



Eli Einbinder, MD;
Tristan A. Horrom

Smart Walker: A tool for promoting mobility in elderly adults

Falls are a major concern for the elderly. Falls due to lack of stability exact not only a physical toll but also a financial toll on many elderly adults; healthcare costs from falls in elderly adults in the United States are estimated to reach \$32.4 billion per year by 2020 [1].

Walkers are an important assistive device for people who have difficulty walking unassisted, helping them maintain mobility and continue an active lifestyle. An inactive lifestyle can lead to weakened motor skills, which in turn can lead to injury [2], so it is imperative for elderly adults to stay active. Walkers provide stable support while users walk and may help them avoid falls by offering a structure to hold during a stumble or dizzy spell.

However, conventional walkers include some inherent problems. Some walkers require the user to lift and move the device forward as they walk. This action can make walking awkward and unnatural, may be difficult for users too unstable or too weak to lift the walker, and makes the user less stable while he or she is lifting the walker. Other walkers are equipped with wheels that allow for a more natural gait and do not require lifting, but they do make the walker less stable. Additionally, a wheeled walker may roll away from the user on an incline, rendering it useless. Wheeled walkers are often designed with hand brakes to address this problem. These hand brakes often resemble bicycle hand brakes, requiring the user to squeeze a handle to engage. While manual hand brakes give the user more control over the walker, a user with arthritis or other debilitating injury or illness may lack the strength or coordination to operate them effectively [3].

It is with these problems in mind that Dr. Eli Einbinder and Cornell University biomedical engineering faculty and graduate students designed the Smart Walker, a wheeled walker with an electronically controlled hand braking system. Working from Dr. Einbinder's patented designs for electronically controlled hand brakes for walkers and automatic passive braking that does not require a user to hold a handgrip [3], Cornell University biomedical engineering students directed by Dr. David Lipson developed the system that would become the Smart Walker. Those involved in the project created a product that would meet users' needs in cost, weight, and simplicity [4].

The Smart Walker is operated by a simple, highly sensitive button on each handgrip (**Figure 1**). The two buttons connect to a microprocessor that operates mechanical wheel brakes. When the walker is powered on, it begins in the braked position to provide a stable support for the user. To release the brakes, the user must simply grasp one or both of the handgrips and press the brake button one time. To engage the brakes, the user only needs to press one or both of the buttons again. If the user releases both handgrips, the walker



Figure 1.
Brake button on Smart Walker handgrip.

immediately brakes to minimize the chance of slips and injuries when the user grasps the handgrips again. This automatic braking also keeps the walker from rolling away when stopped on an incline; the walker stops when the user releases the handgrips. When the user resumes walking, all he or she must do is press a button while holding at least one handgrip to release the brakes. These handgrip buttons are the only ones on the walker, so learning to operate the Smart Walker should be easy and intuitive.*

This new walker design offers several benefits over traditional walkers. The Smart Walker's braking system offers increased stability and ease of operation. The single-touch button controls are ideal for users with reduced fine motor skills or hand strength, promising to dramatically reduce accidental falls among this user group. A user previously unable to walk with a conventional walker, because he or she lacks the strength or stability to lift a non-wheeled walker or the hand strength to operate hand

squeeze brakes, should be able to use the Smart Walker for mobility without incident.

By increasing the ease and safety of using a walker, the Smart Walker also has the potential to encourage a more active lifestyle in elderly adults with limited mobility (**Figure 2**). Physical activity has been shown to decrease the number of injuries in elderly adults by helping them maintain a higher overall fitness level, reducing the risk for chronic health conditions [5]. The increased mobility offered by the Smart Walker will also have a preventative psychiatric benefit; increased mobility for elderly adults can result in a decreased rate of depression and anxiety.

With the population of the United States that is 65 years or older expected to approach 80 million by



Figure 2.
Smart Walker in use.

*Demonstration video: <http://www.youtube.com/watch?v=X6z0HhZy0C8>

2050 [6], it is imperative that we continue to find ways to keep elderly adults active while still keeping them safe from falls. We believe that the Smart Walker will help achieve this goal by providing a safe and easy way for users to be mobile with the assistance they need.

Eli Einbinder, MD,¹ * Tristan A. Horrom²

¹Weill Cornell Medical College, New York, NY;

²*Journal of Rehabilitation Research and Development*, Department of Veterans Affairs, Baltimore, MD

* Email: DrEliEinbinder@aol.com

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