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The A to Zzzz's of Exercise

Treating sleep disruptions with exercise prescriptions for post-menopausal women

by Amy Oprean



When it comes to improving overall health, few activities are cited as frequently as exercising regularly and getting enough sleep. These activities are not only important in their own right, but now appear to be connected. Research in recent years has uncovered exercise's ability to help people fall asleep faster and stay in deeper stages of sleep longer, revealing that a better night's sleep could be attainable without the prescription sleep aids that some people need. Specific exercise regimens may be the answer for those who have trouble sleeping.

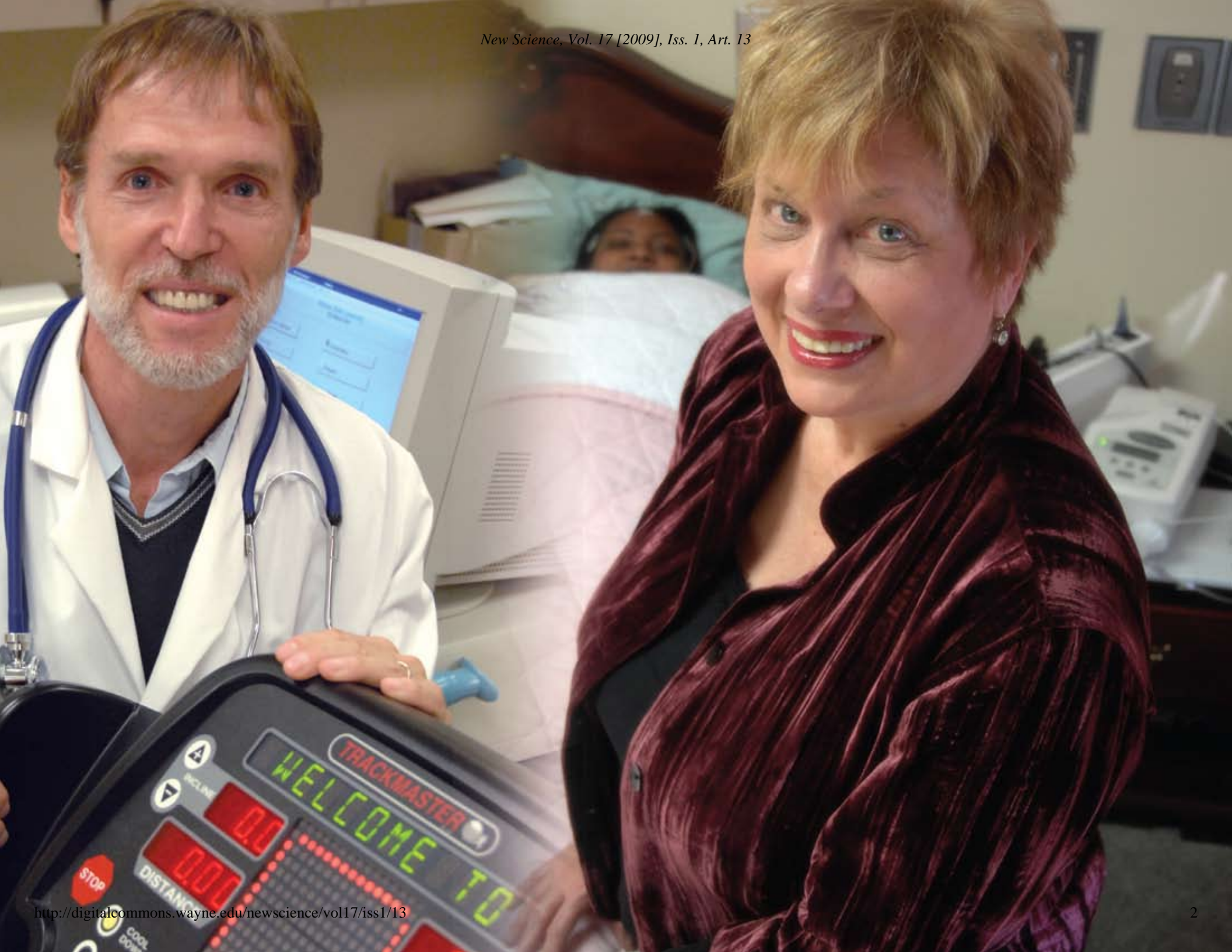
Jean Davis, Ph.D., associate professor and assistant dean for adult health in WSU's College of Nursing, and Hermann-Josef Engels, Ph.D., professor of exercise physiology in WSU's College of Education have been working to find a

solution to getting a better night's sleep. Funded by the National Institute of Nursing Research, their interdisciplinary team conducted a study to determine whether a personalized exercise program could serve as a non-pharmacological treatment for sleep problems. They focused specifically on post-menopausal women, a group for which disrupted sleep – difficulty falling asleep, difficulty staying asleep, or both – is one of the most common complaints.

"We're interested in intervening, actually offering someone a prescription for improving their sleep that doesn't involve drugs, which is what makes this study unique," Dr. Davis said.

While working as a faculty member at the University of Florida, Davis became interested in the topic after learning of the negative side effects

Dr. Herman-Josef Engels, professor of exercise physiology and Dr. Jean Davis, associate professor and associate dean for adult health



The A to Zzzz's of Exercise *continued*

of prescription sleep medications. Though exercise is often suggested by health care professionals as a sleep aid alternative, literature review revealed a lack of objective scientific studies on the topic. "In advanced practice, we frequently advise patients to exercise to sleep better," Dr. Davis commented. "And women would often tell us that their sleep was better, but we had no objective laboratory data that showed this is something that legitimately works."

