Institution: University of Chester

Unit of Assessment: 26 Sport and Exercise Sciences, Leisure and Tourism

a. Context

Established in 2008 (from those SES colleagues who were submitted to the *Other Subjects and Professions Allied to Medicine* Unit of Assessment in RAE2008), the Applied Sports Science Research Group has been the main source of applied research in the Department of Sport and Exercise Sciences (SES) at the University of Chester. The main non-academic users of the research have been elite rugby league clubs and the governing bodies of the Rugby Football League (RFL) and the Rugby Football Union (RFU), as well as a variety of sporting organizations including the English Handball Association (EHA), the English Institute of Sport (EIS) and the England Touch Association (ETA).

The Applied Sport Sciences Group was established to bring together colleagues whose research demonstrates an application to improving or optimizing athletic or health-related performance. The Group's research continues to be driven and informed by applied practice from within the field of sport and exercise, and attempts to provide scientifically robust solutions to real-world problems faced by sport and exercise practitioners. The multidisciplinary group comprises specialists in the areas of human physiology, movement analysis, biomechanics, human nutrition and statistics. Naturally, the types of impact have related directly to the Group's research foci, with a broad emphasis on: the movement, physiological and skill demands of rugby, and the mechanisms of fatigue and recovery after high intensity exercise.

b. Approach to impact

The Group's broad approach to impact has been to generate foundational and applied research as a basis for influencing, in the first instance, the practices of rugby league and rugby union and, latterly, team handball and touch rugby at both elite (1st team through to international) and developmental (Academy) standards. This approach has enabled organizations to evaluate their own policy and practice towards player recruitment, development and performance. In addition, the broader impact of the Group's applied research has been in the health, physical development and well-being (e.g. day-to-day monitoring) of junior and senior elite sportsmen and women. Accordingly, the Applied Sports Sciences Research Group have sought to impact upon clubs' strategies towards, for example, pre-season and in-season strength and conditioning practices, periodization of training, youth training and talent identification, recovery and rehabilitation schedules, and match-related tactics (e.g. *vis-à-vis* interchange strategies).

The Applied Sports Sciences Research Group has sought to develop strong relationships with key users based on group members' areas of expertise and interest. Individual members of the group have been actively involved in the sport of rugby league since 1998, including provision of sport science support on overseas tours to Australia (1998, 2001) and New Zealand (2000) and consultancy to governing bodies and individual clubs since 1999. Other Group members have long-standing relationships with the EIS that has provided access to a wide range of athletic groups and coaching set-ups. Such experiences enable the Group to be acutely aware of the issues that directly influence performance and an appreciation of the applied sporting environment. These relationships have led to strong working relationships with Super League RFL clubs (Warrington Wolves RFC and St Helens RFC) and governing bodies (RFL, RFU, EHA and ETA) who have sought collaboration with members of the Research Group based on reputation, knowledge and expertise.

The nature of the relationships between the Applied Sports Sciences Research Group and key users of its applied research is evidenced in several ways. Funding has been secured from partner organizations (St Helens RFC, Warrington Wolves RFC), for example, to support the appointment of fractional staff who have provided both scientific support to athletes alongside applied research as part of postgraduate study. Since 2006, the Group has also been successful in securing three

University match-funded (Gladstone) bursaries and two externally funded student bursaries. These have enabled the Group to appoint postgraduate students to work in collaboration with the funding partners (RFL, RFU, EHA and Warrington Wolves RFC) on knowledge transfer-related activities based on the Group's research. Several staff also hold long-standing consultancy positions with lead bodies (e.g. EIS, RFL) and with professional organizations (e.g. St Helens RFC, Warrington Wolves RFC, ETA). Finally, a thriving applied sport science masters programme has enabled the Group to offer placements with leading organizations and governing bodies, many of whom have conducted applied research as part of their studies. Collectively such relationships illustrate how the Group interact with key users of the research to facilitate a link between theory (research) and practice (application).

