F-07 Thematic Poster - Field Measures of Running Biomechanics

Friday, May 29, 2020, 1:00 PM - 3:00 PM
Room: CC-2007

2949 **Chair:** Allison H. Gruber, FACSM. *Indiana University Bloomington, Bloomington, IN.*
(No relationships reported)

2950 Board #1 May 29 1:00 PM - 3:00 PM

Changes In Peak Accelerations And Shock Attenuation Over The Course Of A Marathon

Marit A. Zandbergen[1], Jaap H. Buurke[1], Peter H. Veltink[2], Jasper Reenalda[1]. [1]*Roessingh Research & Development, University of Twente, Enschede, Netherlands.* [2]*University of Twente, Enschede, Netherlands.* (Sponsor: Brian W. Noehren, FACSM)
Email: m.zandbergen@rrd.nl
(No relationships reported)

Peak tibial and peak sacral accelerations have been shown to increase during a fatiguing run. Peak accelerations are often used as a surrogate for impacts on the body during running. High tibial impacts have been linked to development of tibial stress fractures. To understand how impacts are related to injury development, we need more insight in how shocks propagate through the body, especially under the influence of fatigue.

PURPOSE: To investigate bilateral peak accelerations and shock attenuation over the course of a Marathon.

METHODS: 5 trained athletes (2M 3F, 33.8±11.8 years, 182.3±5.8 cm, 73.9±9.1 kg years) ran a Marathon during competition. Inertial measurement units (240Hz) were placed on the sternum, pelvis, and bilaterally on the tibia and foot. Mean peak accelerations around initial contact and shock attenuation (% decrease of peak acceleration) were calculated over 25 strides during the 2nd and 42nd km of the Marathon. Paired sample t-tests were used to test for statistical differences between the 2nd and 42nd km and between the dominant and non-dominant side.

RESULTS: See Table 1. Mean finish time was 4:07:40±0:19:07.

CONCLUSION: Impacts and shock attenuation changed asymmetrically during a Marathon. Both side dominance and fatigue significantly influenced shock attenuation. However, on sternum level, only fatigue influenced impacts and shock attenuation, implying some sort of protective mechanism to keep proximal impacts low. The non-dominant side showed larger impacts during the whole Marathon, possibly because this side is less strong and therefore less able to actively (i.e. muscle contractions) absorb shocks. Overall, impacts increased and shock attenuation decreased towards the end of the Marathon, possibly increasing the risk of overuse injuries.

Table 1, Bilateral peak accelerations and shock attenuations for the 2nd and 42nd km of a Marathon. An asterisk (*) indicates a significant difference ($p<0.05$) between the 2nd and 42nd km. A superscript s (^{s}) indicates a significant difference ($p<0.05$) between the non-dominant and dominant side at either the 2nd or 42nd km.

	Peak accelerations			
	Non-dominant		Dominant	
m/s^2	2km	42km	2km	42km
Foot	99.4±24.0*^{s}	116.2±35.4*^{s}	92.7±24.5^s	94.4±21.2^s
Lower leg	92.2±21.6*^{s}	124.2±68.0*^{s}	84.8±18.4^s	87.2±26.6^s
Pelvis	82.8±55.9^s	87.5±59.1^s	64.2±31.1*^{s}	77.3±46.2*^{s}
Sternum	25.1±11.3*	35.9±16.8*	25.9±10.0*	36.7±12.6*
	Shock attenuation			
% reduction impacts	Non-dominant		Dominant	
	2km	42km	2km	42km
Foot-Lower leg	7.3±18.4*	-6.9±49.1*^{s}	8.6±19.3	7.6±21.1^s
Lower leg-Pelvis	10.2±22.9^s	29.5±35.5	24.3±16.9*^{s}	11.3±32.3*
Pelvis-Sternum	69.6±19.6*^{s}	59.0±43.0*	59.6±20.7*^{s}	52.5±35.2*

2951 Board #2 May 29 1:00 PM - 3:00 PM

Low Accelerometer Sampling Rates Attenuate Tibial Impact Acceleration Peaks During Running

Clare E. Milner, FACSM, Kevin G. Aubol. *Drexel University, Philadelphia, PA.*
Email: milner@drexel.edu
(No relationships reported)

High tibial acceleration peaks have been associated with tibial stress fracture in runners. Field-testing with wearable wireless accelerometers in now commonplace, but some devices have a lower sampling frequency than in laboratory testing.