Immobilization devices such as surgical shoes and CAM walkers are commonly prescribed by foot and ankle surgeons for a variety of lower extremity pathologies and during the post-operative period, but the potential to affect a patient’s ability to maintain a safe level of control over the accelerator and brake pedals while driving remains unclear. Tremblay et al found a significant delay in healthy volunteers’ brake response times when driving in CAM walkers and Aircast walkers, but were reluctant to draw any definitive conclusions about this delay’s potentially deleterious effect on driving safety [1]. Other investigators have published meaningful data for healthy and post-operative subjects comparing other driving outcomes measures including reaction times, applied pedal forces, and thinking times [2, 3, 4]. However, we are unaware of any investigation of driving outcomes in a surgical shoe nor any investigation studying a measure of inaccurate brake responses when the accelerator and brake pedals are depressed simultaneously. This is despite the fact that “pedal misapplication” has been identified as a major contributing factor for many automobile accidents [5].

The objective of this investigation was to assess three driving outcomes (mean emergency brake response time, frequency of abnormally delayed brake responses, and frequency of inaccurate brake responses) in a group of healthy participants under three variable footwear conditions (regular shoe gear, surgical shoe, and CAM walker). Participants performed ten trial runs in each of the three footwear conditions (regular shoe gear, surgical shoe, and CAM walker). Participants were able to adjust their seat position to ensure proper alignment and comfort, instructed on the use of the system, given a demonstration, and had an opportunity to practice multiple trial runs prior to initiation of the experiment. Participants were first asked to depress the accelerator pedal to constant speed as a driving scenario was displayed on the monitor. Then, at random intervals within a 10-second period, the software flashed a series of red light activation scenarios to depress the accelerator and brake pedals simultaneously and depress the brake pedal as fast as possible. The primary outcome measure of this investigation was considered the mean brake response time, defined as the time between red light activation and initiation of the brake pedal. Participants performed ten trial runs in each of the three footwear conditions, with elimination of the fastest and slowest time prior to data analysis.

Consistent with previous clinical setting [6-8], we calculated descriptive statistics (mean and standard deviation) and used a paired t-test to compare control and experimental group variables. For our primary outcome measure of frequency of abnormally slow brake response and frequency of inaccurate brake responses, we used the Fischer’s exact test.

The results of this investigation provide foot and ankle surgeons with a better understanding on how to appropriately advise their patients who have been prescribed a lower extremity immobilization device to safely operate an automobile. When compared to their regular shoe gear, the participants demonstrated significantly slower mean brake response times and more frequent “abnormally slow” brake responses while wearing the surgical shoe and the CAM walker. In fact, the frequency of the CAM walker trials that were considered to be “abnormally delayed” outnumbered the amount of safe response trials at 111 to 89. These represent two common forms of immobilization device prescribed by foot and ankle surgeons both in the post-operative recovery process and the treatment of other acute and chronic foot and ankle pathologies.

We have introduced a new outcome measure of “inaccurate” brake responses defined as inadvertent simultaneous depression of both the accelerator and brake pedals. This outcome may be particularly applicable as it speaks to a common cause of automobile accidents [5]. We found that this outcome measure occurred significantly more frequently while in the CAM walker compared to regular shoe gear and the surgical shoe. Although this investigation only included healthy participants without acute or chronic foot and ankle pathology, these results are relevant to this population as well. It is our hope that this data is utilized by foot and ankle surgeons in the education and consent of their patients with respect to the post-operative recovery process following surgical intervention, and is used in the development of future studies examining the effect of podiatric pathologies and intervention on automobile driving function.

References