

**Exertion is only half of the equation: a synthesis of findings in evolutionary movement, exercise biochemistry and chronobiology is shaping new thinking on fitness. Get ready for Cycles™ and the LifeWaves® Program and discover what's been missing from your workouts**

Meg Jordan

For some time it has been said that exercise is good medicine. However, the full extent of what that implies has just taken a bold leap forward--and just in time. Predictions for the public's general health over the next decade run from the gloomy to the disastrous as epidemic rates of obesity, diabetes and chronic illness grow at unprecedented rates, due in large part to sedentary living, unhealthy diets and a host of daily stressors.

This AF exclusive gathers new findings in human performance physiology along with some disturbing news--the adverse effects of endurance exercise. It appears exercise truly is good medicine, but only if the recovery side of the equation is addressed with equal training considerations.

It's 7 a.m. in a small, rural New Jersey town. Linda, a 54-year-old CEO of a nonprofit organization, bypasses a cup of coffee and heads straight for her exercise bike. Not a particularly unusual ritual, two out of 10 Americans duplicate this action as they pursue their morning workout. However, here's where Linda's story takes a different turn.

She straps on her "talking" heart rate monitor, listens for directions and climbs on a stationary bicycle. She pedals with full-out effort for just under a minute. Her forehead is dewy from sweat, breathing audible and heart rate topping a max target. Suddenly the "coach" instructs her to stop. There's no cool-down or slow pedaling. She closes her eyes and grows calm and quiet, listening to instructions from a headset attached to a real-time sensing device which monitors her heart rate and recovery responses. Within a few minutes, her eyes pop open and she bursts into full action again. This stop-and-start cycle is repeated six more times.

To the casual observer, what appears to be a woman doing a radically quick set of intervals is really a brand new form of exercise known as Cycles[™]. It is embedded within a holistic lifestyle program called LifeWaves[R], designed to adjust your circadian rhythm (i.e., your body's natural 24-hour "clock," which organizes all biological processes, including metabolic rises and dips, blood pressure peaks and valleys, hormonal releases, etc. [Refinetti 2000]).

"The amazing thing about Cycles[™]," describes Linda, "is not just that I look forward to exercise for the first time in my life, but that my life and health completely turned around as a result of it." With her doctor's approval, Linda is off all medications (including insulin), her pain has disappeared, energy level is excellent and mood has lifted. Just four months earlier, Linda complained of chronic depression bordering on suicide. Tired of struggling with unstable diabetes for 22 years, she was at the throes of uncontrollable blood sugar swings, often topping 380--despite multiple diabetic medications, an anti-depressant and daily insulin injections. She faced a growing number of disease-related disabilities, such as retinopathy and

peripheral neuropathy. Leg pain, gastric distress, eye surgery--all of it was becoming more than she could bear.

Then, concerned family members talked her into trying the LifeWaves[R] Program. It was not a cure-all, just a way to hopefully manage some of her illness. After all, scientific literature has well documented the benefits of exercise for diabetics. Like countless other people, she knew she should exercise, but conventional exercise guidelines discouraged her with their insistence on long, sustained efforts.

Her first few sessions with the LifeWaves[R] Program were tough. A dampened response of heart rate acceleration and recovery reflected her deconditioned state. Pedaling hard for a minute at an intensity level of four to six out of 10 (RPE) barely nudged her flattened, invariable heart rate upward. However, over the course of the next two weeks, Linda slowly noticed changes. Her heart rate range broadened and variability improved. Heart rate variability, the measure of change in the heart's beat-to-beat rate, remains the only common factor associated with healthy individuals in the long-respected Framingham Heart Study.

Within three weeks, Linda had a renewed vitality and slept through the night. She was no longer depressed and felt in synch with life. Within two months, her blood glucose fell to a normal range with rare spikes. Without a doubt, these tiny doses of exercise, none longer than a minute--almost homeopathic compared to conventional programs--were actually making a difference in her life. Today, she is convinced Cycles[™] saved her life.

#### Putting Cyclic Exercise to the Test

This isn't the first time I've reported the benefits of cyclic exercise in American Fitness. Last year, some exercise research presented at a symposium in Finland flabbergasted me. A study of 10 healthy adult women, ages 32 to 58, examined the impact of individualized cyclic exercise on physiological variability (Goldsmith 2000). The study was designed to train not only the exertion (i.e., arousal) phase, but also the relaxation (i.e., recovery) phase of exercise in a wave-like or pulsatile fashion.

Participants performed the `cycles' (i.e., one paired exertion and recovery) in sets of four to seven by either running in place on a mini-trampoline or pedaling an exercise bike, three times a week, for eight weeks. They increased their heart rates to individualized target rates (drawn from baseline performance data) always in less than a minute and completely recovered before starting another cycle. Researchers looked at measures of cardiorespiratory fitness, autonomic function and quality of life pre- and post-study.

