V}O_2$ max). Once that fitness baseline was established, the subjects were given a quick demonstration on how to use the video game system. Researchers used the standard Nintendo Wii (\$250; www.nintendo.com/wii) bundled with Wii Sports, which includes baseball, boxing, bowling, golf and tennis games. Previous Wii experience was not required as subjects were given 15 minutes of practice time for each of the five sports and allowed to continue practicing until they felt they'd mastered the skills needed to play each one successfully.

Though it's possible to manipulate the onscreen players using minimal body movement, researchers instructed the subjects to simulate the body movements used in each actual sport. "With the tennis game, I could just stand in one spot and flick my wrist and the ball will go back. You can do

Continued on page 8

minimal movement, but we tried to teach the participants to mimic the real game as closely as possible," says lead researcher John Porcari, Ph.D. "We told them when you hit a forehand, swing your arm the way you would swing a racket. When you're doing a backhand, change your stance and really use your body."

Actual testing on the Wii was conducted on a subsequent day. At that time, subjects played each of the five sports in random order. Each game lasted 10 minutes and researchers recorded heart rate and $\dot{V}O_2$ at one-minute intervals. Researchers also interviewed the subjects during the final minute of each sport to determine their perceived exertion levels using the Borg rating of perceived exertion (RPE). A five-minute break was given between each game to return the subjects' heart rates to within 10 beats of their normal resting heart rate prior to beginning testing for the next game.

The Results

Data compiled from all subjects showed that playing Wii Sports increases heart rate, $\dot{V}O_2$ and perceived exertion—and thus calorie burn. Specifically, playing the golf game burns approximately 3.1 calories per minute while eliciting 50 percent of HR max and 20 percent of $\dot{V}O_2$ max. The bowling game burns slightly more at 3.9 calories per minute with 52 percent of HR max and 23 percent of $\dot{V}O_2$ max. Calorie expenditure for the baseball game was recorded at 4.5 calories per minute with 55 percent of HR max and 28 percent of $\dot{V}O_2$ max. And finally, the energy expenditure for the tennis game (at 5.3 calories per minute, 59 percent of HR max, and 33 percent of $\dot{V}O_2$ max) was significantly greater than all of the other sports except boxing, which weighed in at 7.2 calories per minute, 74 percent of HR max, and 44 percent of $\dot{V}O_2$ max.

"When you play the lower-intensity games like bowling or golf you can see that you're not really doing that much," says

Schmidt, "but then when you play tennis or boxing you really do feel like you're getting a workout, like you're getting breathy. And that's exactly what we found and that's what our subjects reported to us as well."



In fact, in addition to burning the most calories, boxing was the only Wii game tested that would be considered intense enough to maintain or improve cardiorespiratory endurance as defined by the American College of Sports Medicine (ACSM). "People were increasing their oxygen consumption, or how many calories they're burning, by five or six times above their normal resting values," notes Porcari. "Even the golf game was two or three times higher than resting rates."

A Wii BIT MORE EXERCISE

The latest and most fitness-oriented addition to the Wii world is Wii Fit, a game that comes with a wired balance board and leads users through 40 different exercises, including everything from aerobic workouts to strength and balance training to yoga. The balance board acts as a game controller and body-weight scale, while also measuring balance and tracking users' fitness results. It was launched after this study was already completed, but an ACE-sponsored study examining Wii Fit is already underway. (\$90, requires standard Wii gaming system; www.nintendo.com/wiifit)

To compare Wii Sports to the average calorie burn of playing the actual sports, researchers turned to values described in McArdle, Katch and Katch's *Exercise Physiology*, a standard text for caloric expenditure information. Compared to golfing at a driving range (3.9 calories per minute), playing Wii Golf burns 0.8 calories less per minute. Actual bowling burns nearly twice as much (7.2 calories per minute) as Wii Bowling, while baseball burns 7.3 calories per minute and Wii Baseball burns 2.8 calories per minute less. Similarly, Wii Tennis burns 2.8 calories per minute less than the actual game (8.1 calories per minute). Finally,

Wii Boxing burns about 3.0 calories per minute less than conventional sparring at 10.2 calories per minute.


