

How many steps
do you take each day?
The answer could determine
whether you are on the path
to good health or are taking
a shortcut toward diabetes
and other problems.

Stepping into health

by Melissa Crytzer Fry



We've all had them. The roll-out-of bed, get dressed, drive-to-work, ride-in-the-elevator, sit-at- the computer, eat-at-the- computer, drive-home, and sit-in-front-of-the-TV kinds of days. You know, those 3,000-steps-per-day kinds of days.

Most of us may not think of sluggish days in terms of the number of steps we've taken. Catrine Tudor-Locke thinks about this stuff all the time.

Tudor-Locke is a scientist. She is interested in measuring the steps-per-day taken by members of various populations. That's her job. She is director of the Walking Research Laboratory in the Department of Exercise and Wellness at Arizona State University's Polytechnic Campus.

The ASU researcher is also concerned about the worldwide obesity epidemic and its relationship to decreased walking. Her study findings suggest that inexpensive pedometers—devices that count number of steps walked—can serve as motivational tools to get people off the couch and into better health.

A global leader in the study of the health benefits of walking, Tudor-Locke was one of the first to answer fundamental questions about steps-per-day:

What does a step mean?

How should step data be collected and interpreted?

Does intensity matter when counting steps?

How many steps are enough?

The theory of 10,000 steps-a-day for optimal health in adults has gained popularity worldwide. Tudor-Locke wants to ensure its accuracy.

The 10,000 figure can be traced to *Manpo-kei*, a Japanese marketing slogan for a pedometer used during the 1960s. Translated, the term literally means “10,000 steps meter.”

Tudor-Locke has conducted research projects with David Bassett of the University of Tennessee. They discovered a correlation between the popular 10,000 steps and the U.S. Surgeon General's daily activity recommendations for adults.

“The goal was to try to come up with a range of steps that were equivalent to what we would suggest for public health guidelines,” Tudor-Locke says. The Surgeon General's public health guidelines suggest 30 minutes of daily moderate activity, above and beyond standard activity.

To convert the 30 minute recommendation into a pedometer equivalent, Tudor-Locke studied 40 men and women between the ages of 18 and 40. Each person wore a pedometer. Each was then monitored on a treadmill during 30-minute intervals. Their steps also were counted from videotaped footage. Additionally, each participant was fitted with a portable metabolic unit used to measure oxygen use. The scientists used that number to infer intensity of the 30-minute workout.

“We also knew the speed of the treadmill,” Tudor-Locke explains. “And with those variables, we were able to produce a formula. We were able to predict energy expenditure if we knew a person's steps per minute.”

The study results indicated that 30 minutes of moderate activity translates to roughly 3,000-4,000 steps. Further verification was completed as additional subjects walked 30 moderate-intensity minutes on their own, using a pedometer. They, too, averaged 3,600 steps.



pedometer shopping made easy

Relax. Buying your first pedometer is much less stressful than buying your first car. By following a few simple guidelines, you'll be paired with a pedometer that is in rhythm with your every step.

>> **Buy a pedometer made in Japan.**

Japan is the only country with established industry standards for pedometer accuracy. Yamax pedometers are considered among the most reliable by the research community and are a good alternative for individuals.

>> **Reliable pedometers cost \$25 to \$30.**

While the \$3 model might seem like a bargain, its quality is no better than the free pedometer in the cereal box.

>> **Test a pedometer in the store.**

Put it on and walk 20 steps, counting

in your head. Your pedometer should read 19, 20 or 21 when you view its display. If it says 5 or 42, don't discard it just yet. Re-adjust it and repeat the same test. Pedometers must be positioned vertically on your waist.

If they hit a bump created by clothing, or are positioned on a body roll, they might read inaccurately. In such instances, positioning them on the small of the back can correct the error.

>> **Less is more.** Accelerometers are another device that can measure steps and walking speed. However, they require extensive personal expertise and can range anywhere from \$450 to \$500. The simple pedometer that counts steps only—without the bells and whistles—is the best buy.

pet pedometers pay off

Ever wonder what frisky Fido or cuddly little Snuggles does while you're at work?

Using a pet pedometer, ASU exercise and wellness researcher Catrine Tudor-Locke found out the details. She learned that her dog, Martin, was inactive the majority of the day. The revelation made clear to her the importance of walking him in the mornings and evenings for increased health.

Learning about Martin's inactivity spurred Tudor-Locke to conduct an additional study of 26 dogs. She wanted to determine just how reliable pedometers are for measuring canine physical activity.

As part of her study, the dogs were fitted with collar-pedometers. Their steps were measured while trotting, walking, and running over a distance of 100 feet. The pedometers showed slight over- and under-estimates depending

on the size of the dog. But the findings suggest that pet pedometers do provide a reasonable degree of accuracy.

The ASU scientist's study also revealed a moderate correlation between Fido's activity level and that of his owner's. Both owner and pet wore pedometers over 14 days. It was easy to see that less active owners had less active dogs. "There is a modest relationship between a dog's steps and their masters'," says Tudor-Locke. "That makes sense, because if they're going for a purposeful walk, they're doing it together."