After eight weeks on the program, participants showed:

\* significant increases in peak  $\dot{V}O_{2\max}$  ( $p < .001$ ) and the ventilatory breakpoint ( $p < .001$ ) (a measure of the efficiency of oxygen delivery)

\* significant decreases in resting diastolic blood pressure

- \* significant increases in high-frequency heart rate variability
- \* trend toward an increase in general positive affect
- \* decreases in subjective ratings of anxiety.

No one exercised more than a combined total of 120 minutes during the eight weeks. More importantly, recovery itself appears to have a significant physiology with metabolic and biochemical changes in the body that impact health. Training the recovery phase is as important, and perhaps more important for certain populations, as the exertion phase.

Ary Goldberg, M.D., a principle investigator, assistant professor at Harvard Medical School and director of the H.A. Rey Laboratory for Nonlinear Dynamics in Medicine, says, "This study is exciting because it presents the first evidence that a novel cyclic protocol designed to train both the activation and recovery phases of exercise may increase cardiovascular fitness, heart rate variability and enhance mood in healthy subjects."

Related research reveals the capacity to achieve peak exercise levels (measured in METs) is a more powerful predictor of mortality among men than other established risk factors for cardiovascular disease, including cholesterol, blood pressure and cigarette smoking (Myers 2002). The key here is not endurance exercise, but the ability to accelerate and achieve peak capacity. In addition, a new Harvard study of 40,000 men found revving up the intensity has a more heart-protective effect than lower intensity exercise, especially when combined with weight training (Tanasescu 2002). Fitness experts who have professed "long and moderate" activity are being forced to consider new evidence regarding the importance of the range between peaks and recoveries. Another study looked at the heart rate during one or two minutes of recovery after treadmill tests and found that one's ability to recover can be stratified as a prognostic measure (Shetler 2001).

#### Getting in Synch with a Healthier Wave

When I pursued the research from the Finnish symposium, I met the developer of the Cycles[™] protocol and discovered a mother lode of material supporting the genesis of these ideas: circadian rhythm and its impact on health; nested waves or rhythms of nature that parallel the body's behavior and biochemistry; the improvement of heart rate variability from short bursts of activation and recovery; evolutionary movement patterns; the flood of the body's own anti-inflammatory agents and anti-oxidants during cyclic recovery phases.

The idea of duplicating wave patterns found in nature through cyclic bursts of exertion/recovery is the work of medical iconoclast Irving Dardik, M.D., an award-winning vascular surgeon and founding chair of the U.S. Olympic Committee Sports Medicine Council. He has dedicated the past 30 years to research and teach this synthesis of human performance findings. Others are beginning to listen. This year some U.S. Olympic pentathlon team members will employ the LifeWaves[R] and cyclic exercise program in their training methodology. This is not the stuff of typical exercise physiology textbooks. In fact, William

McArdle, of the renowned McArdle-Katch textbook, Introduction to Nutrition, Exercise, and Health, recently remarked at a LifeWaves[R] presentation, "This goes way beyond what we knew in exercise research. The impact of circadian rhythms is significant."

Sean Hagberg, Ph.D., a medical anthropologist, explains, "The notion of cyclic exercise comes out of a new understanding of the natural world as composed of interacting rhythms. This is not such a radical thought; rhythms characterize all living systems, indeed, differentiate them from the non-living. Clearly, our own biology depends on rhythms and the major rhythm, the circadian rhythm, is reset daily by the day/night cycle. The functioning of all biochemistry in our bodies depends on the circadian cycle, which is itself dependent on environmental rhythms. There is a deep and necessary connection between our lives and the natural world. Cyclic exercise is designed to leverage these connections, to overcome the distance civilization puts between nature and us."

Civilization as a detractor to a healthy rhythm? How could that be? Just consider how often you feel totally in synch. It's probably not often enough and chronobiologists (i.e., scientists who study the impact of natural rhythms on living systems) suggest why: contemporary stress, insanely busy schedules, skipped meals, artificial light late into the night, no naps--all of it wreaks havoc on the circadian rhythm. It throws off your hormonal functioning, immune system, blood pressure, energy levels, metabolism, fat-storing and makes you feel like you've got a chronic case of jet lag.

When your circadian rhythm follows the optimal healthy profile, you have more feelings of well-being. You have the power to think clearly, perform effectively and move vigorously. You digest, sleep and even mate well. You're on top of your game, enjoying more peak performances. Every level, from the grossest to the sublime--every organ, tissue and cell in your being--has a great day. You feel in synch.

