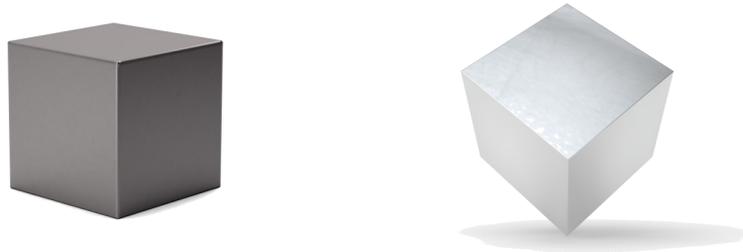


REACTIVE STEPPING: HOW NOT TOO FALL

Medicare defines a fall as “an unintentional change of position to a lower level.” Many factors contribute to increasing the odds of having a fall. Some are health based (intrinsic) risks including: neuropathy in the feet, weakness in the legs and core, poor flexibility especially in ankles/knees/hips, chronic illness, vision problems, rapid loss of blood pressure when changing positions, and some medications. Environmental (extrinsic) risk factors include: Loose rugs or uneven ground (tripping hazards), dogs pulling on a leash or being pushed (unexpected force in one direction), and icy conditions (slipping, low friction with the ground). All these factors contribute to a body experiencing an “unintentional change of position to a lower level.” But to answer the question, “why do we fall” requires a look at how our body reacts, or fails to react, to a specific set of circumstances.

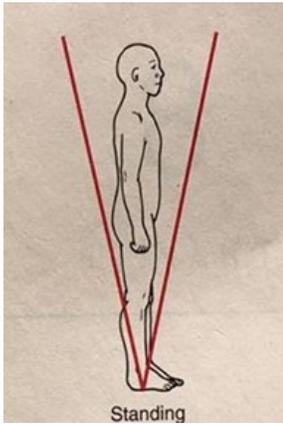
All objects have a center of mass. A cube’s center of mass is directly in the center of the cube. The human body’s center of mass is located in the middle of the body, about 2” below the belly button. All objects also have a “base of support.” As long as the center of mass stays over the base of support the object will not fall.



Here, both cubes have the same placement of their centers of mass. Obviously, the cube on the left has a much larger base of support, and is more stable, less likely to change positions. We too, are more stable on two feet vs. one foot, and in a wider stance vs. a narrow stance. Unlike a cube, humans can sway back and forth before losing balance. This is called our “limits of stability,” and occurs front to back and side to side. Our ankles, knees, hips, and trunk muscles allow us to stay upright in this range. It can easily be experienced by standing rigidly with feet together and rocking slowly front to back. When our center of mass moves quickly or unexpectedly outside of our limits of stability, we lose our balance. See how your body responds to rocking forward quickly.

Technically, walking and running are controlled falling events. Our center of mass moves forward, our opposite foot advances to “catch” us by widening out our base of support. Falling to the ground, is simply our inability to “catch” ourselves. This quick response to loss of balance is called a reactive step. Reactive stepping is like a reflex, a coordinated response that occurs without conscious thought. It is the body’s strategy to not hit the ground. We can also be at risk of falling if an obstacle impedes the advancement of that leg, as in tripping.

Studies have shown that as we age, we lose the ability to quickly accelerate the reactive stepping leg. In addition to this being a normal part of the aging process, individual risk factors may also contribute to having impaired reactive stepping. A very common risk factor is loss of ankle mobility and strength; as the ankle is one of the first areas that has to respond to a loss of balance.



Staying strong and flexible, and minimizing fall hazards around the home are some of the most effective ways to prevent falls. When we trip, the reacting leg has to move quickly and appropriately. Exercises to directly train this response can be helpful in preventing falls. It is important to train for recovering from a loss of balance as a part of fall prevention. We, in essence, have to practice falling. Of course, it is imperative to practice this in a safe space and with supervision if needed.

Here is a great way to test and train your reactive stepping at home or in the gym. To lean outside your limit of stability, hold on to a railing, or the kitchen sink, lean away with feet together (small lean at first), use another person as a solid spotter. Quickly let go of rail and see how your reactive stepping response works. Only try this if you already possess fairly good balance, and can perform it safely.



Sources: Reactive Stepping Behavior in Response to Forward Loss of Balance Predicts Future Falls in Community Dwelling Older Adults - CP Carty; NJ Cronin; D Nicholson; GA Lichwark; PM Mills; G Kerr; Andrew Cresswell; R Barrett. [Age and Ageing](#), Vol. 44, Issue 1; 1/15.

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