The Bottom Line

"The take-home message is that it's better than sitting around," says Porcari. "While not as good as playing the real sport, Wii certainly does burn more calories and gets your energy expenditure up compared to sitting around playing a sedentary video game."

Of course participating in the actual sports themselves provides more cardiovascular and strength benefits than Wii because you're moving your entire body and swinging things with more weight like baseball bats, tennis racquets and golf clubs. Even so, Wii can be a suitable workout and a great option for folks who can't find the time or motivation to get out of the house and exercise. For instance, playing 30 minutes of Wii Boxing burns 216 calories, which is 51 calories more than brisk walking, while a 30-minute Wii Tennis match burns a respectable 159 calories. Some people may also find that the natural competitiveness that comes with playing Wii against an opponent can help with their motivation and, thus, their ability to stick with a regular exercise regime. The convenience of exercising in one's own living room may also improve exercise adherence.



Wii can provide some fitness benefits and help with weight management, but the key comes down to simulating the movements used in the actual sports, says Porcari. "If you want to get as good a workout as you can with Wii Sports, you really need to mimic the real movements as closely as possible."

Too often people look at regular exercise as a chore. Our hope is that new exergames like Wii will entice non-exercisers to get up off the couch and realize that fitness can, in fact, be fun. 

Mark Anders is an award-winning journalist who has covered a wide range of topics, from rock star profiles to surfing river waves in Africa. His work has appeared in more than 20 magazines and books.

WEB SIGHTINGS

exergamelab.blogspot.com

Hosted by Stephen Yang, co-director of the Physical Activity Research Laboratory at the State University of New York-Cortland, this blog explores the latest developments in the "exergame" trend.

www.gamesforhealth.org

An arm of the nonprofit Serious Games Initiative (founded at the Woodrow Wilson Center for International Scholars in Washington, D.C.), Games for Health offers news and hosts conferences based on how exergames and other computer-based games can best impact health care and policy.

Physiologic Responses to Each of the Wii Sports Games

GOLF	MEAN ± SD	RANGE
HR (bpm)	94.0 ± 9.2 ^{de}	82.0–109.0
% HR max	50.0 ± 4.8 ^{de}	42.0–59.0
$\dot{V}O_2$ (ml/kg/min)	8.4 ± 2.3 ^{de}	5.4–13.2
% $\dot{V}O_2$ max	20.0 ± 7.6 ^{de}	12.0–38.0
Kcal/min	3.1 ± 1.2 ^{de}	1.7–6.1
RPE	7.9 ± 0.9 ^{de}	7–9

Kcal/min for actual sport (golf at driving range): 3.9

BOWLING	MEAN ± SD	RANGE
HR (bpm)	98.0 ± 13.1 ^{cde}	80.0–120.0
% HR max	52.0 ± 5.9 ^{de}	42.0–61.0
$\dot{V}O_2$ (ml/kg/min)	10.4 ± 2.8 ^{de}	7.5–15.2
% $\dot{V}O_2$ max	23.0 ± 5.4 ^e	15.0–32.0
Kcal/min	3.9 ± 1.4	2.2–7.3
RPE	8.8 ± 1.6 ^e	7–11

Kcal/min for actual sport: 7.2

BASEBALL	MEAN ± SD	RANGE
HR (bpm)	103.0 ± 13.9 ^{abde}	83.0–130.0
% HR max	55.0 ± 6.6	46.0–71.0
$\dot{V}O_2$ (ml/kg/min)	12.0 ± 3.6	8.3–16.9
% $\dot{V}O_2$ max	28.0 ± 10.5	15.0–50.0
Kcal/min	4.5 ± 1.7 ^a	2.17–8.0
RPE	9.0 ± 1.2	7–12

