Studded and Bladed Football Boots: which one to trust?

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Introduction

Football is one of the most popular team sports in the world. Equipment manufacturers are continuously trying to improve and modify the equipment to enhance players' abilities and performance. One such advance was introduction of chevron shaped 'blades' to replace the traditional 'studs' in football boots. This has caused considerable controversy due to higher and more serious injuries reported with blades, and many international authorities are asking for a ban on this type of football boot design[1].

Study Aims

Our study aims to objectively assess the biomechanical effects of studded and bladed Nike® football boots by measuring the in-shoe plantar pressures to evaluate whether one cleat design offers an advantage compared to the other, and more importantly, if either can be potentially harmful.

Study Objectives

- Two boots from same brand (Nike®): Studs and Blades, in a range of sizes
- The boots will be compared using the Pedar®-X in-shoe foot pressure measurement system
- Players will be asked to perform three common football tasks, *viz.:* walking, straight running and cutting manoeuvres (slalom).

Methods and Materials

Ethical approval was obtained. A total of 18 healthy, male football players participated as volunteers for this study. Nike® shoes (Figure 1) chosen for this study were Nike® Tiempo Legend IV (studs) (left) and Nike® T90 (blades) (right).

Figure 1. (Left) Nike® Tiempo Legend IV; (Right) Nike® T90

Inclusion criteria were age between 18 and 45, UK shoe size between 8 and 10, and regular participation in football.

Exclusion criteria were any injury or surgery to lower limbs or back.

The IMAR Mask (Figure 2) was designed by Putti *et al.* (2007)[2], and was modified by Bentley *et al.* (2011)[3] for Phase 1 of this study. The same mask was used for this study. The clinically relevant areas were identified and labelled as follows:

- Heel: lateral (M1); medial (M2)
- Lateral midfoot (M3)
- Heads of first, second, third, fourth and fifth metatarsals (M4-8)
- Hallux (M9), second digit (M10) and lesser digits (M11)

The masks for right foot were labelled from M12 to M22 in the same sequence. Velocity of the subjects was measured using Vicon® motion analysis system. Test track of artificial turf was used for data collection (Figure 3).

