



EFFECTS OF MACHINE-ASSISTED STRETCHING COMPARED TO AT-HOME STRETCHING ON PLANTAR PRESSURES IN A POPULATION WITH TIGHT ACHILLES TENDON

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INTRODUCTION

In 2010 there were about 200 amputations performed per day on patients with diabetes in the United States (National Diabetes Statistics Report, 2014). Previous research identifies one pathway leading to diabetic amputation: a decrease in dorsiflexion range of motion (DROM) will likely result in an increase in forefoot peak plantar pressures (FPPP), which in turn will increase the risk of ulceration and eventually amputation (Mueller et. al., 2003).

The current study attempted to seek a cost-effective (i.e. non-surgical) therapeutic intervention to increase DROM and potentially decrease FPPP and risk leading to ulceration in the diabetic population. We compared the effects of two ankle ROM interventions: a supervised motorized stretching and at-home stretching programs. We hypothesized that a 4 week routine using CCMASM will have better outcomes than unsupervised at-home routine in increasing DROM and secondarily decreasing FPPP. Diabetics were not used in this preliminary study, instead two healthy participants with tight Achilles tendons bilaterally were recruited to perform one stretching routine per leg and serve as their own control.

METHOD

Subjects:

Participant	Sex	Age (yr)	Body weight (lb)
1	M	23	170
2	F	24	115

Apparatus: F-Scan in shoe pressure mapping system and CCMASM. The CCMASM was also used as the stretching apparatus with graded torques through the study adjusted based on participants' tolerance.

Procedures: Sides were randomized. **Machine Assisted:** Three 25 minute stretching sessions (including rest time) per week for 4 weeks on ankle on selected side. **At-Home:** Same as Machine-Assisted in length and duration but on contralateral ankle and included separate gastrocnemius and soleus targeted stretches.

Data Analysis: Paired T-Test, F-Scan, and Data from the CCMASM at baseline and post-intervention.

RESULTS

At-home stretching resulted in a decrease in DROM for Participant 1 and an increase in DROM for Participant 2. There was an increase in FPPP for Participant 1 and a decrease in FPPP for Participant 2.

Machine-Assisted stretching resulted in an increase in DROM for Participant 1 and a decrease in DROM for Participant 2. There was an increase in FPPP for Participant 1 and a decrease in FPPP for Participant 2.

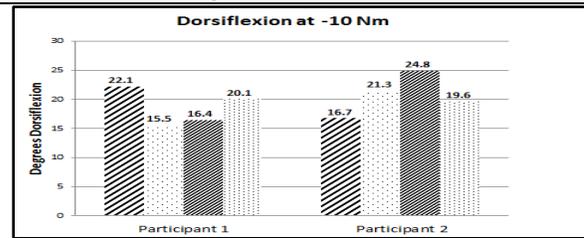


Figure 1: Striped bars = the At-Home DROM pre and post intervention while the dots = Machine Assisted DROM pre and post intervention. The less dense pattern = pre-intervention while more dense = post intervention.

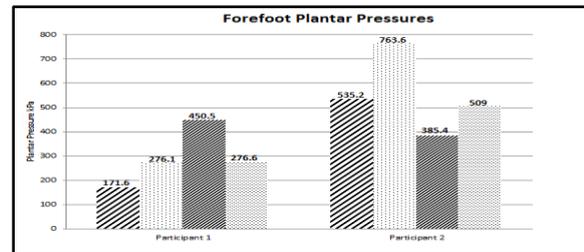


Figure 2: Striped bars = the At-Home FPPP pre and post intervention while the dots = Machine Assisted FPPP pre and post intervention. The less dense pattern = pre-intervention while more dense = post intervention.

DISCUSSION

At-home stretching: Participant 1 had a 25.9% decrease in DROM with 61.9% increase in FPPP. Participant 2 had a 32.6% increase in DROM and a 38.8% decrease in FPPP.

Participant 1 had results that supported the hypothesis because even with a 0.18% increase in FPPP it was smaller than his at-home routine. Participant 2 had inconsistent results.

Machine-Assisted: Participant 1 had a 23.2% increase in DROM with a 0.18% increase in FPPP. Participant 2 had a 7.9% decrease in DROM with a 50% decrease in FPPP.

CONCLUSION

Definitive conclusions could not be made, one participant supported the hypothesis while the other did not. A larger sample size is needed in future study.

CLINICAL APPLICATIONS

Finding effective non-surgical means of preventing ulcerations could prevent amputations and lower the healthcare expenses associated with them.

REFERENCES

- National Diabetes Statistics Report, 2014.
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