Impact sensor provides athletic support

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As athletes strive for perfection, sports scientists need to exploit every technological advance to help them achieve that goal. Researchers in New Zealand have now developed a new type of wearable impact sensor based that can provide much needed information about the stresses and strains on limbs for rugby players, high jumpers, and runners.

Writing in the *International Journal of Biomechatronics and Biomedical Robotics,* Kean Aw and colleagues in the department of Mechanical Engineering, at The University of Auckland, explain how novel materials known as ionic polymer metallic composites (IPMCs), produce an electrical current when compressed. These materials are flexible, lightweight and durable and so can be fashioned into wearable sensor devices to allow sports scientists to monitor directly impact forces without interfering with an athlete's performance.

IPMCs are usually made from an ionic polymer, such as Nafion or Flemion, which is coated with a conducting metal, platinum or gold. Previously, researchers have experimented with IPMC materials as artificial muscles because applying a voltage causes them to flex as ions migrate causing electrostatic repulsion within the composite material. The opposite effect, in which ion movement generated a voltage when the material is flexed, is exploited in the sensor technology.

Impact sensors made from IPMC could be inserted into footwear to measure the impact energy of a foot striking a hard surface or they might be placed in a rugby player's shoulder pads to measure collision impacts or forces exerted during a rugby scrum. The data obtained from

these sensors allows the athlete's performance to be quantified and analyzed in terms of the forces acting on their body with a view to improving their and also reducing the potential for injuries.

The researchers have tested IPMC sensors in the laboratory and compared the readings obtained for different applied forces with those from more conventional measurement techniques. Their analysis of the tests reveals that the IPMC sensors would have to be calibrated with a high and a low impact force prior to testing with a performing athlete. However, the voltage spike and the slope of the voltage measurement obtained with an IPMC can be readily converted into an impact force measurement to within 10% accuracy.

More information: "Ionic polymer metallic composite as wearable impact sensor for sport science" International Journal of Biomechatronics and Biomedical Robotics 2010, 1, 88-92. dx.doi.org/10.1504/IJBBR.2010.033025

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