INVESTIGATION INTO THE EFFECT OF ANKLE BRACES ON RANGE OF MOTION AND PERONEUS LONGUS ACTIVITY

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INTRODUCTION

The protective benefit of ankle braces is thought to be provided by their ability to restrict range of motion (ROM) and possibly by influencing activity of the protective evertor muscles. However, these mechanisms have only been studied under static conditions with results showing that the effectiveness of braces is time-dependent.

AIMS & OBJECTIVES

This study aimed to assess the effect of different braces on inversion ROM, angular velocity and peroneus longus activity, during dynamic motion.

METHODS & MATERIALS

Subjects carried out multiple slalom trials to create lateral cutting movements (Figure 1A). Data was captured by a 12 Camera Vicon® Motion Analysis system at 100Hz and 2 Trigno Wireless EMG sensors at 1000Hz. Three braced conditions were tested: control, elastic (Ultimate Performance Compression; Figure 1B) and semi-rigid (Aircast A60®; Figure 1C). Data for 17 participants (age = 21.6 ± 2.0) were analysed, using a Custom Inversion Bodymodel, combined with manually defined events to isolate the duration of inversion.

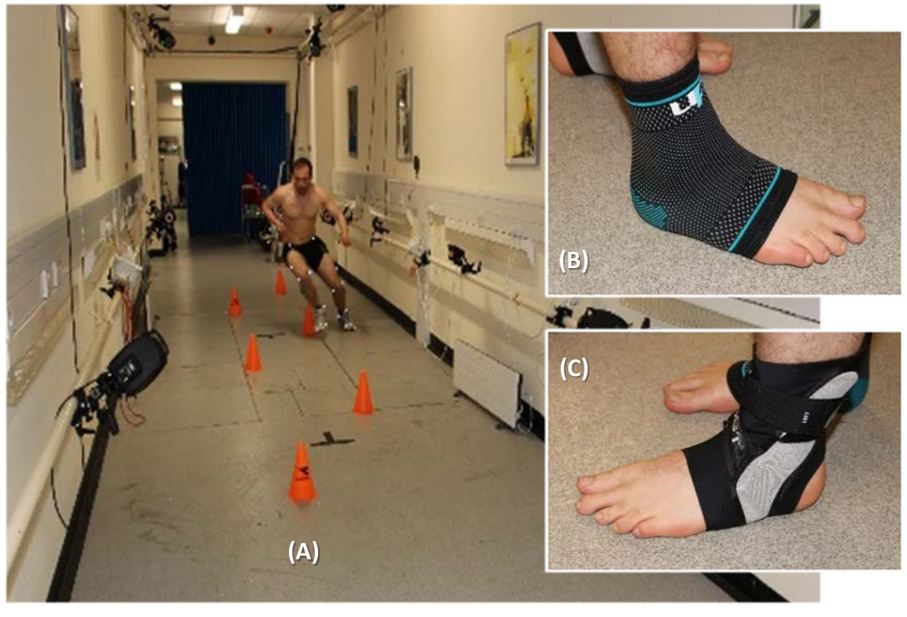

Figure 1. (A) Participant completing slalom course; (B) Ultimate performance elastic compression brace; (C) The Aircast A60 ankle brace.

RESULTS

Results showed a significant reduction in mean angular velocity (21%; p = 0.003) and ROM (16%; p = 0.009) during inversion for the semi-rigid brace (Figures 2 & 3). Reduction was also seen in the elastic brace, but not to a significant level. Neither ankle brace displayed a significant effect on maximum amplitude of the peroneus longus (Figure 4).

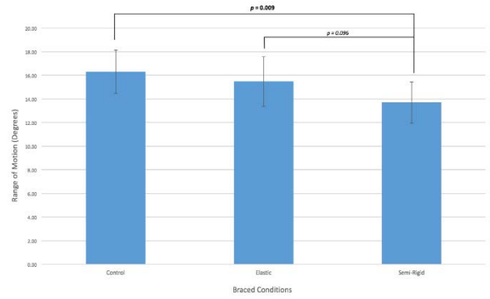

Figure 4. Comparison of mean ROM, in inversion, for different braced conditions.

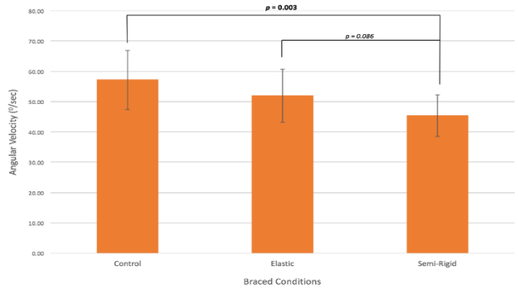

Figure 5. Comparison of mean angular velocity for different braced conditions.

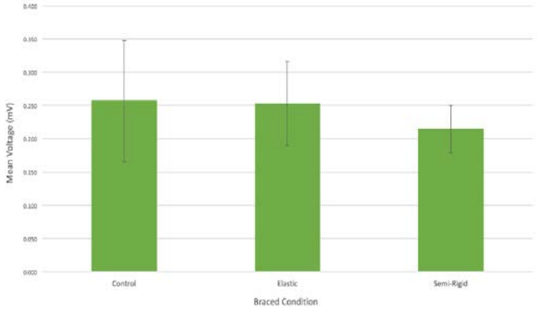

Figure 6. Comparison of mean peak voltage for different braced conditions.

