Penn State's

Center for
Sports Surface Research

2014 World Cup Footwear – Traction Comparison

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2014 World Cup Shoes – Traction Comparison

As an athlete accelerates, stops, and changes direction, numerous forces are transmitted to the lower extremities. The interaction between an athlete's shoe and the playing surface has been indicated as a factor in lower extremity injury risk. In particular, high rotational forces may result in increased injuries to the lower extremities due to the foot becoming "entrapped" in the playing surface during pivoting movements (Torg et al., 1974).

Rotational traction levels of seven popular shoes used by players competing in the 2014 World Cup were tested using Pennfoot (McNitt et al., 1997; Fig. 1). Pennfoot is a portable device consisting of a framed steel leg-foot assembly which measures traction via hydraulic-induced movement of a foot placed on the test surface in a forefoot stance. The amount of force required to rotate the shoe 45 degrees was measured and peak values are shown in this report.

Rotational traction measured with mechanical devices such as Pennfoot allow for comparisons among shoe-types and playing surfaces; however, 'safe' and 'unsafe' traction levels have not been established in the scientific community, as this type of data has not been directly correlated with injury risk. Although researchers have yet to establish 'safe' threshold levels, it is generally accepted that low levels of rotational traction are desired over high levels from a lower extremity injury risk standpoint (Lambson et al., 1996). However, if traction is too low, playability may be reduced as athletes may be prone to slipping, thus increasing potential for other types of injuries.

Each shoe was tested on FieldTurf Revolution and Kentucky bluegrass (*Poa Pratensis*). The FieldTurf Revolution test plot included a sand-rubber infill combination installed into 2.5 inch fibers. The test plot of Kentucky bluegrass was grown on a sand-based rootzone and included the following cultivars: 30% Everest, 30% Botique, 30% P105, and 10% Bewitched. The mowing height was 1.25 inches and the plot contained 100% turf coverage. The volumetric soil water content at the time of testing was 25.1%.

Figure 1. Pennfoot traction testing device

Rotational traction was measured with the shoes shown below

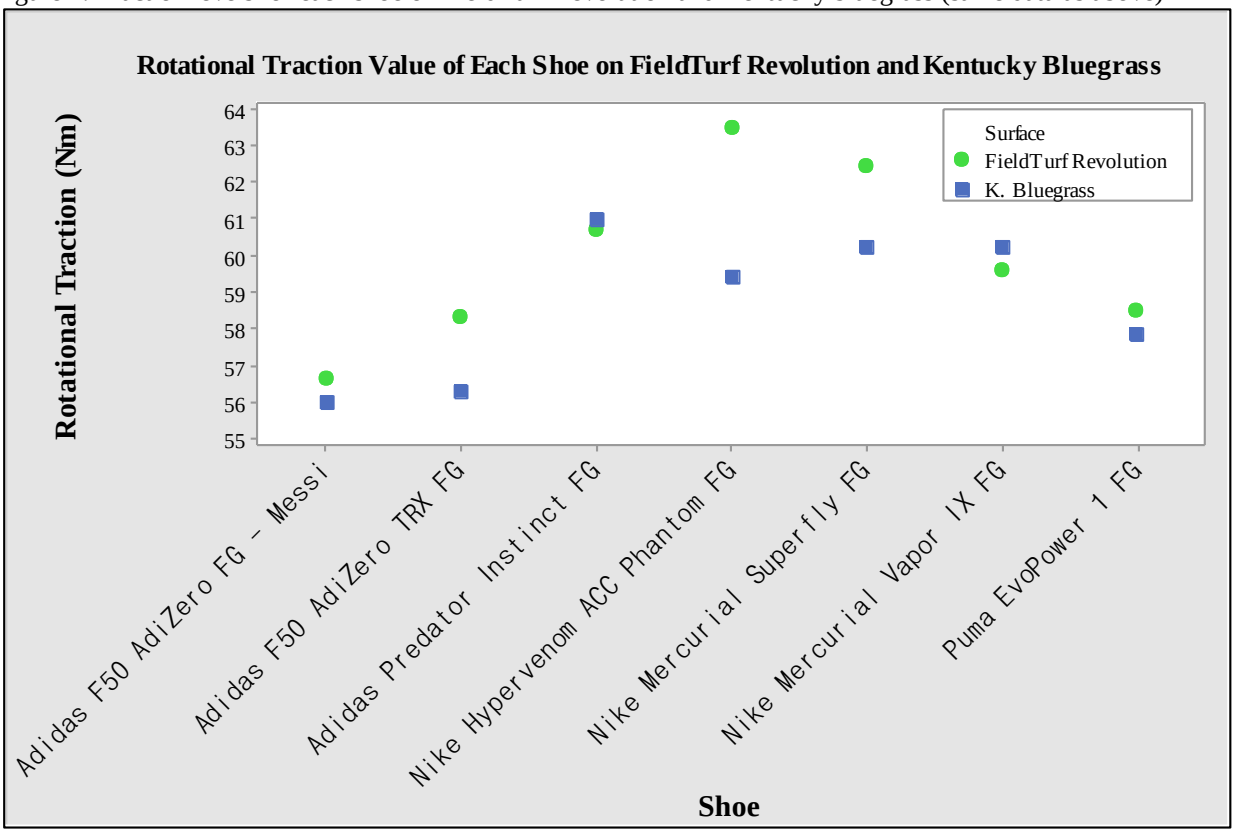
Results

Overall, rotational traction levels among shoes were similar on both FieldTurf Revolution and Kentucky bluegrass (Table 1 and Fig. 2). The range in rotational traction values for shoes on FieldTurf Revolution was 56.6 to 63.5 Nm. On Kentucky bluegrass, traction levels ranged from 55.9 to 61.0 Nm. These traction values are slightly below the average traction level of 30 shoes recently tested at Penn State's Center for Sports Surface Research. The database containing the traction values of 30 shoes on both natural and synthetic turf is available under the "Traction Database" section of our website (ssrc.psu.edu).

Table 1. Traction levels for each shoe on FieldTurf Revolution and Kentucky bluegrass

Shoe	FieldTurf Revolution	K. Bluegrass
	----------Rotational Traction (Nm)----------	
Nike Mercurial Superfly FG	62.4	60.2
Nike Mercurial Vapor IX FG	59.6	60.2
Nike Hypervenom ACC Phantom FG	63.5	59.4
Adidas F50 AdiZero FG - Messi	56.6	55.9
Adidas Predator Instinct FG	60.7	61.0
Adidas F50 AdiZero TRX FG	58.3	56.3
Puma EvoPower 1 FG	58.5	57.8

Figure 2. Traction levels for each shoe on FieldTurf Revolution and Kentucky bluegrass (same data as above)



References

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