Kcal/min for actual sport (pitching a baseball): 7.3

TENNIS	MEAN ± SD	RANGE
HR (bpm)	111.0 ± 14.9 ^{abce}	87.0–140.0
% HR max	59.0 ± 6.9 ^{abce}	51.0–74.0
$\dot{V}O_2$ (ml/kg/min)	14.3 ± 3.5 ^{abce}	9.0–20.7
% $\dot{V}O_2$ max	33.0 ± 10.2	18.0–62.0
Kcal/min	5.3 ± 1.8 ^{ab}	2.8–9.8
RPE	9.9 ± 1.8	8–15

Kcal/min for actual sport: 8.1

BOXING	MEAN ± SD	RANGE
HR (bpm)	139.0 ± 11.3 ^{abcd}	126.0–165.0
% HR max	74.0 ± 8.6 ^{abcd}	62.0–94.0
$\dot{V}O_2$ (ml/kg/min)	19.2 ± 4.9 ^{abcd}	11.6–25.4
% $\dot{V}O_2$ max	44.0 ± 12.9 ^{abcd}	29.0–75.0
Kcal/min	7.2 ± 2.5 ^{abcd}	3.42–12.1
RPE	11.3 ± 2.1 ^{abcd}	9–16

Kcal/min for actual sport (sparring): 10.2

a = significantly different than golf ($p < 0.05$); b = significantly different than bowling ($p < 0.05$); c = significantly different than baseball ($p < 0.05$); d = significantly different than tennis ($p < 0.05$); e = significantly different than boxing ($p < 0.05$)

NOTE: There were no significant ($p > 0.05$) differences in the physiological responses between males and females for any of the variables measured; thus, data were collapsed across gender.

This study was funded solely by the American Council on Exercise (ACE).

This is Your BRAIN on Exercise

By Jim Gerard

Even the most devoted couch potato is at least vaguely aware of the manifold virtues of exercise: lower cholesterol levels, lower risk of heart disease and diabetes, less body fat, more bone density, and increased stamina and longevity. The benefits of physical activity, however, transcend the corporeal—increasing evidence suggests exercise can pump up not only your body, but also your brain.

How to Build Your Own Brain

The brain, spinal column and nervous system are all composed of impulse-conducting cells called neurons, or nerve cells. There are gaps between these neurons, and those gaps are bridged by neurotransmitters—chemicals that allow the transfer of information from one neuron to the adjacent one. The most well-known neurotransmitters are serotonin and dopamine, so-called “mood” chemicals that provide vitality, alertness and feelings of tranquility and euphoria—and that stave off depression.

Till now, the dominant theory of the cause of depression has been an imbalance in serotonin and/or dopamine, which can be (theoretically) rectified by the use of antidepressants such as Prozac. However, even though antidepressants are the most prescribed class of drugs in the U.S.—115 million prescriptions were handed out in 2005—scientists don’t know exactly how they work.

That’s because neuroscience is in its infancy; it is only through the development of imaging technology over the past 40 years that scientists have been able to get an insider’s view of our gray matter and an inkling of how it works. Until recently, scientists believed that the brain stopped growing new neurons in early adulthood, particularly in the medulla

and neocortical areas. This diminishment was thought to be responsible for memory loss and susceptibility to stress among older people.

However, recent studies of lab rats by Berkeley scientists Drs. Marian Diamond and Mark Rosenzweig and the Salk Institute’s Dr. Fred Gage have revealed evidence of neuroplasticity: the brain’s ability to reorganize itself by forming new connections throughout life; to change its own anatomy by growing branches of existing neurons—in response to its environment and experience. As one eminent scientist put it: We can build our own brain. We do this by thinking, learning, acting—and yes, by working out.

