PLANTAR PRESSURE DISTRIBUTION DURING RUNNING IN DIFFERENT SURFACES: PRELIMINARY STUDY

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INTRODUCTION: Overuse injuries in running have been linked to a rigid surface; on the other hand, acute injuries are considered multifactor, since a combination of running speed, surface, shoes, fatigue and training is involved (Walker, 2005). Many stress fractures are due to cumulative impact shock, which is believed to be greater on a hard surface like concrete (Feehery, 1986).The purpose of this study was to compare plantar pressure (PP) distribution on 4 different surfaces. The hypothesis was that surfaces considered rigid would present smaller contact time and greater values in plantar pressure variables in all foot areas; and surfaces considered compliant would present greater contact time and smaller values for the same variables.

METHOD: One subject, 30 yrs, free of injuries during the last 6 months, ran a distance of 30 m on flat tracks of 4 types of surfaces types (2 trials on each surface): asphalt, concrete, grass and Tartan (sport surface). Running velocity was 12 km/h and an allowed deviation of 5% or 0.6 km/h was accepted (De Witt *et al.*, 2000). The time and plantar pressure distribution were measured during the last 20 m of each trial. The Pedar X® mobile System was used to acquire plantar pressure distribution.

RESULTS:

Table 1. Mean, standard deviation and p values of contact time (ms) and time-pressure integrals (kPa.s^{-1}) on each foot area and type of surface

PLANTAR ÁREAS	VARIABLES	ASPHALT	CONCRETE	GRASS	TARTAN	p
REARFOOT	Contact time (CT)	145.8 (11.9)$^{\#}$	180.4 (43.5)$^{*,@,\#}$	136.2 (16.0)$^{@}$	147.9 (16.7)*	**0.001**
	Integrals (TPI)	20.1 (0.9)	19.9 (1.3)	18.5 (2.2)	19.3 (0.9)	0.123
MIDFOOT	Contact time (CT)	207.3 (12.7)$^{\&,\%}$	213.1 (17.4) $^{*,@}$	192.8 (19.4)$^{+,@,\&}$	169.3 (8.0)$^{\%,+,*}$	**< 0.001**
	Integrals (TPI)	14.5 (0.5)$^{\%}$	15.0 (0.6)*	14.2 (1.4)$^{+}$	12.5 (0.5)$^{\%,+,*}$	**< 0.001**
FOREFOOT	Contact time (CT)	191.9 (7.2)$^{\&,\%,\#}$	198.8 (11.7) $^{*,\#}$	185.6 (9.1)$^{+,\&}$	193.6 (4.6)$^{\%,+,*}$	**0.001**
	Integrals (TPI)	36.4 (4.2)	34.72 (4.1)	34.27 (5.7)$^{+}$	36.4 (4.0)$^{+}$	**0.009**
HALLUX	Contact time (CT)	190.4 (5.2)$^{\#}$	197.7 (9.0)$^{\#,@}$	183.7 (7.6)$^{+,@}$	193.21 (3.7)$^{+}$	**0.0003**
	Integrals (TPI)	36.7 (10.85)$^{\&,\%}$	33.3 (7.41)*	32.1 (8.07)$^{+,\&}$	47.2 (2.96) $^{*,+,\%}$	**0.0000**

ANOVA for repeated measures. Significative Post Hoc Scheffé (p<0,05) among surfaces: # Asphalt x concrete, & Asphalt x grass, % Asphalt x Tartan, @ Concrete x Grass, * Concrete x Tartan, + grass x Tartan

DISCUSSION: Related to TPI, the hypothesis was confirmed by the greater values of TPI obtained on concrete at the midfoot and asphalt at the forefoot, besides the smaller values of TPI obtained on grass in the whole foot and tartan at the midfoot. This fact may indicate that compliant surfaces better dissipate the overload at heel strike. Contradicting the initial hypothesis, the tartan presented higher TPI in the hallux and forefoot. However, this fact may be explained due to the necessity of greater propulsion effort on the compliant rubber surface, creating higher pressure under the forefoot area.

CONCLUSION: The running surface may change PP distribution, indicating that the surface must be considered before training prescription in an attempt to avoid injuries.

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