

A Comparison of Prostretch® Versus Incline Board Stretching on Active Ankle Dorsiflexion Range of Motion

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ABSTRACT

Stretching the gastrocnemius/soleus complex to increase ankle dorsiflexion range of motion is a common practice for almost all athletes. There is debatable evidence that increased flexibility can help prevent injuries, improve performance, and decrease muscle soreness. **PURPOSE:** The purpose of this study was to investigate whether calf stretching using a Prostretch® device is more effective than the more traditional method of using an incline board at increasing active ankle dorsiflexion range of motion. **METHODS:** Forty-five college-aged men and women not participating in collegiate athletics were recruited to participate in this study. Subjects' active dorsiflexion range of motion was measured bilaterally using a biplane goniometer. Three measurements were recorded on each ankle by an examiner. Fifteen subjects were then randomly assigned to each of three groups: Prostretch®, incline board, or control. Subjects in the Prostretch® and incline board groups completed a stretching protocol that involved three 30 second stretches per leg, four times per week for six weeks. Subjects in the control group performed no stretching for the entire six weeks. Upon completion of the study, the subjects' active ankle dorsiflexion was remeasured using the same protocol as the pre-test. **RESULTS:** A three-way mixed model ANOVA test showed no significant ($p \geq .05$) difference in pre and post active ankle dorsiflexion range of motion whether using a Prostretch® or an incline board. We also found no significant ($p \geq .05$) difference in pre and post active ankle dorsiflexion range of motion between the subjects in the control group and subjects in either stretching group. **CONCLUSIONS:** Stretching the calf with either a Prostretch® or an incline board is no more effective at increasing active ankle dorsiflexion range of motion than not stretching at all. It appears that no matter what device is used to stretch the calf, it is no more effective at increasing ankle dorsiflexion range of motion. One reason for this could be that we measured the subjects' active ankle dorsiflexion range of motion in a seated, non-weight bearing position while they stretched in a full weight bearing position. More testing is necessary to determine whether measuring range of motion in a functional position versus measuring range of motion in a non-functional position is a significant factor in altering the degree of range of motion an individual can achieve.

Key Words: range of motion, flexibility, gastrocnemius, dorsiflexion

INTRODUCTION

Ankle dorsiflexion and flexibility of the calf muscles are vital elements of normal functions including walking and sport activities. If the calf muscles are tight, ankle dorsiflexion is decreased and causes an altered gait pattern which may cause pain and decreased performance. Currently, it is accepted that increased flexibility can help prevent injuries, improve performance, and decrease muscle soreness.¹⁻³ However, traditional methods of stretching the calf muscle, such as a wall-stretch or manual stretch by a clinician may not be the best way to increase the range of motion of the ankle joint.

There are relatively few previous studies done involving the Prostretch® device. All previous studies have shown that using a Prostretch® device is beneficial in improving active ankle dorsiflexion when compared to more common calf stretching techniques.⁴⁻⁶ These studies serve as proof that the Prostretch® is an effective means of stretching the calf muscles, however none of the studies has compared the Prostretch® device to an incline board, a common stretching device found in many athletic training and other exercise facilities.

The purpose of this study was to compare the effectiveness of using a Prostretch® device to increase active ankle dorsiflexion by increasing the flexibility of the calf muscles compared to using an incline board for the same

purpose. We hypothesized that there would be a statistically significant difference in the amount of flexibility gained by using the Prostretch® compared to the incline board.

METHODS

SUBJECTS

This study was approved by the Institutional Review Board at the University of Wisconsin – La Crosse. Written consent was obtained from each participant prior to participating in the study via the signing of an informed consent form. The subjects were selected from a sample of college aged men and women who were not active in collegiate athletics. The subjects were chosen because they were easily available and represented a variety of fitness levels and were of the same age as collegiate athletes.

Subjects were divided into three groups, each consisting of fifteen people each. Group 1 was the control group and did not alter their activity levels or level of stretching from current levels for the length of the study. Group 2 was a group using the Prostretch® device to stretch their calves. Each person was instructed on proper stretching techniques and stretched both calves. Group 3 was assigned to use the incline board, which was constructed by the researchers to a fixed 22° incline. They stretched both calves according to the instructions provided for them.