So, how do we find rhythmically natural good health in a 24/7 high-tech world? Well, there seems to be a "reset" button after all and it's triggered through exercise. However, not the kind of sustained, aerobic exercise promoted for the past 30 years. Apparently, for most people, the conventional endurance exercise--a submaximal effort sustained for 60 minutes or longer--may contribute to what ails them: chronic inflammation leading to chronic disease. Chronic inflammation at a cellular level has a growing acceptance in recent medical conferences as the fundamental basis for chronic diseases, such as diabetes, obesity, heart disease, certain cancers and auto-immune disorders like rheumatoid arthritis and fibromyalgia. A pro-inflammatory effect floods the body, doing micro-damage to arterial lining, connective tissue, organs and cells.

Instead, performing about six cyclic waves a day may resynchronize your body's natural rhythms, leading to a host of benefits. Researchers found improvements in cardiovascular fitness, mood, immune system, blood pressure and heart rate variability. Putting flexibility back into your heart rate seems to set up corresponding rhythmic waves that put flexibility, adaptability and restorative health back into your body's systems. These healthier waves form

part of a balanced dynamic between stress and recovery, duplicating and reflecting the larger waves found in nature.

#### Takes a Wave to Influence a Wave

How could these short bursts of activity, coupled with complete rest and totaling no more than 60 minutes of exertion per month, create such positive effects in the body? According to Dardik, the real secret is not the bursts of activity and rest, as much as the waves shaped by cyclic exercise. During Dardik's exploration of both elite athletes and the chronically ill, he observed the waves produced by heart rates and the corresponding cyclical waves of the body's biochemistry and immune function. He noted that the body is full of fractals, self-similar repeating patterns at different scales, just as nature is full of fractals.

A flattening of waves occurs in chronic illness, just as a flattening of heart rate range occurs in deconditioned people. The variability of the heart rhythm is itself a wave within larger physiologic waves and the predictive power of decreasing variability is a reflection of sicker, flattened waves.

Just as the heart rate and rhythm become inflexible in their ability to quickly accelerate and decelerate, cells, tissues and organ systems start to grow rigid and inflexible in their ability to respond to change and challenge. According to these principles, the absence of health results in meager wave frequencies within the body. However, bodies don't exist in a vacuum. We live within a nested hierarchy of larger wave scales in nature. The circadian rhythm resides with an infradian rhythm of lunar 28-day cycles, seasonal cycles of cold and hot as well as shifting light and dark.

The LifeWaves[R] Program attempts to honor natural cycles by nudging your overly civilized life back to a healthier oscillation. Roughly four weeks per month, Cycles[™] has you exercise between 6 a.m. to 9 a.m. one week, 9 a.m. to 12 p.m. the next week and 4 p.m. to 6 p.m. the next. On the fourth week, you rest or simply resume your normal activity. This is all done in conjunction with the moon, since our ancestral genetic expression developed in accordance with the lunar cycle. As the full moon wanes, we hibernate a bit and rest, since over the ages, humankind obviously partied hard with the full moon's available light.

Perhaps the most attractive feature of the LifeWaves[R] Program is the recommendation of short, 15-minute to half-hour naps after lunch. The normal afternoon dip in circadian rhythm is confirmed by research showing a quick nap produces renewed creativity and productivity (Refinetti 2001).

The one LifeWaves[R] recommendation I'm not crazy about is the introduction of hot and cold showers ... again, with the idea that our bodies need to cycle up and down, adding to our upper and lower "octaves" of response-ability. Bringing back all the highs and lows makes life healthier in general. Don't let artificial temperature control and lighting flatten your body's natural wave-making processes. Shiver and sweat. Forget the nightlight. Nap when you're tired. Your genes will love you for every nuance of "uncivilized" life you incorporate.

## Evolutionary Movement Patterns

Much of the Life Waves[R] foundational work draws upon the evolutionary history of early humans and their movement patterns. Our bodies were meant for explosive, peak movement. Even the evolution of sports mimics this preferred capacity for intermittent or cyclic, stop-and-start movement (Weinstein 2000). In fact, researchers are exploring the stop-and-start nature of mammal locomotion and concluding that nowhere in nature is aerobic "steady-state" activity found. "Stop and Start Wins the Race," proclaimed Science magazine in April 2000.

## Next Steps for Fitness Professionals

Just learning about cyclic exercise, the physiology of recovery and circadian rhythms may be enough to shake up everything you thought you knew about fitness. AFAA has an ongoing commitment to present the healthiest lifestyle solutions for you to offer your clients. Without a doubt, exercise is good medicine, therefore, it's more important than ever to make sure the type of exercise we're offering an aging population with new aches and pains is the most health-enhancing, safe and effective form around. We haven't seen the last word on this emerging philosophy and research, but you can rest assured AFAA will get you a front-row seat as you ride this healthy wave into the future.