Considerable re-investment of monies received from RAE2008 has also enabled impact from the Group's research. Money has been used to provide full and partial postgraduate student bursaries and research assistant posts that have worked on foundational and applied research to inform the projects described above. In addition, staff are supported and encouraged by the host Department and University to disseminate knowledge gained from research via face-to-face interaction with practitioners (i.e. coaches, athletes), publications in both peer-reviewed and professional journals and to present at appropriate conferences and workshops. This has been fully supported by the University's Research and Knowledge Transfer team, who have created an environment within which the Group are able to translate their research and consultancy activities into effective knowledge transfer to potential users within the sport and exercise community.

c. Strategy and plans

Adopting the applied research model proposed by Bishop (2008: Sports Medicine, *38(3)*, 253-263), the Applied Sports Sciences Research Group's strategy (or approach) towards impact has been to work directly with sporting organizations (RFU, St Helens RFC, Warrington Wolves RFC, EHA, EIS, ETA) and their coaching staff to bridge the gap between applied practice and scientific knowledge in these sports. Accordingly, appropriate structures of scientific enquiry have been developed that seek to change or confirm current applied practice or policy. The work has also sought to heighten awareness of key issues (e.g. day-to-day monitoring) that enables better management of players' health status and capacity to perform. Indeed, a central focus of the research – aimed at achieving impact – has been the education of coaches and athletes through regular feedback and communication. Specific examples of the Group's approach include assisting coaches to better understand the demands of training and matches so that correct decisions on training content and player management can be made to optimize team and individual performance.

Building on the Group's work, future avenues of investigation will continue to maximise the potential for impact in the previously identified areas of research interest. A key area for development for the work with rugby will be to examine the immediate and prolonged implications of match and training demands on player health. This has already begun in the form of a newly funded PhD (September 2013) that will endeavour to provide a more comprehensive evaluation of the biochemical and physiological responses to high intensity collisions (i.e. the tackle). Further work will also examine the chronic adaptations to training and match demands, with an emphasis on the health and well-being of older players. More specifically, this route of enquiry will investigate post-career issues in rugby players, with an emphasis on functional capability, health, well-being (physical and mental) and physical activity. Such work would be consistent with emerging developments in elite sport relating to player welfare, education and development (e.g. State of Mind, Super League Players' Association), as well as supporting the broader agenda for health.

The Group will continue to focus on applied research in specific sports, with a continued emphasis of providing scientifically robust solutions to real-world problems faced by sport and exercise practitioners. Work will continue with team handball (EHA) that will disseminate and extend findings from a current PhD project on the physical and physiological characteristics of British handball players. Indeed, research is already planned to extend the current collaborations with Norwegian and Portuguese partners in an attempt to better inform the training practices and

selection policies of the England and British Handball Associations. Future impact-related applied sports sciences research will also be extended into new areas; namely boxing and martial arts. This will take advantage of the novel research by a new staff member and maintain the Group's mission of addressing real-world problems.

d. Relationship to case studies

The case studies presented have emerged from the strong partnerships with leading sports organizations and clubs with whom the Applied Sports Sciences Research Group has engaged in knowledge transfer and consultancy. Thus, the Group's approach has been, and continues to be, driven and informed by applied practice, where impact is interpreted as scientifically robust solutions to the real-world problems of sport and exercise practitioners. The use of GPS technology to assess the internal and external loads imposed on both rugby league and rugby union players neatly illustrates the Group's approach. This information has optimized player performance by enabling coaches (and, for that matter, players) to employ appropriate training practices. In the process, it has also enhanced coaches' and players' knowledge of the technical requirements of the game. In keeping with this approach, the Group's first case study sought to enable coaches and players (both senior and youth) to better understand the movement, physiological and technical demands associated with match play as well as training at senior and junior standards. This resulted in coaches implementing more appropriate recovery and training practices in the days between and after matches on the basis of a clearer understanding of the mechanisms that contribute to player fatigue. In recognition of the need for coaches (but also players) to develop a better understanding of the necessary tools for measuring fatigue, the second case study addressed these issues.