**Thematic Area:** Health and Physical Activity

**PREVIOUS AND POTENTIAL USE OF INERTIAL SENSORS IN LONGITUDINAL RUNNING GAIT ANALYSIS – LINKS WITH RUNNING RELATED INJURY**

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**Introduction**
As distance running continues to increase in popularity, so too does the number of people suffering from Running Related Injuries (RRI) (Abt et al. 2011). While identification of parameters related to RRI have commonly been identified in laboratory settings, ecologically sound testing methods are required in applied research. As inertial sensors such as accelerometers, gyroscopes and combined units are low cost, portable and lightweight they may be able to generate the necessary information for applied research. While the use of inertial sensors in walking gait analysis has been widely documented, their application to longitudinal running gait analysis is extremely limited.

**Longitudinal Running Gait Analysis and Inertial Sensors – Why?**
An increased risk of RRI onset has long been identified with increasing absolute mileage ran per week (Walter et al. 1989). Yeung and Yeung (2001) found that in a review of the literature, increased exposure to higher training loads, whether it be running duration, frequency or distance, increases the risk of RRI. It is therefore acceptable to reason that longitudinal studies would unveil a significant wealth of information related to RRI, compared to studies undertaking acute trials. Combined with this, parameters which can be derived from inertial sensor technology have been linked to RRI. Among the research, Zifchock et al. (2008) found that subjects with previous unilateral RRI presented elevated peak tibial acceleration on their previously injured side compared to their previously uninjured side. Meardon et al. (2011) found that through stride time long range correlations for previously injured subjects stride time variation differed from previously uninjured subjects. They also identified that this area should be investigated in the future in terms of injury prediction. Lastly, Mizrahi et al. (2000a) identified decreases in stride rate due to fatigue in long distance running. These kinematic adaptions due to fatigue have been linked with RRI as they correspond with muscular fatigue causing a decreased ability to absorb shock and in increase in bone strain rate and magnitude (Mizrahi et al. 2000b).

**Future Research and Conclusion**
Future research will focus on the use of inertial sensors, accelerometers in particular, on recreational runners training for and participating in a half/full marathon. These runners are at higher risk of incurring an RRI due to their lack of previous running experience/mileage undertaken. Accelerometers will be placed bilaterally on the distal anteromedial tibia and record running sessions over 4-6 months in the training for and completion of the distance running event. If links between injury onset and acceleration patterns could be found within these individuals this would make significant progress towards combating injury onset and also the development of a feedback system to assist this.

**References**