Tudor-Locke has phase two of her pet pedometer research ready to go. She plans to assess dog-walking as a possible contributor to healthy physical activity in humans. "We'll be looking at a daddy-doggy physical activity intervention to increase activity for both master and dog health," she says.

Melissa Crytzer-Fry

10,000

“Normal daily walking activity without exercise is probably about 5,000 to 6,000 steps,” Tudor-Locke says. “So if you add 3,000 to 4,000 steps to that, you’re at 10,000.”

Adults who average this number of steps generally are healthier, she adds. They also have reduced rates of obesity as well as fewer medical conditions.

Tudor-Locke cautions, however, that the 10,000-steps average is not one-size-fits-all. “We accumulated current research literature to try and provide some sort of hierarchical structure to how many steps are enough for different groups,” she says.

She and others have studied the recorded steps of different age ranges and various geographic groups. Studies were done with people in Colorado, Australia, the United Kingdom, and South Carolina.

Based on all that accumulated research, the scientists found that children aged 12 to 15 years take between 11,000 and 13,000 steps each day. The higher number is due to short strides and higher energy levels. During the teen years, steps reduce to 10,000 or 11,000.

Tudor-Locke’s research, however, suggests that children ages 6 to 12 should take 12,000 to 15,000 steps per day if they want to prevent weight gain. The ASU researcher also found that 5,000 daily steps can be classified as a sedentary activity level in adults.

In another of Tudor-Locke’s studies, individuals in Sumter County, S.C., received pedometers in the mail and were asked to record normal daily routines. Their average 5,900 steps per day were about 1,000 steps shy of published population samples in Colorado. But the total was comparable to sedentary Type II diabetes patients Tudor-Locke worked with in Canada.

“People who are under 5,000 steps on a daily basis are likely in a positive energy balance,” she explains. “This means they’re gaining weight and also likely losing muscle. They are moving in a fast direction toward diabetes,” Tudor-Locke says.

The ASU scientist is familiar with this trend, having studied the behaviors of her Canadian diabetes subjects. “This group is typically characterized by obesity and sedentary activity,” she says.

Tudor-Locke increased this group’s physical activity by about 2,500 to 4,200 steps from their baseline levels. The results of the 12-week study were encouraging. Individual participants showed modest decreases in weight, waist girth, and improvements in their systolic blood pressure.

“We try to get them to increase their steps to a level that’s sustainable,” Tudor-Locke explains. The participants in the study used a technique she discusses in her recently published how-to book, *Manpo-kei: The Art and Science of Step Counting*.

“That’s why we get people to choose their own goals. I precha ‘more than before’ approach,” says Tudor-Locke. “I do acknowledge that 10,000 steps is useful from a measurement perspective. But the reality is that if somebody goes from 3,000 steps per day

to 8,000 steps per day, they are making outstanding progress,” she adds.

The maximum-steps-per-day approach is based entirely on volume, not the intensity of the workout. Because it’s based on energy expenditure, all steps “count.” That includes shuffling around the kitchen to playing with the kids.

“If you’re trying for the big numbers like 10,000 or higher, there are cautions to consider,” Tudor-Locke says. “You must do what we call purposeful exercise at moderate intensity. This is equivalent to brisk walking, a rate that people can naturally achieve.”

There is other good news. The recommended 30 minutes of purposeful walking doesn’t have to be achieved at once. The same benefit is derived in 10-minute increments.

“Citrine’s work with walking and the idea of *Manpo-Kei* has greatly influenced the ‘safe walking’ component of my program,” says health educator Elizabeth Schnoll, who runs the Bone Builder Physical Activity Program of Maricopa County. Bone Builders is part of an ongoing human subjects study at the University of Arizona. The program is focused on the prevention of osteoporosis and encourages physical activity for better bone and overall health.

Schnoll regularly uses Tudor-Locke’s book, which includes activity and tracking calendars, as well as questions pertaining to readers’ personal activity behaviors.

“The book provides a very real and understandable approach to walking and the physical wellness benefits,” Schnoll says. “Through the simple use of a pedometer, we really get in touch with being active and not just busy.”

“The key is to first find out how many steps you take per day on average, without trying to change your behavior,” Tudor-Locke continues. “You use a pedometer to evaluate and record your daily activity so you can monitor yourself. It allows you to find out what behaviors you do that result in the highest number of steps and the lowest number of steps.”

Research has shown that walking for exercise has remained stable in Americans over the years. However, walking for transportation and incidental walking have eroded, according to Tudor-Locke. People simply don’t walk to work or to school or to the market any more. “Walking has eroded so dramatically in our lifestyles that it’s probably one of the main culprits behind the existing obesity epidemic,” she says.

The ASU scientist hopes to curb that epidemic by re-introducing walking to the public. “Walking is accessible to all. It’s functional. It’s part of our daily lives,” she says. And most importantly, it has proven health benefits.

WALKING AND Pedometer research at ASU’s Polytechnic Campus is supported by Health Canada, The Canadian Diabetes Association, The Centers for Disease Control, and Associated Schools of Public Health. For more information, contact CATRINE TUDOR-LOCKE, Ph.D., Department of Exercise and Wellness, 480.727.1944. SEND E-MAIL TO CATRINE.TUDOR-LOCKE@ASU.EDU