The Impact of Walkers and Canes on Gait Dynamics and Muscle Activation
Written Reflective Critique

My capstone research project focused on answering the question “Is Gait Affected by Cane and Walker-Assisted Movement?” The goals of my research included: analyzing baseline walking movement, evaluating using EMGs placed on various locations, looking at GAIT mechanics and muscle activation, and gaining a better understanding of different walking patterns when canes and walkers are introduced. I referenced several articles to gain insight into what I might find on muscle activation and GAIT analytics. My findings included joint movements of the lower limbs showing an unloading at the joints and a general reduction in lower limb energetics, load relief given from upper limbs, it was predicted that elderly people that are walker dependent will have slower GAIT speed and shorter stride lengths, and vastus lateralis and soleus muscles will show a decrease in activity with walking-assistive devices.

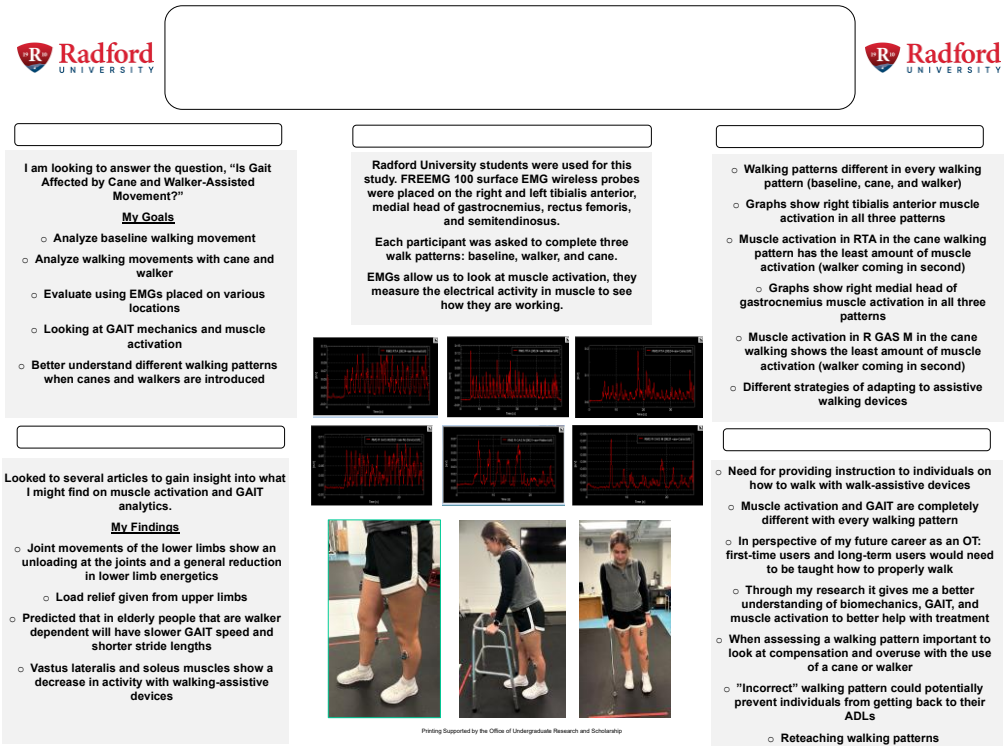
Some previous research compared GAIT characteristics in elderly people with knee pain and people that are walker dependent. A VICON system was used to look at GAIT analysis. The normal group and the knee pain group had faster GAIT speed and longer stride times and stride lengths than the walker group, the walker slowed them down. I took this into consideration when conducting my research. This data helped me predict that participants using a walker would have slower stride times and stride lengths. In another study leg muscles were looked at with assistive walking devices. The devices used were an axillary crutch and ED walker, they also used force plates in their study. They found that in vastus lateralis and soleus muscles both assistive devices allowed for about 50-65% reduction in electromyographic activity during non-weight bearing condition. Walking with assistive devices the muscle activation pattern varied with weight-bearing load. The leg extensor muscles appeared to show a greater reduction in muscle activity when compared to the flexors. I used data from this study to get background information so I could predict which muscles would be activated with assisted walking techniques.

I used Radford University students as participants in my study. FREEMG 100 surface EMG wireless probes were placed on right and left tibialis anterior, medial head of gastrocnemius, rectus femoris, and semitendinosus. Each participant was asked to complete three walk patterns including baseline, walker, and cane. The EMGs allowed us to analyze muscle activation by monitoring the electrical activity in the muscle.
Each walking pattern differed between baseline, cane, and walker-assisted devices.

My results showed different walking techniques during baseline, cane, and walker movements. There was a commonality in right tibialis activation in all three patterns. Muscle activation in right tibialis anterior in the cane walking pattern had the least amount of muscle activation and muscle activation in right gastrocnemius in the cane walking shows the least amount of muscle activation. The significant differences in walking patterns relays a need for a more in-depth description on how to effectively use walking

devices because muscle activation and GAIT are completely different with every walking pattern. I see the need for first-time and long-term walker and cane users to be taught how to walk with walking assistive devices as well as retaught when that device is no longer needed in the physical and occupational therapy field.

My research allowed me to achieve a better understanding of the biomechanics, GAIT, and muscle activation and their role in treatment. I was also able to pick up on some other key factors when assessing my participant's walking patterns including paying close attention to compensation and overuse with the use of a walking-assistive device. An "incorrect" walking pattern could potentially prevent individuals from getting back to their activities of daily living. Reteaching walking patterns is a necessary process for those using walking-assistive devices. With the addition of force plates being another component of my study we would be able to see the amount of bearing weight and stress placed upon the body on different areas of the foot and even weight bearing differences between legs and hips. I was not able to carry out my study on clients who were currently using walking-assistive devices or those who have used one in the past, this was a limitation in my research. With future studies on this topic and access to a wider range of participants and with the use of force plates I would be able to getter a more in-depth analysis of GAIT affected by walking-assistive devices.



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