



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.

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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. 

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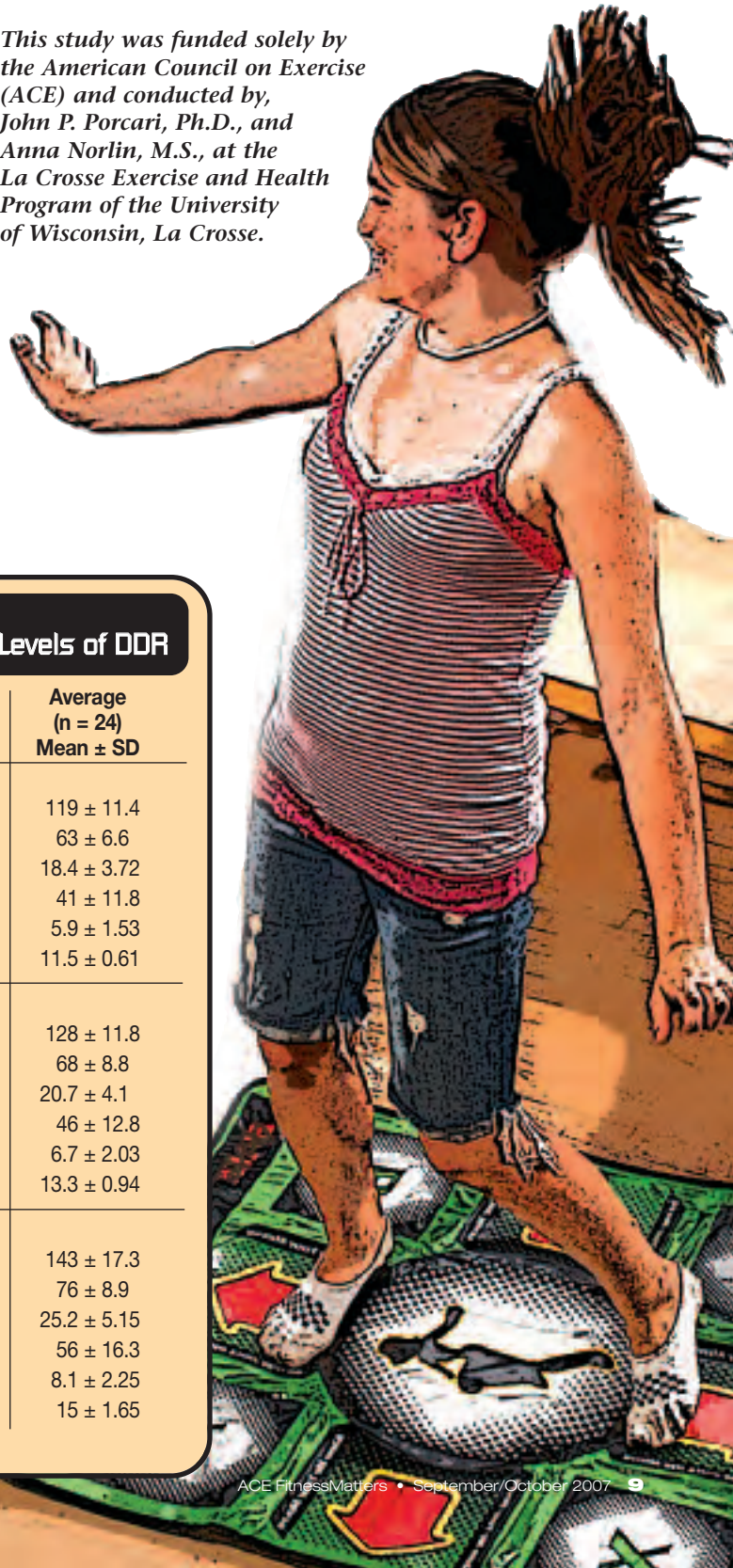


TABLE 1
Physiologic Responses in Subjects (n = 24) to Three Levels of DDR

	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)