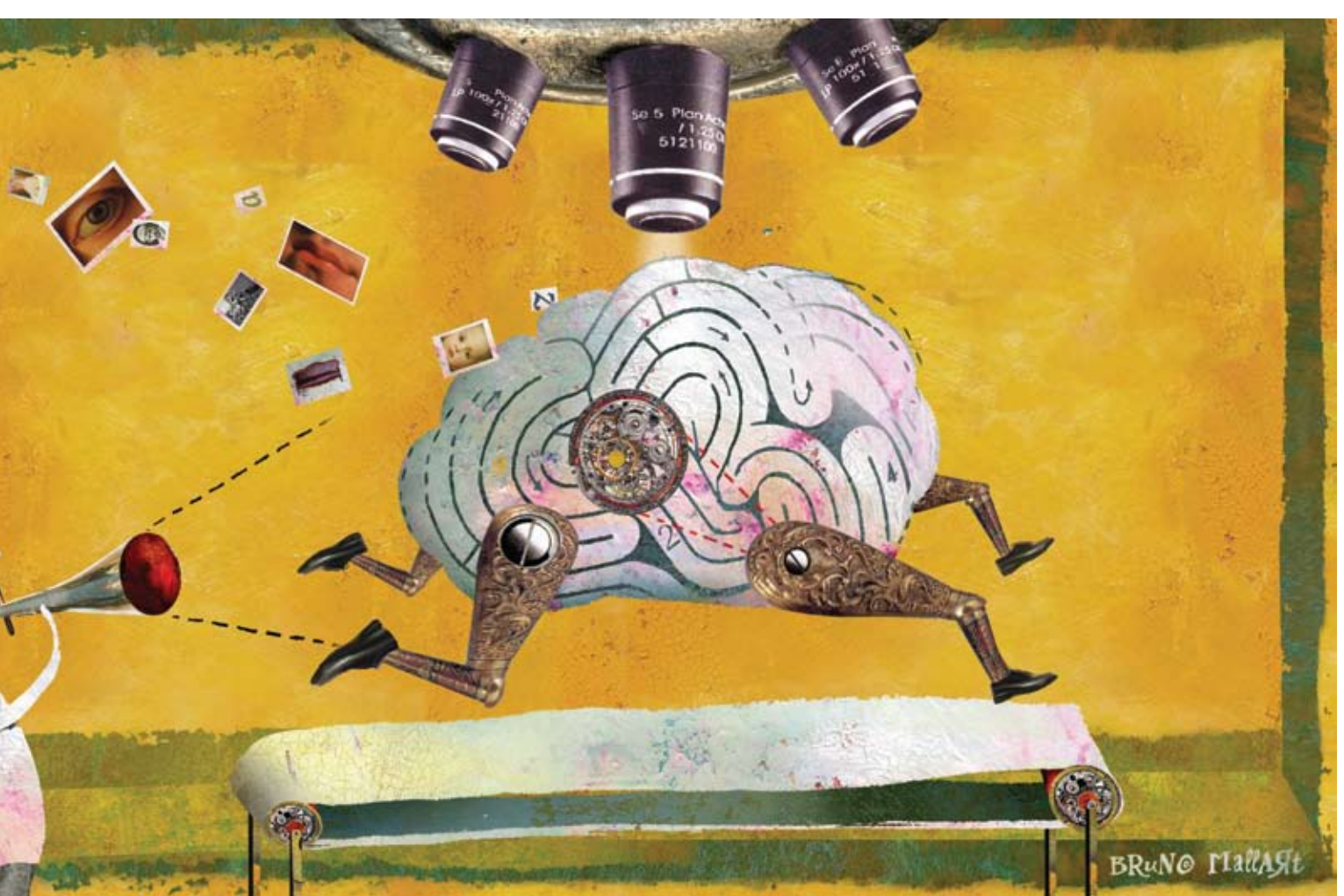
Running Away From Depression

Recent studies have shown that exercise is just as effective as Prozac in elevating mood chemicals in the brain—more so, in some cases. (Hence, the so-called “endorphin high.”) If you think of the brain as a perpetually under-construction superhighway, exercise is the construction crew that helps fill its potholes, as well as the Department of Transportation that regulates its dense network of connections.

