Introduction:

Sport-related concussion has received much recent national and international interest, with focus on the consequences of both acute and repeated concussive episodes (e.g. Bazarian et al., 2014; Harmon et al., 2013). While most players return from concussion without any lasting problems, concern has been voiced in relation to other sporting codes about whether there are long-term consequences of repeated concussions and subconcussion (e.g. Murugavel et al., 2014; Singh et al., 2014). Given that Australian Rules Football has a comparatively high incidence of concussion, averaging over five definite concussions per team per season, there is real concern in the community regarding it and the long-term effects of the accumulation of subconcussive events in sport. Furthermore the true incidence of concussion and subconcussion in Australian football is unknown, and less severe events may go undetected, especially in junior and non-elite competition.

Assessment of concussion through portable technology:

Concussion is a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces to the head (Meaney et al., 2014; Patton et al., 2013). Assessment of impact loads applied to the head is normally carried through the measurement of the head’s linear and angular kinematics (acceleration and velocity). Until now, such assessment has relied on indirect evidence from video modelling and laboratory-based simulation of head impact, with limited practical game-day application. However, specialist wearable electronic devices have recently now been developed for contact sports that can measure head impact characteristics in real-time on individual players (Siegmund et al., 2014). Similar devices have been used in a large number of studies in American Football and ice hockey where they are built into the helmet (Davenport et al., 2014). Recently, devices have become available that can be attached directly to the player’s head without being built into a helmet.
Wearable X2patch technology:

The National Trauma Research Institute has partnered with X2Biosystems to pilot this impact sensing technology in senior amateur Australian rules football players. X2Biosystems leads the way in non-helmented impact sensing technology and concussion monitoring software. Its x2patch is a cost-effective low-profile adhesive patch to be worn behind the athlete’s ear. The x2patch contains micro-transducers able to measure linear and rotational accelerations and transmit those to the sideline. At the sideline those data can be assessed and applied to player management as well as being stored for longer-term player management and research. The technology provides real time data about on-field collisions and has been used in American football to notify coaches and club doctors when a player should be taken from the field. Such technology can also provide a large amount of information, previously unattainable, about the forces experienced by players over the course of a game, or a season, and whether this relates to any clinical features of concussion.

The need to test this technology in Australian Rules football:

Field validation of the x2patch has been undertaken in several high profile American college football teams (Notre Dame, Stanford, University of Washington), as well as in lacrosse and field hockey. Whilst the results of these tests are promising the sensors have not been tested independently and under situations relevant to Australian Football. Australian rules football is Australia’s most popular team sport with the highest spectator attendance of all sports in Australia, over 163,000 (2011) adult participants and a staggering 627,905 junior players (Australian Football League annual report, 2011). The NTRI plans to undertake a very small wearability pilot late in 2014 that would lead to a full pilot of the technology over a larger number of games in 2015 (the subject of this proposal) and a possible NHMRC Partnership Grant application.

Anticipated outcomes:

It is hoped that this technology will provide a large amount of information, previously unattainable, about the forces experienced by Australian Rules football players over the course of a game, or a season, and whether this relates to any clinical features of concussion. More importantly this technology may provide an accurate cost-effective way to support coaches and trainers to assess head impacts during game play and protect the brains of the youngest and oldest players of the game.

References:


