

Foot Strike Patterns of Division III Female Cross Country Runners: Comparison Of Three Footwear Conditions

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Introduction

- Many collegiate cross country runners practice in standard running shoes, but compete in track spikes.
- Different types of footwear may produce different foot strike patterns and different foot strike patterns have been associated with different types of running injuries.^{1,2,3}

Purpose

- The purpose of this study was to examine the foot strike patterns of female cross country runners while running shod, with track spikes, and barefoot.

Methods

- Eleven Division III female Cross Country runners consented to participate.
- The subjects ran at a self-determined "race pace" around a 200 meter indoor track in three footwear conditions: with traditional running shoes, with track spikes, and barefoot.
- The subjects were videotaped from the waist down.
- Two to three foot strikes were recorded per participant.
- The order of footwear conditions was counterbalanced.
- Video images were analyzed using Dartfish software to determine the foot strike per trial.
- Foot strikes were classified as 3 = hindfoot, 2 = midfoot, and 1 = forefoot.

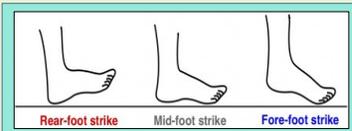


Figure 1. Illustration of progressive foot strike patterns.⁴

Results

Table 1. Foot strike data from testing athletes in three different footwear conditions ($n = 11$).

	Forefoot Strike (1)	Midfoot Strike (2)	Hindfoot Strike (3)
Shod	0 (0%)	1 (9%)	10 (91%)
Spikes	2 (18%)	3 (27%)	6 (55%)
Barefoot	2 (18%)	4 (36%)	5 (46%)

Friedman's test revealed a significant difference between the three groups [$\chi^2 (2, N = 11) = 8.00, p = .018$]

Table 2. Mean rank of foot strike for the three footwear conditions determined by the Friedman's test ($n = 11$).

	Mean Rank
Shod	2.45
Spikes	1.91
Barefoot	1.64

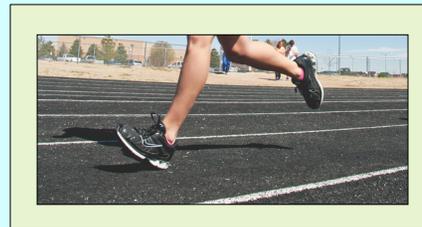


Figure 2: Foot strike on track⁵

Conclusion

- The three footwear conditions resulted in significantly different foot strike patterns during race-pace running of Division III female cross country runners. This finding may have practical implications for athletes, coaches, and athletic trainers as they consider specificity of training and risk factors associated with running injuries.

Future Research

- Future researchers could investigate the most effective footwear for training, competition and foot type based on the strike associated with the footwear.
- Researchers could also analyze the growing trend of forefoot strike due to popular minimalist shoes.

References

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Discussion

- Findings are consistent with the previous studies in which running shod is associated with hindfoot strike and running barefoot is associated with forefoot strike.^{1,2,3}
- This study is unique from previous studies because not only does it look at shod and barefoot running, but also running in spikes.
- According to the Friedman's test, the mean of running in spikes was closer to the forefoot strike than the hindfoot strike which implies that running in minimal footwear, specifically running spikes, results in a midfoot or forefoot strike.

Implications

- Due to the "principle of specificity" which states that in order for training to be effective, it must be relevant and specific to the activity, it may be beneficial for athletes to practice with the same footwear as they compete with so as to train specific muscles related to the foot strike.⁶
- It is important to note that consistently using the same type of footwear will make a runner more prone to overuse injuries associated with the corresponding foot strike.
- Changing footwear may help prevent injury by providing a cross-training effect due to the potential change in foot strike pattern.

Acknowledgments

We would like to thank the College of St. Benedict Cross Country Team for their participation in our study.