

# PAPER

## Personal Mobility

F. RASOULI, K.B. REED. *Crutch tip that provides assistive motion based on downward force*. *Gerontechnology* 2018;17(Suppl):97s; <https://doi.org/10.4017/gt.2018.17.s.095.00>

**Purpose** Walking with crutches requires significantly more energy than walking without a crutch, yet most of the recent research has only focused on making crutches more comfortable. Reducing the necessary energy expenditure allows crutches to be used for longer periods of time and users can walk longer distances. Traditional and other existing crutches and crutch tips are unable to alter crutch gait dynamics, and they cannot control the descent of a crutch user walking down a slope. **Method** The “Kinetic Crutch Tip” (KCT), also called the Moterum MTip, is a unique low-cost crutch tip that is able to passively and effectively assist crutch users during level and up-hill walking, while also enhancing control and balance during down-hill walking<sup>1,2,3</sup> (Figure 1). Even though there are many ways to use crutches, this crutch tip can improve walking characteristics for both short-term and long-term crutch users. Conventional crutch tips have a standard point or constant radius tip that cannot assist the user during walking; all forward progression forces must be generated by the user pushing themselves forward over the crutch. In contrast, this simple, yet highly effective, crutch tip uses a special kinetic shape<sup>4</sup> to predictably redirect the user’s downward force into a propulsive force that assists the individual in forward ambulation. This assistance is provided passively, so no motors or power supplies are required. The assistance force helps the individual use less energy while moving forward over level ground and when walking uphill. The crutch tip shape can be rotated to reverse the assistance force and provide a more controlled descent down a hill by reducing the user’s momentum. **Results & Discussion** Several sets of experiments showed that walking with this crutch tip resulted in a decrease in crutch walking energy and the reduction of crutch-ground impact impulse<sup>1,2,3</sup>. In addition, by interviewing more than one hundred individuals, insights were found to identify the target market and possible market need for such assistance. The main challenge of this project was in determining precisely what roll-over crutch tip shape should be used, and how the tip affects the gait dynamics and energy used.

### References

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**Conflict of Interest:** Kyle Reed has a patent (US 9,763,848) related to this work with a licensing agreement to Moterum Technologies. The University of South Florida also has a financial interest in Moterum Technologies. A management plan has been implemented and followed to reduce any effects of these conflicts of interest.

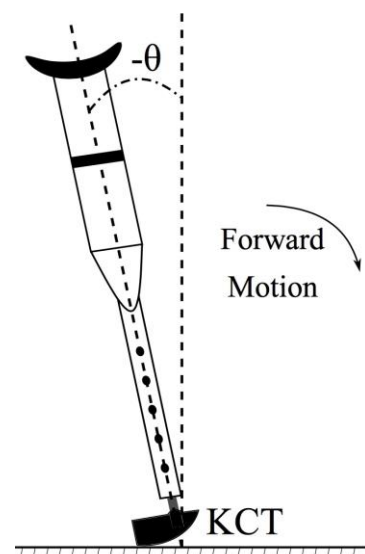


Figure 1. The Kinetic Crutch Tip (a.k.a. the Moterum MTip) is a crutch tip that redirects the user’s downward force into an assistive forward motion