

# Device may help identify fall-prone elders

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With the aid of a device that resembles a bathroom scale, Boston University researchers think they can predict which older individuals are at risk for a potentially bone-fracturing fall.

Other scientists are discovering how tai chi, the graceful slow-motion exercises derived from Chinese martial arts, can help elders reverse age-related decline in their ability to retain their balance.

Both types of research are part of a broad initiative to discover why elders fall and what might be done about it.

Falling, among the elderly, is a complex problem that costs the nation approximately \$13 billion a year in medical costs, primarily in treating broken hips and other fractures. Nearly 250,000 Americans break their hips in falls every year.

Although only a tiny fraction of falls send elders to the hospital or nursing home, injurious falls often spell the end of independence and active participation in life for hundreds of thousands of elderly people each year.

Among people over age 75, falls account for nearly 70 percent of all emergency room visits, said Dr. Richard W. Sattin of the US Centers for Disease Control and Prevention.

Many factors contribute to falls among the elderly, from poor eyesight to dangling telephone cords.

Since no single approach will solve the problem, researchers and federal funding agencies are trying to identify who is fall-prone so preventive efforts can be targeted to them.

"The [approach] is a relatively simple technique to identify a person who is susceptible to falls before he has actually fallen," said James J. Collins, a biomedical engineer at BU.

Collins and his colleagues say they may have discovered the basis for such screening.

They published a paper last week in a leading physics journal, *Physical Review Letters*, showing that the subtle shifts people make in their center of gravity while standing still, called sway patterns, indicate whether they are likely to lose their balance if they stub their toe or slip on a rug.

The balance control mechanism behind both is the same, they found, using a complex mathematical formula and a widely known theory of how any complex system fluctuates and comes to rest.

"Previously there were two schools of thought among researchers," said Casson C. Chow, a BU mathematician and coauthor of the new study. One group would nudge or trip subjects to see how they recovered their balance, while the other would observe people as they stood quietly.

"There was no proof that the two were connected, until now," Chow said.

Collins and Chow say their discovery may open the way to a simple

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and safe test that would have subjects merely stand quietly on what Chow calls "a souped-up bathroom scale" to measure subtle sway patterns. Those who are more prone to fall, he said, will have "more slope in their posture control system."

Collins's group has already found that older people, especially those past age 70, display more of these subtle weight shifts than younger people. Among elders, some have more difficulty standing perfectly still than others.

Earlier research by Collins and his co-workers suggests that elders who have more difficulty standing upright may unconsciously compensate by stiffening their muscles. But that may make them more likely to fall and more likely to injure themselves when they do.

In addition to identifying elders who may be at risk of falling, the BU researchers say their proposed "bathroom scale" test would be valu-

able to assess the good or bad effects that various drugs have on balance and to determine whether a patient's proneness to falling is increasing or decreasing.

For instance, they intend to do before-and-after tests among elders who have undergone training in tai chi, which recent research suggests improves balance.

Steven Wolf of Emory University reported in 1996 that giving elders over age 70 a 15-week tai chi course reduced risk of multiple falls nearly 50 percent. More recent research, he said last Friday, suggests why the course might work.

Elders who have had tai chi training learn to roll with the punches, in effect — to "increase their sway in a controlled fashion" when their balance is perturbed, as Wolf puts it.

"I think this translates into an ability to regain their balance when they've lost it," especially when their weight is on one leg, Wolf said.

"Up to 70 percent of all falls occur with some kind of trip or slip when a person is in that single-limb stance," he added.

Ramel Rones, a Boston-area tai chi instructor who frequently works with elders, said Wolf's science ratifies his experience.

"What the Chinese call 'body memory' can be trained," Rones said. "Tai chi teaches the muscles when to work and how much. It distributes the work among different muscles. And you learn how to align the bones. You create stronger roots, a stronger base."