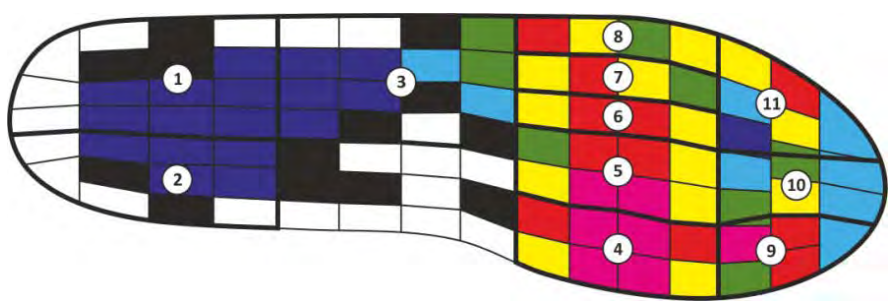

Figure 2. The IMAR Mask

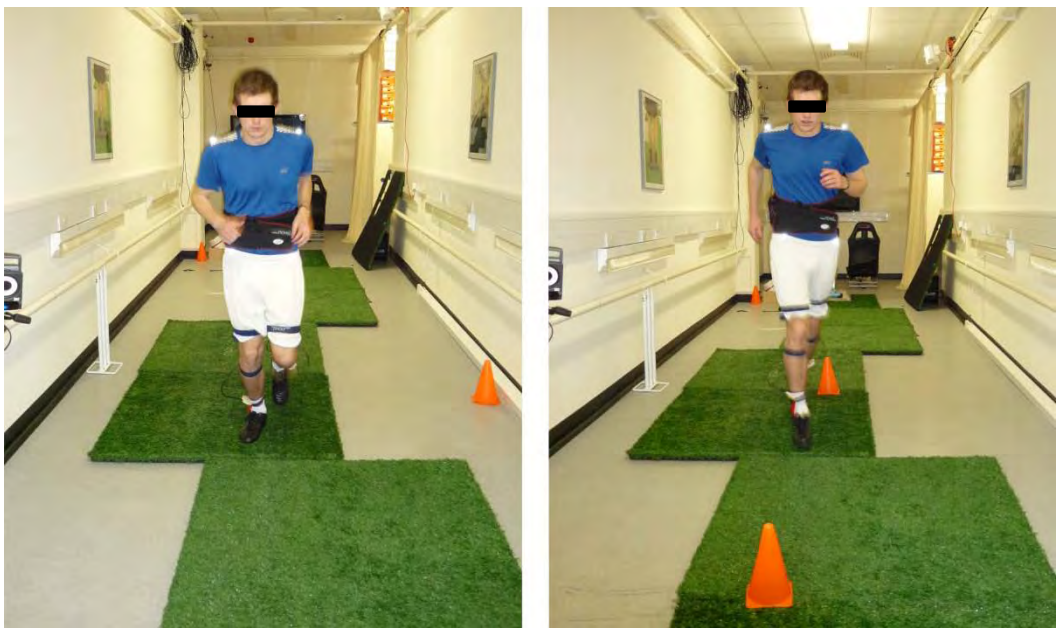

Figure 3. Test track of artificial turf. (Left) Straight trials; (Right) Slalom trials

The Parameters Analysed

Most IMAR studies, and indeed the Phase 1 study as well, evaluated the six most clinically relevant parameters, which are:

- Contact area
- Force-time integral
- Peak pressure
- Contact time
- Instant of peak pressure
- Pressure-time integral

Results

The results suggest that with blades, there is a higher incidence of peak pressure (PP) (Figure 4) over lateral midfoot and lesser metatarsals. The bladed boots also recorded consistently higher force-time integral (FTI) values over lateral midfoot and lesser metatarsals, and higher pressure-time integral (PTI) values (Figure 5) over the heads of lesser metatarsals in all the trials. The mean instant of peak pressure (IPP) values were higher and statistically significant for blades over head of first metatarsal and toes.

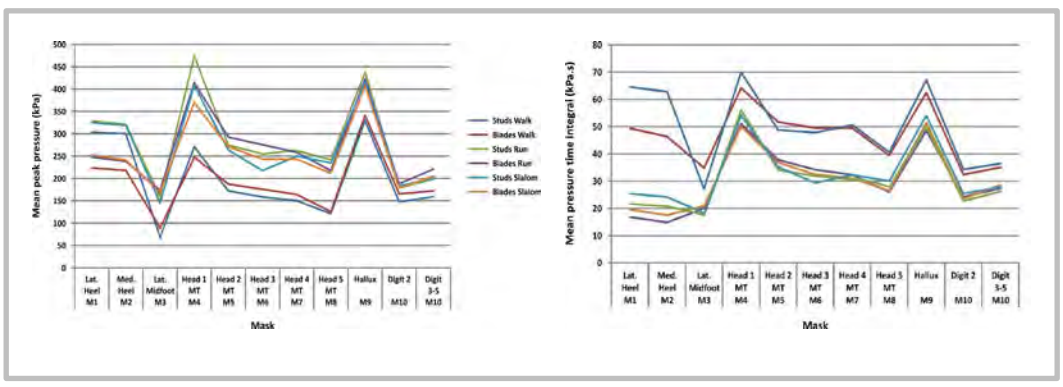

Figure 4. Mean Peak Pressure versus Mask | Figure 5. Mean Pressure-time Integral versus Mask

Discussion

Higher peak pressures (PP) can precipitate more acute injuries, and higher pressure-time integrals (PTI) and force-time integrals (FTI) can precipitate more fatigue injuries. The pattern of plantar pressures with bladed football boots shows unnatural and higher loading patterns over the sole of foot, especially over lateral midfoot and lesser metatarsals. This suggests that blades can possibly precipitate more injuries over these areas. This is a particular claim made by people who call for a ban on bladed football boots.

Conclusion

The results support the outcome of Phase 1[3] study and suggest that bladed football boots may predispose players to unnatural loading and higher plantar pressures, with resultant risk of stress fractures of the lateral midfoot and lesser metatarsals. This suggests that the bladed football boots may potentially be harmful.

REFERENCES

1. BBC News 2005; Mirror News 2005; The Northern Echo 2008
2. Putti AB, Arnold GP, Cochrane L, Abboud RJ (2007). The Pedar® in-shoe system: Repeatability and normal pressure values. Gait & Posture; 25 (3): 401-405.
3. Bentley JA, Ramanathan AK, Arnold GP, Wang W, Abboud RJ (2011). Harmful cleats of football boots: a biomechanical evaluation. Foot & Ankle Surgery; 17: 140-144.

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