Special thanks to Sean Hagberg, Ph.D., for assembling the research in this article. An anthropologist who trained post-doctorally as a medical scientist, Hagberg serves on the faculty at Brown University Medical School and is the chief knowledge officer at Life Waves International. He specializes in exploring what goes unnoticed in medical science, such as rhythms.

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RELATED ARTICLE: LifeWaves[R] Clinical Research.

Parkinson's Disease Trial (data presented at Puijo Symposium, paper in preparation). Institutions: Harvard and Columbia Medical Schools, Mind/Body Institute at Harvard Medical School, New Jersey Institute of Technology, University of Missouri Medical School. A 12-week trial of the protocol involved patients, average age 78 years, with moderate to severe Parkinson's disease. The methods were very similar to those used in the Healthy Women's Trial discussed in the article. Trainers assisted some participants due to unsteady gait and balance. Significant findings include:

- \* Improved motor function as measured on the UPDRS scale, a measurement tool used to assess function in Parkinson's disease patients
- \* Improved diastolic blood pressure
- \* Improved immune function
- \* Collaterals and participants reported significant improvements in quality of life, sleep and social interaction
- \* Adherence to the protocol was over 90 percent. More than half the participants continued to use the program after completion of the trial.

Extended Parkinson's Study (data under analysis). Institutions: Mind/Body Institute at Harvard Medical School, New Jersey Institute of Technology, University of Missouri Medical School, Midwest Research Institute. Eight participants from the first study continued with the protocol after formal completion. They were recruited into a new study, using some new methodologies pertaining to heart rate variability data collection and analysis.

Healthy Women's Controlled Trial (data under analysis). Institutions: Mind/Body Institute at Harvard Medical School, New Jersey Institute of Technology, University of Missouri Medical School, Midwest Research Institute. Twenty-two people participated in a 12-week controlled trial which compared the LifeWaves[R] Program with moderate aerobic exercise. The trial was designed to detect changes in immunological function affecting inflammatory and anti-inflammatory biochemical processes.

HIV/AIDS Study (ongoing). Institutions: Wistar Institute, Philadelphia FIGHT, New Jersey Institute of Technology. The controlled trial consists of three cohorts of people with HIV/AIDS, a standard care, an aerobic exercise and a LifeWaves[R] Program arm. The trial is approximately half-way completed with a total recruitment of 51 people. Participants are receiving HAART since some of the newer drugs have significant impact on normal circadian function. The primary outcome variable is quality of life. Secondary outcomes include viral load, CD4 count and other biochemical markers.

Insomnia Study (ongoing). Institutions: Mind/Body Institute at Harvard Medical School, New Jersey Institute of Technology. The controlled trial has 30 participants in total and consists of standard care (i.e., cognitive-behavioral therapy) against standard care plus the LifeWaves[R] Program. Outcome variables are standard variables in sleep studies, including objective measures of sleep time and quality. The study is currently beginning the LifeWaves[R] Program arm.

Healthy Women's Trial (American Journal of Medicine and Sports). Institutions: Harvard and Columbia Medical Schools, Mind/Body Institute at Harvard Medical School, New Jersey Institute of Technology. (See main text.)

Ancillary Research:

These data sets developed either through non-research-based feasibility trials or opportunities that developed during other research programs.

Feasibility trial in corrections: Delivered the LifeWaves[R] Program to incarcerated young adults and juveniles in two prerelease settings in Boston, Massachusetts. Noted subjective and anecdotal improvements in physical performance.

Actigraphy in elderly adults: Used actigraphy units (i.e., circadian rhythm recording devices) on elderly adults to develop data sets not already in existence.

Feasibility trial in advanced metastatic cancer patients: Evaluated the utility of the LifeWaves[R] Program for participants with advanced metastatic cancer. Six participants were able to successfully engage in the LifeWaves[R] Program.

Clinical network: a free-standing list-serve-based network of clinicians using or interested in using the LifeWaves[R] Program with their clients. This network exchanges information on

feasibility and outcomes as well as generates case reports on improved clients. Two such case reports are currently being prepared for publication. Hosted by The Plexus Institute.

Principle Investigators:

Rochelle Goldsmith, Ph.D.  
Columbia University. Published  
Healthy Women's Study,  
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Subject K:

Sample #1 is dated Feb. 6,  
1998.

Sample #2 is dated Jun 27,  
1998.

An expert in heart rate  
variability was sent these two  
graphs as blinded data. He  
determined from the data that

the "first" graph was of someone who was very old or very ill. The second graph was identified as a younger, healthier individual.

When the data were unmasked, it was shown that this was the SAME person who had been doing Cycles.<sup>[TM]</sup> The person was a 70-year-old male.

[GRAPHIC OMITTED]

Meg Jordan, Ph.D., R.N., is editor in chief of American Fitness, a medical anthropologist with a clinical specialty in behavioral medicine and author of *The Fitness Instinct* (Rodale Reach; 1999).

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