

Jumping

Without a Rope

BY BOB SKIPPER



Dr. Lyons

JUMPING ROPE IS A GOOD FORM OF CARDIO-VASCULAR EXERCISE. FOR THOSE WHO LACK SUFFICIENT COORDINATION OR PROPER FORM, HOWEVER, IT CAN BE INEFFECTIVE. ARMS TIRE QUICKLY. GETTING OFF CADENCE CAUSES THE PERSON TO STOP AND START AGAIN.

Scott Lyons, an assistant professor of physical education and recreation at Western Kentucky University, is testing a machine that could help exercisers enjoy the benefits of jumping rope without enduring the obstacles.

The Digi-Jump Machine is designed to help people exercise through repetitive jumping. "I know that sounds a little strange, but just think about jumping rope without the rope," Dr. Lyons said. The machine has a blinking light and beeping mechanism that activate at a pre-defined cadence, or jumps per minute. If the subject jumps at the set rate, he is rewarded with a green light. If he gets off cadence, he gets a red light to help him get back on track. The machine also has a set of adjustable infrared beams to check the height of the jumps.

"The real benefit over jumping rope is that when you jump rope and you get off cadence or don't jump high enough, then you catch your foot and you have to stop and start all over. With this, you just get a red light and you can keep going and get yourself back on cadence," he said.

The machine was developed by Vaughan Scott and Larry Wilkins of Louisville. About two years ago, they approached WKU's Physical Education and Recreation Department about testing it. "They wanted some good, valid, impartial research data to see if this is a legitimate exercise machine," Lyons said.

Some of Lyons' colleagues and students began evaluating the Digi-Jump Machine for its exercise value. "We looked at areas such as metabolic response to repetitive jumping at different cadences," he said. "Metabolic response measures the cardio-vascular or aerobic effect of the exercise."

The researchers have also collected bio-mechanical, or motion analysis video, which was analyzed in the fall of 2007. This involves placing markers on the subjects and videotaping them in the dark so that only the markers are visible. "We can digitize the video and calculate vertical displacement and angular velocity," explained Lyons. "We can look at the interaction of bio-mechanical efficiency and aerobic efficiency."

The goal of the studies is to compare jumping on the machine with other forms of exercise. "Jumping rope is a strenuous form of cardio-vascular exercise. Theoretically this should be as well because this mimics it without the rope," Dr. Lyons said. "It's not as strenuous as running five miles, but from the data we've collected so far, it's about the same as jumping rope, which is in the range of 10-12 metabolic equivalents (METs)." The target is to provide exercise at about 65-85 percent of a person's age-predicted maximum heart rate. "As long as you can get your heart rate up to a good training zone, and maintain it, it doesn't really matter what you do."

"I've had some people ask, 'What's the big deal with this machine? Why can't people just jump up and down on their floor?'" Dr. Lyons said. "Because they won't. People like machines. What's the big deal about a treadmill? Why don't we just run in place? People like a machine telling them what to do and keeping them on track."



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The machine has interchangeable platforms of different thicknesses. The original platform was 1/2 inch thick and the developers have added platforms of 3/8 and 1/4 inch thicknesses. Although the data is in analysis, Dr. Lyons said they discovered that the metabolic cost of the exercise was similar on all three, but the subjects reported varying subject biases. Some preferred the increased “spring” associated with the thinner platforms while others reported that it was more difficult to jump on the less rigid platforms.

Dr. Lyons described other studies that compared exercising at cadences of 100 jumps per minute (jpm) and 120 jpm, which is about standard for jumping rope. While the exercise benefit between the two was minor, most participants preferred the faster cadence. “The 120 jumps per minute was much, much more preferred by the subjects than the 100,” he said. Subjects reported more leg muscle fatigue and more of the subjects were unable to complete the full 15-minute trial at the 100 jpm level, he said.

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Lyons is also launching a study to develop a metabolic equation to estimate the energy expended from jumping. “In the *American College of Sports Medicine Guidelines for Testing and Prescription Handbook*, there are five metabolic equations that have been derived through research where you can enter a couple of known variables and estimate energy expenditure from a given activity,” he said. These equations are for walking, running, stepping, leg cycling, and arm cranking. For example, speed and grade can be entered into the running equation to estimate the energy expenditure for any runner. “We’re looking to see if we can develop one for jumping that we can get endorsed by the American College of Sports Medicine (ACSM),” he said.

The results gathered so far have been used in several professional presentations and at three ACSM regional and national meetings. Dr. Lyons and his colleagues also have published one article in the April 2008 issue of the *International Journal of Exercise Science*, along with two other articles in review at other journals.

Another benefit from the Digi-Jump may be in the treatment of bone mineral density disease. Lyons has applied for a grant from the National Institutes of Health to study how repetitive jumping exercise can help those with conditions such as osteoporosis. The grant would be used to buy additional equipment.

“We know that weight-bearing exercise positively affects bone mineral density as far as preservation of bone mineral density. And we know that impact exercise positively affects bone mineral density,” he said. While people over fifty who have not exercised at all or have not exercised recently are not going to start running, they may do a little weight lifting or may be willing to jump for a short period every day. “If we can find a positive response on bone mineral density from jumping at a defined cadence, it seems like a pretty good idea to me,” he said.

He added that the research may also show that the machine could be useful in training and rehabilitation for athletes who complete in sports with vertical components.

The owners of the machine have made changes to the original design by adding attachments that incorporate upper body movements with the jumping. Dr. Lyons will be testing standard circuit training workouts against workouts that include the machine. He explained, “We’re going to see if this machine can give a significant contribution to metabolic response from circuit training.” ■