STRETCHING PROGRAM INSTRUCTIONS

- *General Technique*

Group 1, the control group, did not perform any stretching and did not alter their current activity levels. Group 2 and Group 3 followed a stretching protocol where the subject stretched their calf for 30 seconds, followed by 30 seconds of rest. They repeated this sequence four times, then repeated the entire routine for the other leg. This is more commonly described as four sets of 30 seconds of stretching, performed bilaterally. Each subject performed the stretching protocol four times per week, at their convenience, for six weeks, for a total of 24 sessions.

- *Prostretch® Technique*

Group 2 performed the general stretching program using a Prostretch® device. The subjects were instructed on proper foot placement in the Prostretch® device and were instructed on proper stretching techniques. The subjects were instructed to balance on the Prostretch® device, placing no weight on the uninvolved leg, but were allowed to place their arms against a wall for support if needed. The subject then rocked their heel back towards the floor up to the point of maximum tension without pain in their calf (Figure 1). The subjects kept their knee straight throughout the stretch and held the stretch for 30 seconds. At the end of the 30 seconds, the subject rocked forward slowly, placed their uninvolved leg on the floor, and stepped out of the Prostretch® device.



Figure 1: Stretching using a Prostretch® device

- *Incline Board Technique*

Group 3 performed the general stretching program using an incline board. The subjects were instructed on proper foot placement and stance when using the incline board. The subject placed the incline board against a wall and stepped with one foot fully onto the board. The uninvolvement foot remained on the ground next to the board for balance. The subject then placed their hands on the wall for support and leaned forward until maximum tension without pain was felt in their calf (Figure 2). They held this position for 30 seconds before they pushed back off the wall, relieving the tension in their calf muscles, and stepped off the incline board.



Figure 2: Stretching on an incline board

FLEXIBILITY TESTING

Each subject, after signing the Informed Consent Form, met with the researchers for a fifteen minute session where the one of the researchers measured the subject's active ankle dorsiflexion. The angle of dorsiflexion was measured using a biplane goniometer (Figure 3). The biplane goniometer was chosen over a standard goniometer due to the full length base plate which helps keep the subject's foot in subtalar neutral. Each subject lay on their backs on a treatment table in room 10, Mitchell Hall (Athletic Training Room) and was asked to bring their toes toward their shin as far as they could and hold that position. One of the researchers then measured the angle between the shin and the foot using the biplane goniometer. This procedure was repeated for both ankles. The landmarks that were used for measurement were the head of the fibula proximally and the outermost projection of the lateral malleolus distally. This aligned the stationary arm of the goniometer along the course of the fibula and the base plate of the goniometer acted as the movement arm of the goniometer. This axis was measured and marked on each subject's ankle before measurements were taken. This standardized the measurement procedure so all subjects were measured with the same technique and data was consistent.

