

Erin Hanscom, OTS Samantha Lorenzetti, OTS Anne Qu, OTS Allison Tunick, OTS

Ithaca College, Occupational Therapy Department

Introduction

Americans are using mobility devices such as canes now more than ever. In the 2014-2015 National Health Survey, approximately 1 in 10 adults age 50 and older reported using a cane or walking stick (Centers for Disease Control and Prevention, 2016). While mobility devices, such as canes, are known to promote function for those that use them, there has been little research done to explore possible negative impacts of their use. Existing research indicates that chronic cane users are at an increased risk for developing wrist pain and conditions such as Carpal Tunnel Syndrome.

Objectives

1. Identify research problem
2. Review, critique and summarize literature
3. Identify research question
4. Based on findings, devise a methodology

Research Question

“To what extent does cane handling technique impact muscle activation in wrist flexors and extensors?”

Literature Review

Ample literature resources currently exist that support the use of canes for individuals with a variety of impairments and limitations. Studies conclude that canes and walking aids help to improve balance and walking ability in both functional activities and community mobility. There are, however, adverse consequences when it comes to the use of canes. These include decreased ability to maintain balance in certain circumstances, as well as significant strength and metabolic demands coming from their long term use (Bateni & Maki, 2005). Cane use can compromise the integrity of an individual's upper extremity and hand over an extended period of time by decreasing dexterity and sensorimotor function (Son, Kwon, Nam, Lee, Kim & Kim, 2012). Sustained postures and repetitive movements of the same joints and muscles occur during use of adaptive equipment (Mount, Howard, Dalla Palu, Grafstrom, Pinto & Rudy, 2001). Specialty molded handles can potentially help slow the progression of negative consequences (Löfkvist, Brattström, Geborek & Lidgren, 1988). Additionally, certain styles of cane handles can be more beneficial to supporting the maintenance of the integrity of the upper extremity and hand over time compared to others (Chiou-Tan, Magee & Krouskop, 1999).

Among the few studies that have been conducted regarding the consequences of cane use on upper extremity function, a variety of methodologies have been used. Some studies have used floor reaction force gauges to analyze operating point and load amount when using canes (Taniguchi & Takanishi, 2015). Others have used surface EMG electrodes to monitor voltage output of muscles during cane usage (Chiou-Tan, Magee & Krouskop, 1999). Few others used digital potentiometers, tracking tasks, and the nine-hole pegboard test (Son, Kwon, Nam, Lee, Kim & Kim, 2012).

Though the topic of detrimental effects of cane use on the upper extremity and hand function has been lightly noted, there is a clear gap in the literature about how it can affect the upper extremity. It can also be argued that there are simply not enough studies about this issue in general, while those that do exist are limited in sample size and scope. Further research on the impacts of cane use is necessary in order to identify solutions and adjustments to canes and cane use in a way that promotes the highest form of function possible for users, with the least negative physical impact.

Conclusion

Based on the information gathered from a literature review, the developing research question is, “To what extent does cane handling technique impact muscle activation in wrist flexors and extensors?” Next steps in the research process include devising a methodology consisting of participant criterion, methods for gaining data, materials needed, and the exact procedures being conducted in the study.



References

- Bateni, H., & Maki, B. E. (2005). Assistive devices for balance and mobility: Benefits, demands, and adverse consequences. *Archives of Physical Medicine and Rehabilitation*, 86(1), 134-145. <https://doi.org/10.1016/j.apmr.2004.04.023>
- Centers for Disease Control and Prevention (2016) *QuickStats: Use of equipment or assistance for getting around among persons aged ≥50 years*. Retrieved from: <https://www.cdc.gov/mmwr/volumes/65/wr/mm6549a7.htm>
- Chiou-Tan, F.Y., Magee, K.N., Krouskop, T.A. (1999). Comparison of upper limb muscle activity in four walking canes: a preliminary study. *Journal of Rehabilitation Research and Development* 36(2) 94-99.
- Löfkvist, U. B., Brattström, M., Geborek, P., & Lidgren, L. (1988). Individually adapted lightweight walking aids with moulded handles for patients with severely deforming chronic arthritis. *Scandinavian Journal of Rheumatology*, 17(3), 167-173. <https://doi.org/10.3109/03009748809098779>
- Mount, J., Howard, P. D., Dalla Palu, A. L., Grafstrom, A., Pinto, D. M., & Rudy, S. L. (2001). Postures and repetitive movements during use of a long cane by individuals with visual impairment. *Journal of Orthopaedic & Sports Physical Therapy*, 31(7), 375-383. <https://doi.org/10.2519/jospt.2001.31.7.375>
- Son, S.M., Kwon, J.W., Nam, S.H., Lee, N.K., Kim, K., Kim, C.S. (2012). Adverse effects of motor-related symptoms on the ipsilateral upper limb according to long-term cane usage. *NeuroRehabilitation* 31(2), 137-141. DOI: 10.3233/NRE-2012-0782
- Taniguchi, K., Takanishi, A. (2015). Design and evaluation of the walking cane handle grip. *International Journal of Automation and Smart Technology* 5(4) 203-207. DOI: 10.5875/ausmt.v5i3.927
- Werner, R., Waring, W., Davidoff, G. (1989). Risk factors for median mononeuropathy of the wrist in postpoliomyelitis patients. *Archives of Physical Medicine and Rehabilitation*, 70(6), 464-467.