Institution:
Southampton Solent University

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

Title of case study:
Using an approach to Strength and conditioning to provide public benefit in elite athletes.

1. Summary of the impact (indicative maximum 100 words)

Sport and exercise research at Southampton Solent University commenced in 2007 and comprises a young research team focussed on strength and conditioning within sport. The overarching methodological approach is defined in the work of Fisher et al (2011) as momentary muscular fatigue (MMF) whereby training is undertaken to maximal exertion. Using MMF the research team have published findings and their conclusions for public benefit, thus improving performance with a range of client groups in sport. The impact of this methodological approach is far reaching, improving performance in elite performers, whether they are able or disabled. The beneficiary groups include; two Paralympic squads in the build up to, and including, the London 2012 Paralympic Games and a premiership football team.

2. Underpinning research (indicative maximum 500 words)

During the past thirty or so years, the popularity of strength training has increased enormously. Simultaneously, the number of popular books and articles devoted to this topic has increased, many containing contradictory and inconsistent advice. Such concerns as the appropriate number of sets and repetitions individuals should perform, the movement cadence individuals should adopt, frequency of training, and how to specifically target increased power or muscular endurance are discussed regularly in popular weight training magazines and books, with little authority, (Smith and Bruce-Low, 2004). The research team through their scholarly activity have attempted to address the issue of confusion through quality research and develop a strategic approach to training in elite athletes.

Momentary Muscular Failure (MMF)

The paper by Fisher et al (2012) challenges many of the approaches to conventional strength training building on previous work undertaken by Smith and Bruce-Low in 2004. The use of training to momentary muscular fatigue enhances training efficiency as well as strength gains and is the salient point covered in this article. It shows clearly that this form of training is a fundamental aspect of preparation for the development of strength and power with the work of Bruce-Low et al (2012) showing it can be used in a time-efficient method to optimise muscular development and also prehabilitation (training to prevent injury). The paper by Mola et al (2013) successfully identifies methods (including MMF) by which training in professional soccer can be enhanced by undertaking post activation potentiation and improving power output to enhance soccer performance.

Therefore, this research on the training intervention of MMF shows impact for helping to improve performance in elite athletes. It is the claim of this research group that this research has both reach and significant interim impact.

Positions held during research period

Mola – Research Assistant Southampton Solent University
Bruce-Low – Associate Professor Southampton Solent University
Fisher – Senior Lecturer Southampton Solent University

Steele – Associate Lecturer Southampton Solent University
Smith – Senior Lecturer Manchester Metropolitan University

3. References to the research (indicative maximum of six references)

1. Fisher J, Steele J, Bruce-Low S, and Smith D (2011). Evidence-based resistance training recommendations. *Medicina Sportiva*: 15 (3): 147-162. 10.2478/v10036-011-0025-x
2. Fisher J, Bruce-Low S, Smith D. (2012). A Randomized Trial to consider the effect of Romanian deadlift exercise on the development of lumbar extension strength. *Physical Therapy in Sport*, August, 1-7. 10.1016/j.ptsp.2012.04.001
3. Bruce-Low S, Smith D, Burnet S, Fisher J, Bissell G, Webster L. (2012). One lumbar extension training session per week is sufficient for optimal strength gains and reductions in low back pain in chronic participants. *Ergonomics*: 55 (4), 500-7. http://dx.doi.org/10.1080/00140139.2011.644329
4. Mola J, Bruce-Low S, Burnet S. (2013). Optimal Recovery Time for Postactivation Potentiation in Professional Soccer Players. *Journal of Strength and Conditioning Research*.
5. Smith D & Bruce-Low S. (2004) Strength training methods and the work of Arthur Jones. *Journal of Exercise Physiology online*. 7 (6): 52-68.
6. Smith D, Bissell G, Bruce-Low S, Wright C (2011). The effect of lumbar extension training with and without pelvic stabilization on lumbar strength and low back pain. *Journal of Back and Musculoskeletal Rehabilitation*, 24, 1-9.

Articles 1, 2 and 5 are well cited in the literature suggesting impact within the academic field. Articles 3 and 4 are published in well-respected journals known for their rigorous peer review process suggesting the quality of the articles is high.

4. Details of the impact (indicative maximum 750 words)

The manner in which the MMF strength training is undertaken is key and the research from this group has shown that our work has high impact. Using this strength training approach, we believe this research has interim impact for those practitioners within the field of sport, exercise and fitness working with recreation and elite performers across the world.

High Performance Sport and Strength Training

This line of strength research has allowed the team to work with high profile clients during high profile events such as GB Wheelchair rugby (GBWR) and GB ladies wheelchair basketball at the Paralympics in the summer of 2012. During the preparation of the GBWR squad the group's published MMF research (references above) was adopted nationally to all the club teams, thus to all wheelchair rugby players in the country. This impact for the sport was nationally recognised and is clearly supported by the reference sent by the head coach of the squad for the 2012 Paralympics clearly stating the success of the interventions created the fittest team for the last 3 Paralympics, which he places firmly as a result of the work undertaken by Dr Bruce-Low. The team's involvement in GBWR resulted in extensive media coverage with regards to the training undertaken. For example, Dr Bruce-Low was filmed by Channel 4 undertaking multiple filming sessions (Paralympic breakfast show; Best of British). In addition, his work now spans to premiership football where he is a sport science consultant to Southampton football club. James Fisher was able to apply his research in conjunction with the GB Wheelchair ladies basketball in their preparation for the 2012 Paralympics. His 2011 publication clearly challenges the current

approaches to strength training, suggesting that training to MMF instead of non-fatigued states, has had impact for many strength coach practitioners around the world in ensuring their training methods are evidenced based and successful. This is clearly evidenced by the emails sent to James Fisher in response to his publications but also from the emails from the assistant coach detailing James' role in the preparation of the Women's Wheelchair Basketball squad for the London 2012 Paralympics.

5. Sources to corroborate the impact (indicative maximum of 10 references)

The application of SSU research to Paralympians received wide media coverage:

Paralympic coverage - Channel 4 - 07-09-12
three live broadcasts (five minutes each) from Southampton Solent University talking about the strength and conditioning training under taken by Paralympian Aaron Phipps with Dr Stewart Bruce-Low at the university's BASES accredited physiology labs.
7.40am, 8.15am and 8.45am

The Guardian - 18-11-11Interview with paralympian Aaron Phillips referring to his relationship with SSU http://www.theguardian.com/sport/2011/nov/18/london-olympic-hopefuls-aaron-phipps

Use of SSU techniques with professional football clubs has received local coverage, particularly given Southampton's current success:

Sport Science - Southern Daily Echo 09-10-13: Saints, who have soared into the top four of the Premier League, also have the use of Southampton Solent University's state-of-the-art physiology sports laboratory that has now been recognised as one of the top centres in the UK.

Researcher User Testimonials:

Head of Sports Science, Southampton Football Club corroborates the claim the SSU research has been used to improve the strength and conditioning of their premiership level players.
Head Coach, Great Britain Wheelchair Rugby corroborates the claim that SSU research was used to create previously unprecedented levels of fitness.