

GET UP AND GO

REGARDLESS OF EXERCISE, IF YOU SIT TOO MUCH, YOU MAY RISK MAJOR DISABILITY LATER IN LIFE, SAYS FEINBERG PROFESSOR DOROTHY DUNLOP. AS THE LEAD AUTHOR OF A STUDY ON SEDENTARY BEHAVIOR, DUNLOP IS DETERMINED TO GET ALL OF US OUT OF OUR CHAIRS — AND MOVING. *by Anne Stein*

Halfway through her research team's twice-weekly meeting on the Chicago campus, Dorothy Dunlop announces with a smile that the group should finish the discussion standing up. Instantly, the four female clinicians and technicians, who are gathered in a small room overlooking Lake Michigan on the 10th floor of the Arthur Rubloff Building, stand up and stretch. They're joined by a fifth researcher connected via Skype from her office in Ohio, who also gets up and out of her chair.

It's not an unusual request from Dunlop '90 PhD, a longtime health services researcher at the Feinberg School of Medicine's Center for Healthcare Studies and professor of medicine and preventive medicine. Dunlop has spent much of her career studying the effects of exercise and the lack of it on public health, particularly on those with arthritis. She and her colleagues, including principal co-collaborator Rowland Chang, senior associate dean for public health at Feinberg, have focused especially on preventing disability in older adults.

Their most recent paper, published in February's *Journal of Physical Activity & Health* (Dunlop is lead author), has drawn international media attention — and it explains Dunlop's preference for moving over sitting.

SIT AT YOUR OWN RISK

In a study of more than 2,200 adults ages 60 and older, every additional hour a day spent sitting was linked to a 50 percent greater risk of disability — regardless of how much moderate exercise those in the study got.

"This study is a smoking gun. Regardless of exercise, the more time people spent sitting and being sedentary, the more likely they were to be in the pool of disabled people. Sitting is emerging as a separate risk factor from insufficient physical activity," explains Dunlop, a biostatistics expert who earned a doctorate in industrial engineering and management sciences at the McCormick School of Engineering and Applied Science. "In fact, sedentary behavior was almost as strong a risk factor for disability as a lack of moderate exercise.

"The message we're looking at, which was launched by this recent study, is that 'Yes, exercise is very important, but it's also important you're not being a couch potato the rest of the day.'"

That advice applies to people of all ages, says Dunlop. "We don't have a national longitudinal study yet

[it's one of several the Chang-Dunlop group is working on], but if you're sedentary, you're more likely to develop diabetes and heart disease, so we're encouraging older people, as well as younger people, to be aware of how much they're sitting and look for opportunities to substitute activity." (See "Move It or Lose It," page 41.)

This discovery is positive news, says Dunlop. "We now have two things we can do to promote good health. We can be active, because we know it's better for your health. And we can be aware of how much time we spend being sedentary and find ways to chip away at that behavior."

WALKABOUT

Dunlop literally walks the walk, logging 5 miles a day on foot. Her research team uses accelerometers to capture exercise data, and since last summer she has worn a Fitbit bracelet — a device that allows her to record and post exercise activity online. "We got these in August because

Sitting Versus Standing

How often should we interrupt our sitting? Does breaking up prolonged sitting through simply standing provide health benefits?

Dorothy Dunlop: Available studies indicate the more you sit, the greater your risk for health problems. However, we do not know if there is a threshold for adverse health consequences or how often sitting needs to be interrupted. We do know that standing is better than sitting and activity is better than standing.

we were considering using them for our study, and Pamela Semanik [adjunct assistant professor in physical medicine and rehabilitation and one of the Chang-Dunlop group's researchers] insisted we try everything for ourselves before we use them on study participants," explains Dunlop.

On especially cold winter days she doesn't always reach 5 miles, but Dunlop gets close. She commutes from north suburban Libertyville to downtown Chicago and often walks between Union Station and her Streeterville office.



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— DOROTHY DUNLOP

"Even before physical activity was a focus of my research, it's always been a way that I've gotten energized," says the tall, slim Dunlop, who describes herself as "60-plus." It's easy to walk 5 miles a day, she says. "You just look for opportunities."

Dunlop and her husband John, a geriatrician/internist in private practice, spent family vacations with their now-grown children hiking through state and national parks. When friends visit Chicago, Dunlop takes them on walking tours of downtown, stopping at Navy Pier to watch the sunrise, or she leads them on hikes through local forest preserves. And when she interviews job applicants at Feinberg, they stroll through the medical school and over to the law school to breeze past the stained-glass windows and the lecture hall named for Abraham Lincoln.

Dunlop's career wasn't originally focused on fitness and disability intervention, though it has always involved numbers. Dunlop earned a bachelor's degree in mathematics from Wheaton (Ill.) College in 1972 and went on to teach high school math for a year in Baltimore County, while her husband attended medical school at Johns

Hopkins University. She decided she wanted to pursue something that combined math and medicine and in 1974 earned a master of health science degree in biostatistics from Johns Hopkins. Soon after that the family moved to the Chicago area, where Dorothy spent more than a decade as a statistician designing medical studies for a pharmaceutical company.

But she decided she didn't have enough background to examine some of the medical questions she really wanted to address, so she came to Northwestern to study industrial engineering, earning a doctorate in 1990. "It gave me a broader, more interesting tool kit than just pursuing statistics or other approaches," she says.

Her adviser was Professor Ajit C. Tamhane. Like Dunlop, he was interested in taking mathematical tools and applying them to medical problems. "It was at the very beginning of the AIDS epidemic, so we took some very sophisticated tools and worked to estimate the incubation time from HIV to AIDS. That study launched my medical career and introduced me to the medical school at Northwestern."