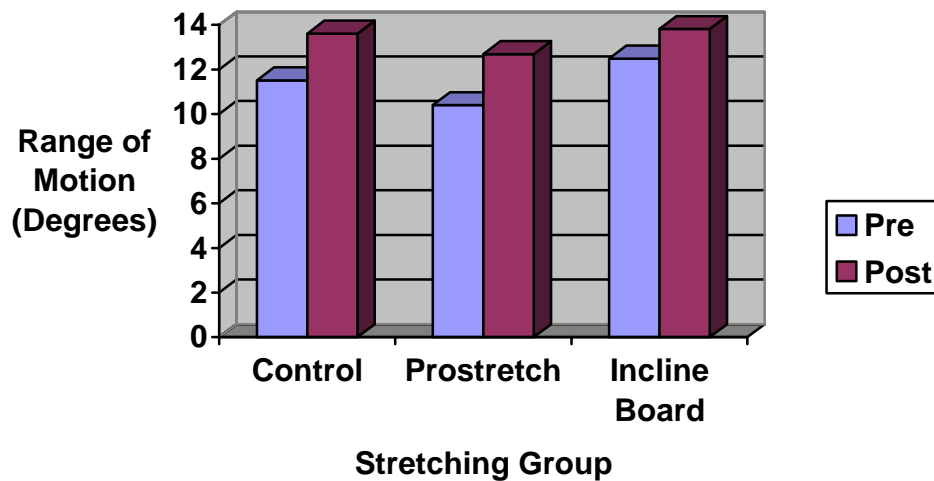


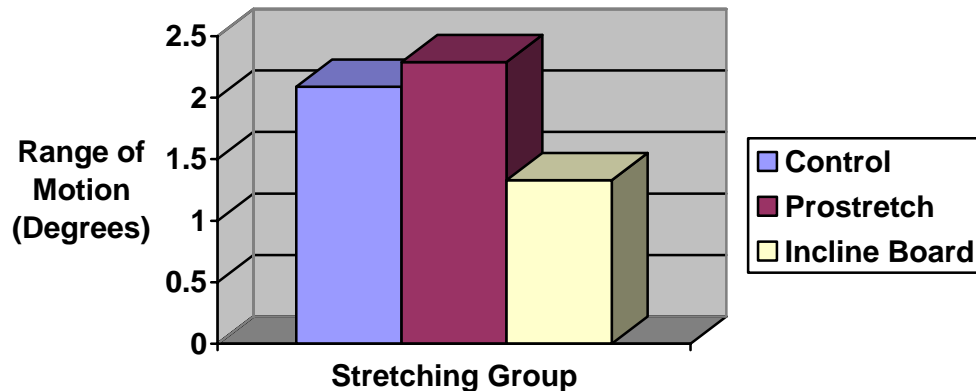
Figure 3: Measuring active dorsiflexion ROM using the biplane goniometer

RESULTS

A three-way mixed model ANOVA test showed no significant ($p \geq .05$) difference in pre and post active ankle dorsiflexion range of motion whether using a Prostretch® or an incline board. We also found no significant ($p \geq .05$) difference in pre and post active ankle dorsiflexion range of motion between the subjects in the control group and subjects in either stretching group (Graphs 1 and 2).

Graph 1: Mean Pre and Post Measurements for Each Stretching Group



Graph 2: Mean Difference in Pre and Post Measurements

DISCUSSION

From these data, we concluded that stretching the calf with either a Prostretch® or an incline board is no more effective at increasing active ankle dorsiflexion range of motion than not stretching at all. It appears that no matter what device is used to stretch the calf, it is no more effective at increasing ankle dorsiflexion range of motion.

These findings are inconsistent with all previous studies comparing the Prostretch® to other types of stretching.⁴⁻⁶

There are a number of reasons that our findings did not coincide with the other studies. One reason for this could be that we measured the subjects' active ankle dorsiflexion range of motion in a seated, non-weight bearing position while they stretched in a full weight bearing position. In talking with a number of the subjects, many of them stated that they felt like they were able to move their ankle through a larger range of motion when they were performing the stretch than when they were dorsiflexing for measurement. Another limitation that may have affected our findings is that we did not monitor the stretching activities of the subjects. At the end of the study, some of the subjects stated that they were active runners and felt in necessary to stretch before or after activity, including those in the control group. Obviously, this would have affected our data as someone in the control group who is stretching will affect the final measurements. Ideally, control group measurements should be virtually identical pre and post, and this was not the case in our study.

CONCLUSIONS

More testing is necessary to determine whether the Prostretch® device is more effective at increasing dorsiflexion range of motion than an incline board, but should be done under different settings. Future research should focus on determining whether measuring range of motion in a functional position versus measuring range of motion in a non-functional position is a significant factor in altering the degree of range of motion an individual can achieve. Furthermore, future research should explicitly state exactly what subjects in each of the stretching groups can and cannot do outside of the study. By following stricter guidelines and measuring range of motion in a more functional position, future research will be able to more accurately determine the true effectiveness of the Prostretch® device at increasing dorsiflexion range of motion when compared to an incline board.

ACKNOWLEDGEMENTS

The authors would like to thank the University of Wisconsin – La Crosse for funding this study through the undergraduate research grant program. We would also like to thank Medi-Dyne Health Care Products for helping provide the Prostretch® devices used during this study. We must also thank Mr. Frank Kuzma, the father of one of the researchers, for his assistance in constructing the incline boards to a standardized format. Additionally, we would like to thank Dr. John Porcari for his assistance in the statistical analysis of the data. Finally, we would like

to thank Mr. Scott T. Doberstein for his mentorship and assistance throughout this entire research project and throughout our undergraduate careers at the University of Wisconsin – La Crosse.

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