Dr. Monika Fleshner, associate professor in the department of integrative physiology at the University of Colorado at Boulder, points to a study that compared exercise to SSRIs (selective serotonin reuptake inhibitors, a class of antidepressants that includes Prozac). “It found that exercise was almost as beneficial, and that the combination of the drugs and exercise was even better. Exercise helped patients stay on their meds.”

Fleshner and her colleagues have conducted numerous studies on rats (who, whether we like it or not, are genetically almost identical to humans) that focused on the





capacity of exercise to help the brain handle stress. Two groups of rats were given the same diet and environment, but one group ran on a wheel every day while the other group did not. After six weeks, the group that ran saw changes in their serotonin and dopamine levels and was better able to handle stressors to which they were subjected.

Fleshner adds, "There's a lot of literature on research in humans that supports our results. People who exercise more have a lower risk of developing depression and anxiety. Brain imaging techniques show that when we're exercising, parts of our brains are consuming more oxygen and are more metabolically active."

In fact, the shield that exercise puts up against depression and anxiety is just as strong as its long-renowned protection against cardiovascular disease. Studies suggest that people who exercise regularly and have a stroke later in life might suffer less damage because they're able to utilize cellular stress proteins developed from exercising.

Dr. Charles H. Hillman, associate professor in the department of kinesiology and community health at the University of Illinois at Urbana-Champaign, says there are real-world implications of the exercise-brain development link: "Studies of children show that aerobic exercise is related to higher test scores."

Hillman adds that aerobic exercise not only enhances the connectivity of neurons (and, thus, memory) and boosts the levels of serotonin and dopamine, but increases actual brain size and strength as well. This is particularly true in the hippocampus, the part of the brain that helps regulate emotion.

Dr. Andrea L. Dunn, a senior scientist at Klein Buendel, a public health research firm in Golden, Colo., explains that, "The hippocampus is smaller in depressed people. Exercise seems to increase a protein known as brain-derived neurotrophic factor [BDNF], which when combined with another enzyme, makes the brain more resilient and creates neuronal growth." BDNF is a powerful substance—rats with boosted BDNF levels navigate mazes and heal brain injuries faster than those with lower levels.

"The class of tasks in the brain called executive functions," explains Hillman, "are especially susceptible to exercise intervention." These are goal-directed activities that fall into three categories: inhibitory control (the ability to inhibit a strong, potentially detrimental, response to achieve a correct action); working memory and cognitive flexibility (the capacity to understand a piece of information, act on it, then put it aside to execute another task).

In addition to all of the foregoing benefits, the beneficial affects of exercise on the aging process are the subject of much scientific scrutiny. And working out may even help us retrieve latent memories buried deep within our brain.

Christopher Bergland, a consultant, triathlete and author of *The Athlete's Way*, says that the latest scientific validation may help convince people that the benefits of exercise extend far beyond rock-hard abs. He attests that, based on his experience as a high-school Gloomy Gus who saw his mood metamorphose when he took up running, "The athletic process helps you learn about setting goals and generates optimism."

Continued on page 16

Sandbags are a Blast

By
Jim
Gerard

Jonathan Sexsmith's workouts are not for the faint-hearted or the out-of-shape. The name of his most popular class, "Adrenaline"—which sounds like the new Jackie Chan–Chris Tucker flick but is actually an interval-based athletic-conditioning class—suggests as much.

Earlier this year, Sexsmith devised a new interval workout called "Sandblast," using sandbags, whose ever-shifting nature, he says, taxes the body and forces it to use more muscles than a traditional kettlebell or dumbbell—and certainly more than an exercise using just one's body weight.

An internationally ranked black belt in Olympic-style Tae Kwon Do (which he calls "boxing with your legs"), amateur boxer and judo athlete, Sexsmith argues that, "Nobody trains harder than boxers and martial artists."