PETER BARRERAS

After completing her dissertation, Dunlop focused for several years on raising her two sons while working part time with Susan Hughes at what was then Northwestern's Center for Health Services and Policy Research, now the Center for Healthcare Studies. "My research was very statistical and model based, looking at the trajectory of disability of people with arthritis and how joint impairment increased disability," she explains.

"Dorothy really embodies the ideal attributes of a true translational scientist," says Rebecca Jackson, a professor at Ohio State University's medical school and a frequent collaborator with Dunlop, describing Dunlop's ability to produce study results that promote innovative public health programs. "Her knowledge of study design and also her ability to apply the most cutting-edge techniques for assessment of physical activity have really given us new insight into how osteoarthritis and risk for osteoarthritis can impact people; it has allowed us to improve our ability to make recommendations for patients."

PREDICTING DISABILITY

A eureka moment in her career, says Dunlop, and what eventually led to the recent paper on sedentary behavior and disability, came from a study she did some 14 years ago with Rowland Chang, trying to figure out what predicted disability among people with arthritis. They had

very rich data — from health history and income to social support and health insurance coverage. They discovered, however, that low levels of physical activity were the biggest predictor of disability, rather than the other factors — including health history. "This was exciting because you can't change your health history but you can change your activity level," says Dunlop.

"So Bing [Chang] and I divided the question into two pieces. Bing took the question of, 'How do we get people with arthritis to be more active, to change their behavior?' And I took the question of 'How much physical activity does a person with arthritis need to maintain function?' They realized when physical activity was increased, sedentary behavior didn't necessarily decrease, and that was another factor they needed to look at.

This last paper has led to a slew of studies that the Chang-Dunlop research team is working on. They are looking at novel interventions to get people with arthritis or symptoms of arthritis to be more active and to decrease sedentary behavior; they are measuring how much physical activity people need to maintain their independence, which may be at a different level from maintaining heart health; and they are trying to determine the relationship between sedentary behavior and disability over time, in contrast to the February paper based on survey data.

TAKING A STAND

Dorothy Dunlop uses a standing desk at her office in the Arthur Rubloff Building on the Chicago campus.

They are also trying to figure out how much sitting is detrimental. "Available studies indicate the more you sit, the greater your risk for health problems," explains Dunlop. "However, we don't know if there is a threshold for adverse health consequences or how often sitting needs to be interrupted. We do know that standing is better than sitting and activity is better than standing."

AMERICANS LEAD SEDENTARY LIVES

Another challenging task is figuring out how to get our sedentary society to stand up. The sedentary-disability study found that more than half the people surveyed age 60 and over are sedentary two-thirds of their waking hours, mostly sitting, lying or engaged in some "very low-level activity," Dunlop says.

And then there's technology, which has made being sedentary extraordinarily popular and easy. "We've gone from an agricultural society, where much of the day was spent doing physical labor, to a society where we sit with the computer or a tablet or an iPhone," says Dunlop. "It's a different focus, and I think it makes sense that it changes behavior, and behavior changes in this case appear to have health consequences."

One member of the research team, Semanik, cites her son, who figured out how to play a Wii fitness game while sitting. An accelerometer in the controller measures the game-player's activity while "jogging," but as long as the controller is moving, the game works, so her son simply sits with the controller in his hand and moves his arms.

Team member Jungwha "Julia" Lee says she hadn't realized how sedentary she was until she started the project. "Sometimes I sit in my office for four hours without realizing it, so I have an application on my computer that lets me know every 20 minutes to get up," she says.

Being sedentary isn't healthy for a number of reasons. Especially when you're slouched in a chair, says Dunlop, "you're not using support muscles and over time you could develop back and neck pain." Glucose levels rise to an abnormal level when people sit for long periods of time, which eventually can lead to diabetes, says another team member, Linda Ehrlich-Jones, an assistant professor in physical medicine and rehabilitation. There may also be a relationship between sitting too long and higher levels of lipids (fats) in the blood.

Always one to look on human nature's positive side, however, Dunlop says she and her team have found that people want to change. "Maybe not everyone, but if we start helping those people who recognize that they need to change and provide them with some ideas and tools, they will try. The challenge for us is coming up with approaches to make change sustainable.

"Right now we're not looking for special equipment or special programs," she says, about getting people off their couches and out of their chairs. "We're simply looking for things that are doable by large numbers of people."

To read "Sedentary Time in U.S. Older Adults Associated with Disability in Activities of Daily Living Independent of Physical Activity," visit bit.ly/DunlopStudy.

Anne Stein is an Evanston-based journalist.

MOVE IT OR LOSE IT



Dorothy Dunlop's top 10 ways to get more active at work and at home:

- » **Walk for short errands** instead of taking the car.
- » **Park at the far end of the parking lot** when you drive to a store.
- » **Take the stairs** instead of the elevator.
- » **Get up at every commercial break** when you're watching TV. Clean up the kitchen or do some quick, easy task.
- » Fill your water bottle with half the amount you'd normally drink so you have to **get up more often**.
- » **Stand at your kitchen counter** and read rather than sit on the couch.
- » **Stand up when you talk on the phone.**
- » **Hold standing or walking meetings.**
- » **Get a standing desk** — a raised platform that you stand at to work. No budget? Put your computer on top of a box so you can work from a standing position.
- » **Get an app** or set a timer on your computer or phone to alert you to stand at least once every hour. Use that time to stretch, walk in place or walk around the office.