

THE INFLUENCE OF KNEE AND ANKLE BRACING ON LOWER EXTREMITY KINETICS AND KINEMATICS DURING JOGGING

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INTRODUCTION

There is substantial research on the effects of both ankle and knee braces on lower extremity kinetics and kinematics, when these braces are worn independently [1,2,3]. However, bracing of the knee and ankle simultaneously, for both prophylactic and rehabilitative purposes, is a common practice in athletics. While prophylactic bracing in athletes may be beneficial, some research has demonstrated potentially detrimental effects on lower extremity function. Of particular concern in this regard, are the effects that may be due to the combined use of ankle and knee braces. It has been speculated that the mobility limitations induced by multiple braces may create aberrant motion and forces at other joints that may result in injury. Therefore, the purpose of this investigation was to determine how ankle bracing alone, knee bracing alone, and ankle and knee bracing together affect lower extremity kinetics and kinematics during straight ahead jogging in healthy subjects.

METHODS

Eighteen subjects with no history of lower limb pathologies within the two years prior to this study participated in the investigation. Each of the subjects performed a series of jogging trials with each of four brace conditions (no brace (NB), ankle brace (AB), knee brace (KB), ankle and knee brace (ABKB)). An Ankle Stabilizing Orthosis (Medical Specialties Inc.) and the functional knee brace (dj Orthopaedics, LLC.) were fitted to each subject according to manufacturers' guidelines. The subject rode a stationary bike, at a comfortable self selected pace for 5 minutes to provide a period of accommodation to the braces prior to the jogging trials. Each subject was then required to complete five to seven trials of straight ahead jogging for each of the randomized bracing conditions. Gait data was collected using a six camera, 3-D HIRES video system, a gait analysis software package and two force platforms. This data was analyzed for each of the subject's trials to determine the affects of the different brace conditions on the individual's gait pattern.

RESULTS AND DISCUSSION

Average knee, ankle and hip joint angles for the NB, AB, KB and the ABKB groups were calculated and statistically compared at the point of peak knee moment (PKM). Figure 1 illustrates a statistically significant reduced knee joint angle at PKM in the KB and ABKB conditions compared to the NB condition. Results also revealed significantly reduced ankle joint plantarflexion ($p = .046$) at PKM in the AB trials and a significantly reduced hip flexion angle ($p = .034$) in the KB and ABKB trials.

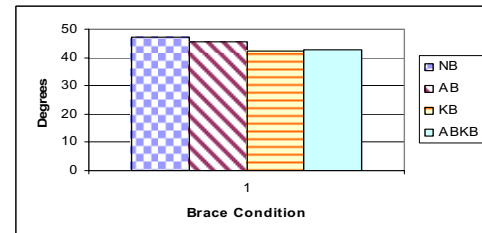


Figure 1: Left Knee Position at PKM. $p = .007$

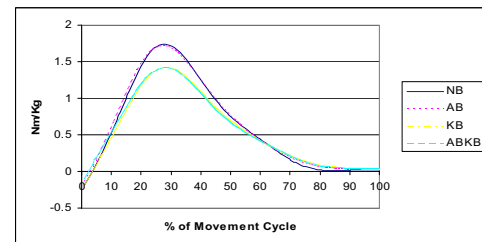


Figure 2: Left Knee Moments

Additionally, although not statistically significant, there were interesting trends in the joint moment data that illustrated a decreased knee extension moment in the KB and ABKB conditions (Figure 2). Additionally, there appeared to be a reduced ankle joint moment in the AB condition when compared to the other conditions. Finally, the ABKB condition appeared to evidence a slightly higher peak hip moment compared to the other conditions.

Previous studies have demonstrated a pattern of knee extensor torque adaptation during jogging, associated with FKB use, indicative of reduced stress on the ACL [1,2]. However no previous research has addressed the influence of simultaneous knee and ankle bracing on lower extremity function. It does appear from the current results that knee and ankle bracing may be protecting their respective joints, through a reduction in the moments. However these bracing conditions may be predisposing other areas of the body, specifically the hip and low back, to potential injury. With the rise in the use of prophylactic combined knee and ankle bracing in athletics, it is important for clinicians to be aware of these possible predisposing factors, even though the braces may be of some benefit in reducing injury.

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