Sexsmith says that his extensive athletic experience—including advanced kettlebell training and Olympic weightlifting—prompted his interest in group fitness instruction. "I wanted to learn why my coaches were making me do all that working out, and I wanted to do it better than them, and share those protocols with others." So he incorporates techniques used in elite sport-conditioning camps into his group fitness classes for the Equinox gym chain.

Sexsmith devised "Sandblast" while searching for an athletic-conditioning class that could incorporate martial arts elements, but that didn't require kettlebells, which he realized had drawbacks (the handles could make them hard to maneuver, and there was potential for injury if they were dropped).

He had been using sandbags in his martial-arts training and realized that they had unique properties that could maximize conditioning while doing both martial-arts movements such as "swings" and traditional exercises. "A lunge is a lunge is a lunge," he says, "but they differ depending on whether you use dumbbells, a body bar or a sandbag."

The most distinguishing aspect of sandbags, says Sexsmith, is that "every repetition can be different. Due to the instability of the sandbag itself, each repetition delivers to your central nervous system something different to adapt to. That is unheard of with any other fitness tool," he claims.

Sexsmith adds that because of the way your brain has to coordinate with your nervous system to handle the shifting sand, your body is forced to work harder and burn more calories. He claims that working with the sandbag offers the following benefits:

- ★ Increased endurance, neuromuscular efficiency and motor-unit recruitment
- ★ Increased dynamic muscular alignment and balance
- ★ Increased core stability and strength
- ★ Improved spatial awareness in all planes of motion
- ★ Improved speed, agility and reaction time
- ★ Enhanced endurance and functional movement ability
- ★ Improved body composition
- ★ Increased metabolic efficiency

While the list is impressive, the average person—including the many people who jam Sexsmith's classes—is drawn to Sexsmith's "Sandblast" class for the perennial reasons: 1) burn fat, 2) build muscle; and 3) shape and tone the body.

The Workout

To help people achieve those ends, Sexsmith created the following workout for *ACE FitnessMatters*. His general advice is to execute the workout at your appropriate level of fitness and to “listen to your body—if a movement hurts, stop immediately.”

Start with a warm-up, such as active stretching or jumping rope, for five minutes. Most sandbags weigh either 10 or 15 pounds; choose a bag that is roughly 10 percent of your body weight. (Sexsmith adds that you can do the workout with a dumbbell, but you won't derive all of the benefits.)

Sexsmith advises that you do this workout twice a week, and suggests that you follow a day of Sandblasting with a less-strenuous workout day involving some light cardio or yoga.

The workout described below is “Sandblast” level one, for beginners. This means you should do 10 reps on either side where reps are indicated. For level 2, intermediate, do 15 reps instead of 10, and for level 3, advanced, do 20 reps. Rest 15 seconds in between each exercise. Repeat this circuit three times.

One-arm Clean and Press

Pick up the sandbag and hold it at your side with your elbow fully extended. Start in the power position: knees bent, neutral posture, sandbag hanging directly under your shoulder. Forcefully bend at your knees as if you were jumping, shrug your left shoulder while lifting the bag and catch it at your left shoulder. From there, lift the bag overhead as in a shoulder press and then back down to your shoulder. Then drop the bag to your side with your elbow fully extended. The clean and press principally works the shoulders, but also engages the triceps, biceps, lower back, traps, hamstrings, calves, abdominals, shoulders and glutes. (That's almost every major muscle in the body, which is why it has long been a favorite of power lifters).



Sandbag Swings

Start in the “power” position and hold the sandbag in front of you with both hands. Bend the knees and hips slightly, shift your weight to the balls of your feet and squeeze your shoulder blades together while swinging the sandbag in front of the body. Control the movement and keep the sandbag in front of you at all times (don't allow it to swing behind the head). During power movements, you are not lifting the bag with your upper body, but by the force generated by the lower body. The swing not only builds your legs, core muscles and arms, but also your explosive strength.



