Impact Accelerations in Recreational Runners with and without a History of Injury.

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Aoife Burke[1,2], Siobhán O'Connor[1], Enda Whyte[1], Sarah Dillon[1,2], Shane Gore[1,2] , Kieran Moran[1,2].
[1] Insight Centre for Data Analytics, Dublin City University.
[2] School of Health and Human Performance, Dublin City University.

Introduction

Recreational running is extremely prevalent, with running related injuries (RRIs) being a persistent burden[1]. While it has been hypothesized that impact loading is a contributing factor, there has been mixed evidence to support this, particularly with regard to the use of ground reaction force. Recently, impact accelerations have been advocated because of their advantages over force plates (e.g. segment specific loading, low cost, portable). Few studies have compared runners who have never been injured (INJ_0) with runners who have a retrospective RRI history (INJ_R)[1]. We conducted a novel study to explore the differences in peak impact accelerations ($Peak_{accel}$) and rate of acceleration ($Rate_{accel}$) between INJ_0 and INJ_R males and females.

Methods

Accelerometers (Shimmer, Ireland) were used to compare $Peak_{accel}$ and $Rate_{accel}$ of the tibia in 50 INJ_0 and INJ_R male and female runners during a 15 minute running trial. INJ_R runners were matched with controls (INJ_0) by gender, running experience and cumulative training mileage within the previous three months (INJ_0: n=25; 44.7±8.5yrs; 297.5±210.2km) and (INJ_R: n=25; 42.2±6.2yrs; 299.1±205.2km). A two-way between-groups analysis of variance explored the effect of injury status and gender on tibial accelerations. Significance at $P \leq 0.05$.

Results

There was statistically significant interaction effects with a medium effect size for both $Peak^{accel}$ ($F=4.64$, $p=0.04$, $n2=0.09$) and $Rate^{accel}$ ($F = 6.30$, $p = 0.02$, $n2 = 0.12$) between gender and injury status. INJ^R females demonstrated significantly greater $Peak^{accel}$ (7.5g vs 5.3g) and $Rate^{accel}$ (652.7 g/s vs 284.9 g/s) than INJ^0 females. No difference was evident between INJ^R males and INJ^0 males for either $Peak^{accel}$ or $Rate^{accel}$ (5.3g vs 5.4g; 314.4 g/s vs 327.6 /g/s) and no difference was evident between male and female runners who had never been injured.

Conclusion

It is has been suggested that elevated levels of loading through high impact accelerations may increase the risk of RRI potential. The present study found this to be true for females, similar to Davies (refs), but not for males. This also is the case for $Rate_{accel}$. While it is unclear whether this reflects an altered movement pattern due to injury, or is related to the cause of injury, it may be important for females with high $Peak_{accel}$ and $Rate_{accel}$ to alter their running technique to reduce these impact loads. This highlights the value of biofeedback and gait re-education, which has been demonstrated to be an effective method of impact acceleration reduction in runners[2].

1. Davis et al., British Journal of Sports Medicine, 2015.

2. Wood et al., Journal of Biomechanics, 2014.