Penn State's

Center for
Sports Surface Research

Rugby Footwear – Traction Comparison

July 2014

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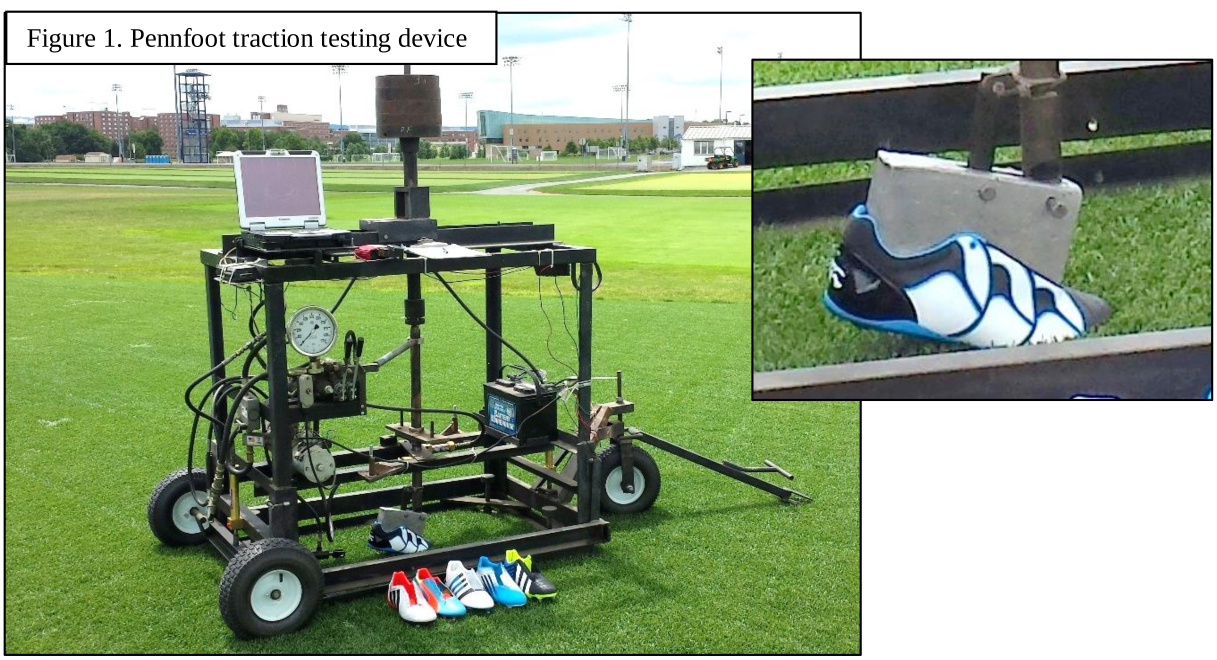
As an athlete accelerates, stops, and changes direction, numerous forces are transmitted to the lower extremities. The interaction between an athlete's shoe and the playing surface has been indicated as a factor in lower extremity injury risk. In particular, high rotational forces may result in increased 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 six popular rugby shoes 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 25.5%.

Figure 1. Pennfoot traction testing device



Rotational traction was measured with the shoes shown below

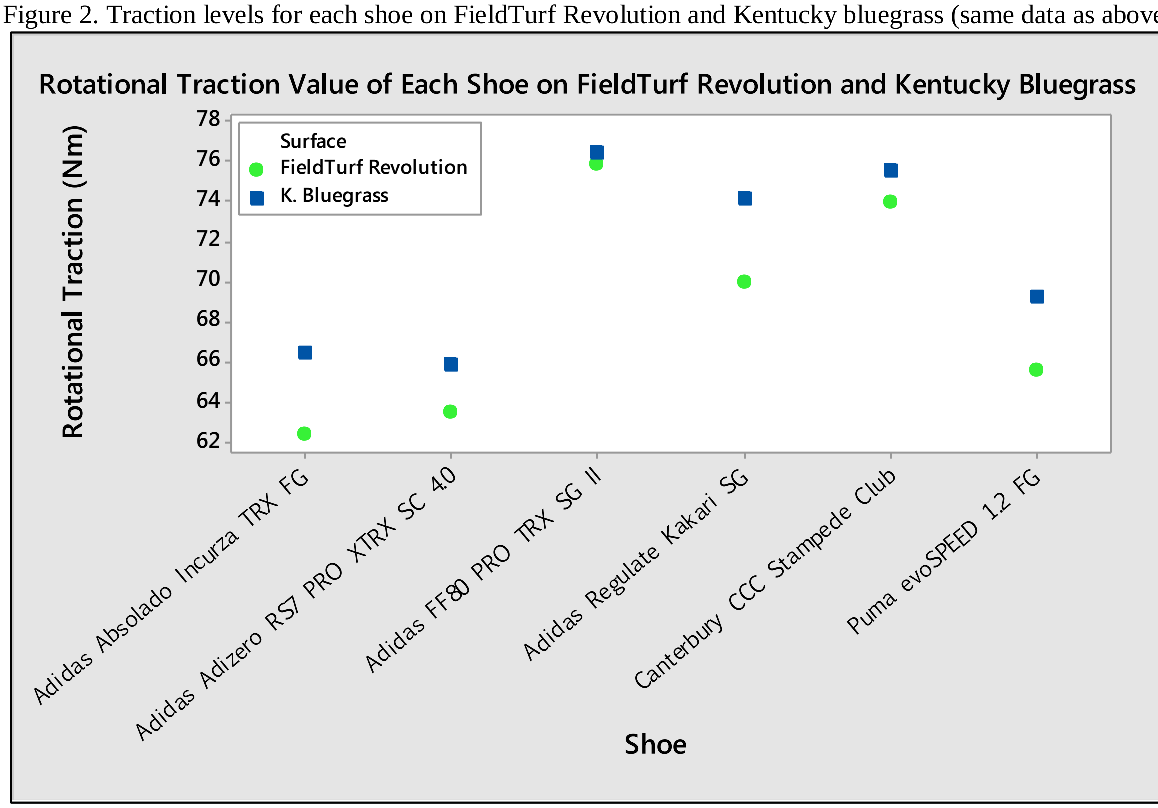
Results

Overall, rotational traction levels among shoes were generally similar on both FieldTurf Revolution and Kentucky bluegrass with slightly lower values on FieldTurf for most shoes (Table 1 and Fig. 2). The range in rotational traction values for shoes on FieldTurf Revolution was 62.4 to 75.9 Nm. On Kentucky bluegrass, traction levels ranged from 63.5 to 76.5 Nm. These traction values can be compared to the traction levels 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)-------------	
Adidas Absolado Incurza TRX FG	62.4	66.5
Adidas Adizero RS7 PRO XTRX SC 4.0	65.8	63.5
Adidas Regulate Kakari SG	69.9	74.2
Adidas FF80 PRO TRX SG II	75.9	76.5
Puma evoSPEED 1.2 FG	65.5	69.3
Canterbury CCC Stampede Club	74.0	75.6

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



References

Lambson, R.B., B.S. Barnhill, and R.W. Higgins. 1996. Football cleat design and its effect on anterior cruciate ligament injuries. A three-year prospective study. Am. J. Sports Med 24(2):155–159

McNitt, A.S., R.O. Middour, and D. V Waddington. 1997. Development and evaluation of a method to measure traction on turfgrass surfaces. J. Test. Eval 25(1):99–107.

Torg, J.S., T.C. Quedenfeld, and S. Landau. 1974. The shoe-surface interface and its relationship to football knee injuries. J. Sports Med. 2(5):261–269.