MISLEADING COMMENTS ABOUT SHOE MIDSOLE MATERIALS DO NOT AFFECT REARFOOT KINEMATICS DURING WALKING

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INTRODUCTION
The literature suggests that gait kinematics may be altered in response to a different hardness in the shoe midsole. Expectancy theory indicates that an individual might modify personal activity to attain an expected outcome. The purpose of this study was to determine if investigator comments regarding shoe midsole materials influenced rearfoot motion during walking. Rearfoot motion was quantified as subjects walked in three pairs of shoes. One group of subjects was provided misleading information concerning midsole characteristics. Results indicate subjects, as a group, do not modify rearfoot kinematics in response to comments on shoe midsole hardness that do not match true midsole characteristics.

REVIEW AND THEORY
As the interface between the ground and the body, the shoe affects gait and the risk of acute injury or chronic pain (James et al, 1978). Much previous biomechanics research on shoe design has focused on impact force attenuation and rearfoot stability properties of the shoe, often with conflicting results. For instance, some results indicate greater impact forces in shoes with "soft" midsoles (Hennig et al, 1996; Milani et al, 1997) while in theory a softer compliant midsole should absorb more shock. To explain these unexpected results, it was suggested that subjects adjust kinematics based on expected impact (Frederick, 1986; Lees, 1988). Typically in shoe research, subject blinding with regards to varied shoe characteristics is not emphasized. According to the expectancy theory, an individual might modify personal activity to attain an expected outcome (Kirsch, 1985). Thus, if a subject is cognizant of wearing an experimental midsole, gait mechanics might be altered to attain the expected impact. Expectation of cushioning during impact may therefore prompt an individual to instinctively change joint kinematics (Robbins & Waked, 1997). The purpose of this study was to determine if investigator comments regarding shoe midsole materials influenced rearfoot motion during walking.

PROCEDURES
Seventeen college-aged females, healthy and free of injury, volunteered and provided informed consent. Each was randomly assigned to one of two groups. Data were collected while subjects completed 10 walking trials in 3 pairs of shoes (S). Members of Group 1 (n = 9) were intentionally misled to believe that the intent was to test the effectiveness of an "advanced cushioning material" used in the midsole of S2. In reality, S2 and S3 were constructed the same but differed only in midsole color; the midsole of S1 was actually softer either S2 or S3, but was similar in color to S3. Members of Group 2 (n = 8) served as a control and received no shoe information. The study was conducted using a double blind design, as the investigators were unaware of actual shoe differences until testing was completed. Reflective markers were secured on standard positions (Nigg, 1986) on the right lower extremity to measure multiple 2D rearfoot motion parameters from video records (120Hz) of the 10 walking trials. Following each shoe condition, subjects rated perceived
cushioning and stability in each shoe using a scale (Hennig et al, 1996). The 10 trial mean values for each of the rearfoot variables, along with ratings of perceived cushioning and stability, were analyzed using a 2x3 mixed factors ANOVA ($\alpha = 0.05$).

**RESULTS and DISCUSSION**

The statistical analysis of rearfoot motion during walking exhibited no significant group by shoe interaction and no significant between group differences for any of the dependent variables measured. Thus, investigator comments did not cause differences in rearfoot motion between the misled and control groups, as similarly reported for ground reaction forces (McCaw et al, 2000). There were, however, significant differences in touchdown angle (Figure 1a), maximum pronation angle (Figure 1b), and the rating of perceived cushioning among the three shoe conditions. The results from the rearfoot variables were generally consistent with the literature indicating a softer shoe tends to allow greater rearfoot movement (DeWit et al, 1995; Nigg, 1986). In conclusion, the results indicate that, as a group, rearfoot motion measures and ratings of perceived shoe cushioning and stability are not influenced by investigator comments regarding midsole materials.

![Figure 1](image_url)

**REFERENCES**


**ACKNOWLEDGMENTS**

Supported by an ACSM Visiting Scholar Award and an ISU Research Grant.