Lateral Hops

Place the sandbag on the ground and hop laterally over the bag for 45 seconds. This is a “prehab” exercise for the knees, and is especially useful for athletes involved in intermittent field sports that involve running and changing direction, including baseball, hockey, soccer, football and basketball.

More exercises
on page 14



SANDBAG WINDMILLS

Start by holding the bag in your right hand, arm extended overhead, and feet hip-width apart. Bend your left knee and keep the right leg straight. Laterally flex down to the floor as low as you can go while contracting the glutes and hamstrings. This works the glutes, hamstrings and obliques.



BENT-OVER ROW

Hold a sandbag in your right hand. Balance on the right leg, lean forward and extend your left leg back. Bend the elbow and draw it close to the body—just slightly beyond parallel to the ground. Return the bag to its original position until your arm is extended and you feel a stretch in your shoulder. Complete desired repetitions and repeat with the opposite arm. This exercise, like a conventional bent row, principally works the lats, traps, rhomboids and posterior deltoids.




PUSH-UPS

Do 20 push-ups. If you want to increase the intensity, put the sandbag across your shoulder blades while you do the push-ups.



ACTIVE RECOVERY LEG LIFTS

Lie on your back and extend the legs at a right angle toward the ceiling. Stretch the arms along the ground by your sides. Contract the abdominals and slowly lift and lower the hips slightly off the ground. To increase the challenge, place a sandbag between your knees. Do as many as you can for 45 seconds. 

SANDBAGS AND WHERE TO GET THEM

Sandbags are the latest piece of fitness equipment to be incorporated into group fitness classes. One reason for their popularity is the simplicity of their use. They also provide a kinesthetic and cognitive challenge, as they force the user to try to figure out the ideal way to pick them up, lift and shift them from one side to the other.

Sandbags are also versatile; there are all sorts of ways to pick them up and handle them, and they can be used for any movement from traditional squats to jogging, climbing and throwing. Moreover, sandbags are light and mobile, which makes them a natural for group fitness training.

You can purchase sandbags at a wide range of Web sites, including Amazon.com and Yoga.com. Most cost between \$15 and \$25, and some come with the kind of handles you'd find on a knapsack. Some vendors offer just the bag without the sand. The advantage to filling it yourself is adaptability—you can add as much or as little sand as you need. The downside is that you've got to either live near the beach or cruise construction sites to get the sand. However, you can use rice, buckwheat or any other grain-like substance. Some experts advise using two sandbags and placing one inside the other for greater durability.



ACE FITNESSMATTERS CEC QUIZ

July/August 2008

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. In a hurry? Take the quiz online at www.acefitness.org/fmquiz for instant access to CECs.

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

- A 10-year study of more than 7,000 people found that the proportion of calories consumed at night was _____.
A. Related to total body-fat percentage
B. Greater among overweight people
C. Related to body weight
D. Unrelated to body weight
- According to ACE-sponsored research, which Wii Sports games burn the most calories?
A. Boxing and baseball
B. Bowling and tennis
C. Tennis and boxing
D. Tennis and baseball
- The exercise-brain development link can be seen in studies of children that demonstrate that aerobic exercise is related to _____.
A. Higher test scores
B. Improved social skills
C. Lower incidence of ADHD
D. Enhanced optimism
- Which of the following is NOT one of the primary benefits of a sandbag workout?
A. Increased core stability and strength
B. Enhanced endurance and functional movement
C. Improved speed, agility and reaction time
D. Increased muscle hypertrophy
- What is the most important factor to consider when designing an exercise program to reduce stress and improve brain function?
A. Intensity
B. Modality
C. Duration
D. Frequency
- According to Dr. Monika Fleshner, an ideal distribution of exercise to trigger brain benefits is _____.
A. 30 percent cardio, 50 percent strength, 20 percent stretching
B. 50 percent cardio, 20 percent strength, 30 percent stretching
C. 60 percent cardio, 30 percent strength, 10 percent stretching
D. 70 percent cardio, 20 percent strength, 10 percent stretching
- A breakfast that increases satiety and decreases subsequent energy intake should include _____.
A. High-protein foods such as eggs and meat
B. High-carbohydrate, fiber-rich foods such as whole grains and fruit
C. Easy-to-transport foods such as cereal bars or muffins
D. An equal proportion of high- and low-glycemic foods
- Data from the National Weight Control Registry found that nearly _____ of people who lost weight and kept it off for six years reported eating breakfast every day.
A. 20 percent
B. 40 percent
C. 60 percent
D. 80 percent
- Boxing was the only Wii game tested that would be considered _____.
A. Challenging enough to improve real-life performance capabilities
B. Intense enough to maintain or improve cardiorespiratory endurance
C. Sufficient to improve total-body muscle strength and endurance
D. An adequate replacement for traditional cardiovascular workouts
- Which of the following brain functions is NOT considered especially susceptible to exercise intervention?
A. Inhibitory control
B. Working memory
C. Cognitive flexibility

