Effects of Different Footwear on Landing Forces from a Grand Jeté in Trained Dancers

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Introduction

The Grand Jeté movement is a popular leap elevation movement used in ballet, modern, contemporary and jazz dance. The move involves taking off from one foot and landing on the other foot reaching the highest point possible in the air and lifting legs to a split position. Dancers may perform many grand jetés in a single routine, and consequently experience repeated landing impacts. Appropriate dance footwear has the potential to reduce the force of impact on landing. Previous research into footwear has found that certain types of footwear have the potential to reduce injury (Lafortune & Hennig, 1992). Research in this area could potentially assist dancers, schools and private organisations in deciding whether to advise pupils to wear certain shoes for dance instead of bare feet.

Purpose

The purpose of this study was to investigate if footwear used by dancers can reduce the vertical impact forces caused by landing from high leaps.

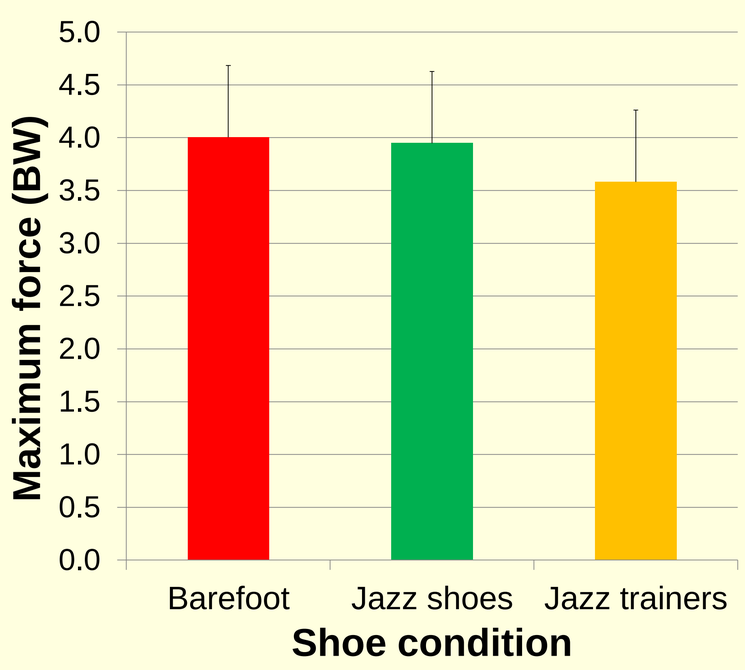
Methods

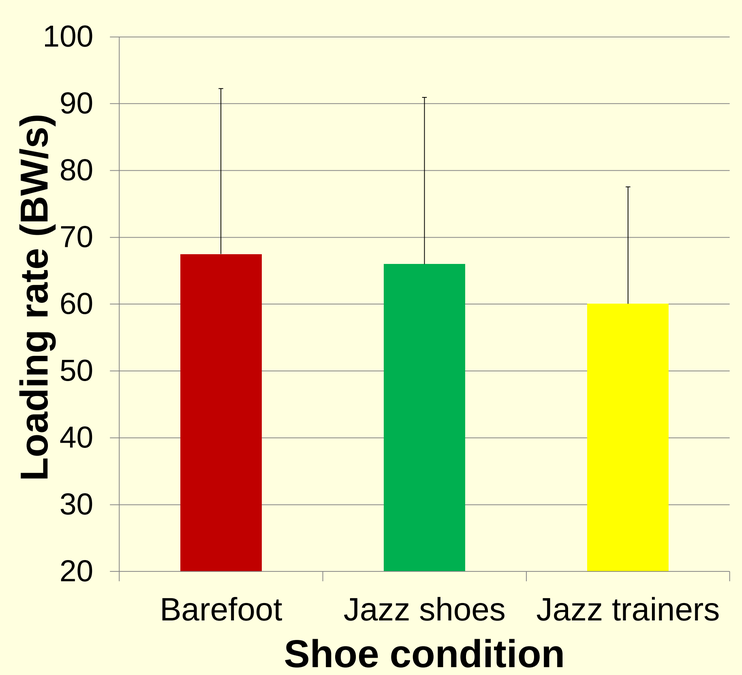
The study was approved by the University's ethics committee and informed consent was given by ten highly-trained female dancers (Age mean 23.1, *s* = 1.6 years; stature 1.64, *s* = .08 m; mass 57.7, *s* = 5.2 kg). Following test familiarisation, the participants all performed a grand jeté in three different footwear conditions: bare feet, Katz Split-Sole Jazz Shoes and Bloch Boost DRT 1 Mesh Split-Sole Dance Trainers with shock absorbing properties. The order of testing was randomised. Landing forces were recorded using a Kistler force plate (600 mm x 400 mm) sampling at 1000 Hz. Peak impact force was determined as the maximum vertical force occurring during the first 0.07 s of contact. Statistical analysis consisted of repeated measures ANOVA with post hoc pairwise comparisons using Bonferroni adjustments.

Figure 1. Katz Split-Sole Jazz Shoes (left) and Bloch Boost DRT 1 Mesh Split-Sole Dance Trainers

Results

Maximum force during the landing phase decreased from 4.00 BW (± 0.72) in the barefoot condition to 3.95 BW (± 0.69) in the jazz shoes condition and 3.58 BW (± 0.68) in the trainers condition ($F_{2,9}$ = 2.5 , P = .108, eta^2 = .22, power = .44). Higher impact peak and loading rate values were found in the barefoot condition compared with the shod conditions, with the trainers showing the lowest values. However there were no significant differences between the footwear conditions for impact peak force ($F_{2,9}$ = 0.50, P = .616, eta^2 = .05, power = .12), time to peak impact force ($F_{2,9}$ = 0.44 , P = .653, eta^2 = .05, power = .11), or loading rate to the point of maximum vertical force ($F_{2,9}$ = 0.53 , P = .597, eta^2 = .06, power = .12).





Discussion

The results showed lower maximum landing forces, impact peak force, and loading rates in the dance trainers compared with the barefoot and jazz shoes conditions. Although the values were not significantly different, the small difference between footwear conditions may prove important with the onset of fatigue during a routine. Dancers may adopt different landing techniques when wearing non-protective footwear (or when barefoot) to reduce impact forces, and indeed they should train to develop these safe landing techniques when performing barefooted.

References

Lafortune, M. & Hennig, E. (1992) *Clinical Biomechanics*, 7, pp.181-184