DISCUSSION

Unfortunately, due to poor marker tracking, data could only be analysed for the non-dominant leg. This data is equally applicable to the dominant side, however, as numerous epidemiological studies[1] show no difference in injury incidence between the two legs.

This study found the semi-rigid brace to possess restrictive and force attenuating properties, during dynamic movement, therefore offering protection against inversion injury. It is suggested that the elastic brace may possess these properties, but further study is required before this can be confirmed.

Importantly, these results were demonstrated in a true dynamic environment, for which there is very little existing evidence. The dynamic nature makes it directly relatable to a sporting environment, especially a hard court surface which is the highest risk surface for lateral ankle sprain[2].

CONCLUSIONS

This study clearly displays the effectiveness of semi-rigid braces in the prevention of lateral ankle sprain. The elastic brace may also possess these same properties. Recommendations, which include improved motion analysis set up and increasing inversion angle, are proposed to help future studies elicit these results.

Considerable disagreement exists within the field on the effect of ankle braces on peroneus longus activity. This study provides additional evidence to those who suggest that ankle braces play no role[3], and importantly, delivers new insight due to the dynamic nature of the research.

ACKNOWLEDGEMENTS

The authors would like to thank Mr Sadiq Nasir and Mr Calum MacDonald for their invaluable assistance with data collection and also Mr Ian Christie for the high quality diagrams created for this project.

REFERENCES

[1] Beynnon *et* al. 2001. Ankle ligament injury risk factors: a prospective study of college athletes. J. Orthop. Res. Off. Publ. Orthop. Res. Soc; 19: 213–220.
[2] Doherty *et al.* 2014. The incidence and prevalence of ankle sprain injury: a systematic review and meta-analysis of prospective epidemiological studies. Sports Med. Auckl. NZ; 44: 123–140.
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Figure 1. Participant Completing Slalom Course

Subjects carried out multiple slalom trials to create lateral cutting movements. Data was captured by a 12 Camera Vicon® Motion Analysis system at 100Hz and 2 Trigno Wireless EMG sensors at 1000Hz. Three braced conditions were tested: control, elastic (Ultimate Performance Compression) and semi-rigid (Aircast A60®). Data for seventeen participants (age = 21.6 ± 2.0) was analysed, using a Custom Inversion Bodymodel, combined with manually defined events to isolate the duration of inversion.

Figure 2. Ultimate Performance Elastic Compression Brace

Figure 3 The Aircast A60 Ankle Brace

RESULTS

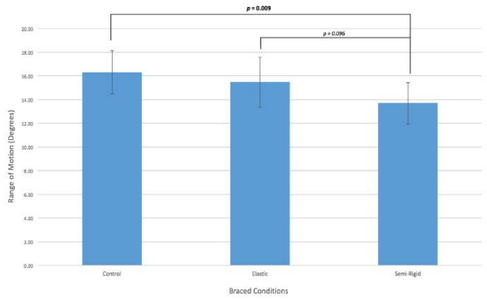

Figure 4.. Comparison of Mean Range of Motion, in Inversion, for Different Braced Conditions.

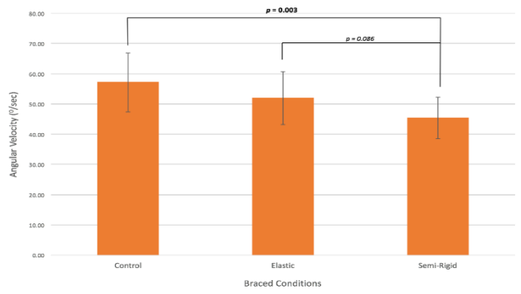

Figure 5. Comparison of the Mean Angular Velocity for Different Braced Conditions.

Results showed a significant reduction in mean angular velocity (21%; p = 0.003) and range of motion (16%; p = 0.009) during inversion for the semi-rigid brace (Figure 4 & 5). Reduction was also seen in the elastic brace, but not to a significant level. Neither ankle brace displayed a significant effect on maximum amplitude of the peroneus longus (Figure 6).

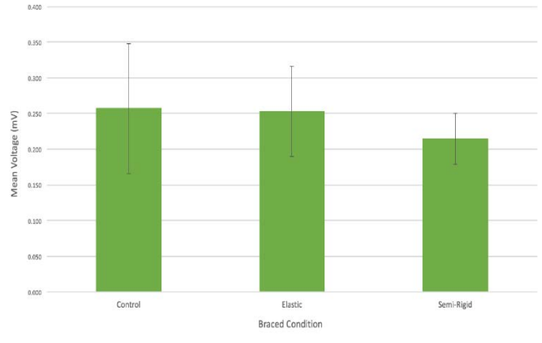

Figure 6. Comparison of the Mean Peak Voltage for Different Braced Conditions.

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If you would like to know more about this project, please scan the QR code. It will direct you towards a mobile friendly version..

ACKNOWLEDGEMENTS

I would like to thank Dr. Weije Wang for the invaluable statistical advice he provided and Mr. Ian Christie for the high quality diagrams he created for this project.

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