Evaluation of credit offering:

- Was material New Review for you?
- Was material presented clearly? Yes No
- Was material covered adequately? Yes No
- 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 _____ CVS Code _____

Signature _____

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

Expires August 31, 2009

FM

This is Your Brain on Exercise

Continued from page 11

Is There an Optimal Brain-building Formula?

Experts are at odds over the type of exercise necessary to trigger the brain benefits. Fleshner thinks an ideal distribution of exercise would be 70 percent cardio work, 20 percent strength training and 10 percent stretching/flexibility. "Strength gives you bone density, which benefits the nervous system in ways we don't totally understand, and yoga's deep breathing slows brain waves down." Those theta brainwaves have been linked to states of deep relaxation, increased creativity and problem-solving abilities, as well as lower levels of stress.

However, while some studies have shown a correlation between strength training and stretching and increased brain function, others showed that only aerobic activity worked.

It appears, says Hillman, that the amount of exercise is the determinant, not the intensity. In one of his studies, a group of people who clocked 180 minutes per week on the bike and treadmill for 12 weeks had far less depression than a second group that only did 80 minutes.

While the evidence supporting the brain-boosting properties of exercise mounts, scientists remain in the dark about its root causes. Hillman postulates that an answer may be found in our evolutionary roots. "Anthropologists estimate that our ancestors on the African savanna walked or ran about 20 miles every day. My epidemiology studies bear that out; some of my rats, left to their own devices, ran nine miles a night on the wheel." Fleshner adds that, "The 10 million dollar question is how and why exercise leads to receptor changes in the brain. Maybe the rats activate the circuits involved with reward and feeling good when they run on the wheels. The bottom line is that much of the movement has been removed from our lifestyle, but our genome hasn't changed."

Regardless of the precise mechanism, Hillman seems pretty convinced that our sedentary lives are contravening nature. "When you think about how we developed physiologically, you could conclude that all this sitting around isn't so great, that it may be causing dysregulation in our sympathetic nervous system. I think that the high rates of depression in our society are partly caused by inactivity,

because we're not doing what our bodies are designed to do, which was to hunt for food."

There may be another component to the genetic basis of exercise, says Hillman. A study by Dr. Angela Bryan at the University of Colorado at Boulder showed that exercise may be mediated by our genetic makeup. In other words, people who enjoy exercise more may have more of a dominant gene for it. What's most fascinating for the fitness community is the possibility that in the near future, science might be able to view a person's complete genome and tailor an exercise program specific to that individual on a cellular level.

Most of the studies on the effect of exercise on the brain have been conducted within the last five years—and there are a lot of unanswered questions. Dunn says, "We need a lot more data; randomized control trials. And we need to look at the problem from the perspective of lifespan. Does exercise influence people differently at different ages?"

In time, science may unravel these thorny issues. In the meantime, we can only look to the rats. And they're not talking.

They are, however, running like crazy. 



4851 Paramount Drive
San Diego, CA 92123

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