Of the previous exercise studies that were conducted, many focused on athletes and people who weren't currently suffering with sleep problems. Wanting to assess the potential benefits of exercise on disrupted sleep specifically in post-menopausal women, she approached Engels upon joining Wayne State in 2003. Eager to pioneer research on the understudied topic, Engels agreed to join forces.

"There hadn't been much research looking at exercise as a treatment for sleep disturbances," Dr. Engels said. "We're both very genuinely interested in this, and thought we could really make a vital contribution to help answer some lingering questions in this area."

In order to keep as many confounding factors out of their study group as possible, Davis and Engels disqualified subjects with health problems that included sleep apnea, hypertension, obesity and heart disease, cutting the group of approximately 600 women interested in the study to less than 40. At the beginning of the study, subjects underwent

a maximal oxygen uptake (or VO₂max) test in the WSU Exercise Physiology Laboratory to assess their physical work capacity, and based on that measurement, were given an individualized exercise prescription. The workout program consisted of a 16-week, home-based walking program conducted five times per week for 30 minutes per session at a moderate level of intensity.

The VO₂max tests were given again at the end of the study to verify the subjects' physical fitness improvements and their correlation with improvements in sleep. A control group underwent the same assessments without an exercise program, to further analyze the effects of the exercise

program on sleep. Other controls included monitoring subjects' day-to-day exposure to light and not allowing subjects to exercise within two hours of going to bed – both factors that have been suggested to affect sleep patterns.

The same rigor was applied to measuring subjects' sleep patterns throughout the study. Conducted in the Sleep Disorders Center at Hutzel Hospital in Detroit, Davis and Engels continuously measured subjects' brain waves, eye movements and chin muscle tension as they slept. These three measures were used to score the subjects' sleep and determine the amount of time subjects were spending in the different stages of sleep (NREM and REM sleep), as well as instances of arousal or awakening. "We were very meticulous," Dr. Engels said. "In order to be able to look at the potential of exercise to improve sleep, we employed widely accepted 'gold standard' procedures for both the exercise and sleep components of the study."

The team also measured core body temperature, a strong indicator of an individual's circadian rhythm – the 24-hour physiological cycle that influences the 24-hour sleep/wake pattern. The body's daily physiological "cue" to fall asleep is a drop in body temperature. As people age, the rise and fall of their daily core temperature becomes less stable, possibly causing fragmented sleep. Davis and Engels are for the first time characterizing the 24-hour temperature curve specifically of post-menopausal women, looking for clues as to why this group in particular reports sleep problems so frequently.

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"I think that the quality of the research is much better when you have experts from different disciplines making a contribution."

— Dr. Herman-Josef Engels

Restoring the cycle

If post-menopausal women experience a shift in their circadian rhythm, the question remains as to why. One theory suggests it may be due to a decrease in estrogen levels around the suprachiasmatic nucleus – the body’s inner clock, Dr. Davis said. “There is some evidence that the area around the suprachiasmatic nucleus is rich with estrogen receptor sites. Postmenopausal women who are estrogen deficient may have fewer estrogen receptor sites. The loss of estrogen in the area of the suprachiasmatic nucleus could make for a less stable temperature cycle, and therefore, women aren’t going to sleep as well.”

If improvements in physical fitness improve sleep quality in post-menopausal women, it may also be attributed to a slight increase in estrogen released into the bloodstream as stored fat is mobilized, Dr. Davis said. A second possible explanation is that habitual exercise could improve sleeping patterns by providing a new daily “cue” that restores stability to women’s circadian rhythm, she added. “We don’t know for sure if one of these explanations is the reason exercise improves sleep, but that’s also part of the study. The clinical trial sought to answer not only if exercise has this positive effect, but if it does, why?”

With their study complete, Davis and Engels are in the process of analyzing the extensive amount of data collected. Though the results will heavily influence the direction of subsequent research, their interests include the therapeutic aspects of

passive and active body warming on sleep patterns and exercise “intervention” therapies for post-menopausal women suffering from hypertension or other chronic ailments.

Whichever direction their results will lead, however, Engels and Davis plan to continue studies that combine their expertise.

“It’s been a challenging and enjoyable experience to work with people outside my department,”

Dr. Engels said. “I think that the quality of the research is much better when you have experts from different disciplines making a contribution.”

“There is an incredible environment at Wayne State University for collaborating,” Dr. Davis added. If there is a research problem you want to study, people from across the campus will help you make it happen.”

About Dr. Jean Davis: Dr. Davis earned a B.S. in nursing from Michigan State University and an M.S. in nursing from Hunter College, the City University of New York. She completed her Ph.D. in nursing research and physiology with a specialty in neurophysiology at the University of Arizona. Dr. Davis has been on the faculty at UCLA and the University of Florida, and joined Wayne State University in 2003.

About Dr. Hermann-Josef Engels: Dr. Engels received a B.S. and M.S. from the Florida International University in Miami, Fla. He completed his doctoral training in exercise physiology at Florida State University in Tallahassee. Dr. Engels is a fellow of the American College of Sports Medicine and of the Research Consortium of the American Alliance for Health, Physical Education, Recreation and Dance. He joined Wayne State University in 1989.

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