

Institution: Staffordshire University
Unit of Assessment: 26 – Sport and Exercise Sciences, Leisure and Tourism
Title of case study: Developing a Challenge Approach to Psychological Stress (Case Study 1)
<p>1. Summary of the impact</p> <p>We have developed, and applied, an approach to help athletes view the psychological stress of competition as a challenge (positive) rather than a threat (negative). This approach either has been, or is shortly to be, used in professional football, professional cricket, international rowing, international Futsal, as well as being applied to the workplace and in education. Central to this approach is a protocol, underpinned by theory, for assessing cardiovascular responses to the psychological stress of competition that indicates a challenge or threat state. Based on this protocol feedback is provided which is used to identify, and support, those who may need to develop a challenge approach. The impact of this work is disseminated through public engagement events and invited talks.</p>
<p>2. Underpinning research</p> <p>Since 2000 we have been running research programmes to help athletes deal with, and perform, under psychological stress. Initially our research was focused on understanding and controlling psychological and emotional responses to sport competition [1]. In 2007 we began to explore psycho-physiological responses to competition and embarked on the development and testing of a Theory of Challenge and Threat States in Athletes (TCTSA) [2]. In the TCTSA, responses to psychological stress are conceptualised as positive (challenge) or negative (threat), and these two states are indicated by differing cardiovascular responses to psychological stress. It is the change in two cardiovascular variables in response to a psychological stressor that is key to this approach. The two variables are cardiac output (the amount of blood being pumped out of the heart per minute) and total peripheral resistance (measure of the overall resistance in the vasculature). Specifically, a challenge response to a psychological stressor is indicated by an increase in cardiac output and a decrease in total peripheral resistance, whereas a threat response is indicated by little or no change in cardiac output and an increase in total peripheral resistance [2]. The TCTSA outlines that athletes who feel confident, in control and are focused on what can be achieved will respond to competition in a challenge state, whereas those who have low confidence, lack control and are focused on avoiding failure will respond to competition with a threat state.</p> <p>We have demonstrated that the cardiovascular responses associated with a challenge state are associated with better performance, than cardiovascular responses associated with a threat state, in cognitive (modified stroop test) and motor (netball shooting) tasks [3]. Similar findings have been observed in elite cricketers who took part in a task designed to assess their batting ability [4]. We have also looked critically at the underpinning theory and tested the relationship between cardiovascular responses to psychological stress and self-reported psychological states and found that often the relationships are unclear [3, 4] or contrary to what is expected [5]. While self-reported psychological states have not always aligned with cardiovascular responses as predicted, manipulating psychological states does change cardiovascular responses in line with the TCTSA. In our research we have demonstrated, in two separate studies, that enhancing self-efficacy, control and an approach focus in participants before a competitive task does lead to cardiovascular responses indicative of a challenge state (paper currently under review).</p> <p>Emerging from our research has been the development of a protocol for use with athletes that has been utilised by professional and national sports teams. Specifically, we collect data on changes in cardiovascular responses from rest when athletes are presented with a psychologically stressful scenario (e.g., a young football player asked to imagine what it would be like to make a debut for the first team). This protocol provides an objective way of assessing how an athlete may respond to an upcoming competition to complement other methods such as interview or questionnaires that</p>

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may be subject to socially desirable responses. This assessment is then used, if required, as the basis for interventions with the athletes to help them develop a challenge approach to competition.

Collectively the research programme focused on helping athletes deal with, and perform, under psychological pressure has yielded >40 papers, >40 conference presentations and has been supported by six PhD students who have completed. The research was begun by Professor Marc Jones, supported by Associate Professor Jamie Barker, Dr Paul McCarthy (Senior Lecturer in Sport and Exercise Psychology, left in June 2009) Dr Martin Turner and Matthew Slater. It has been conducted in collaboration with Nottinghamshire County Cricket Club, The England and Wales Cricket Board, and Stoke City Football Club.

3. References to the research

- [1] Jones, M. V. (2003). Controlling emotions in sport. *The Sport Psychologist*, 17, 471-486.
- [2] Jones, M. V., Meijen, C., McCarthy, P. J., & Sheffield, D. (2009). A theory of challenge and threat states in athletes. *International Review of Sport and Exercise Psychology*, 2, 161-180.
- [3] Turner, M. J., Jones, M. V., Sheffield, D., & Cross, S. L. (2012). Cardiovascular indices of challenge and threat states predict performance under stress in cognitive and motor tasks. *International Journal of Psychophysiology*, 86, 48-57. doi:10.1016/j.ijpsycho.2012.08.004.
- [4] Turner, M. J., Jones, M. V., Sheffield, D., Slater, M. J., Barker, J. B., Bell, J. B. (2013). Who Thrives Under Pressure? Predicting the Performance of Elite Academy Cricketers Using the Cardiovascular Indicators of Challenge and Threat States. *Journal of Sport and Exercise Psychology*, 35, 387-397.
- [5] Meijen, C., Jones, M. V., McCarthy, P. J., & Sheffield, D. (in press). Challenge and Threat States: Cardiovascular, Affective and Cognitive Responses to a Sports-Related Speech Task. *Motivation and Emotion*. Doi: 10.1007/s11031-013-9370-5

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4. Details of the impact

The impact of our research is in the use by sports teams, sports governing bodies and organisations of stress management programmes underpinned by the Theory of Challenge and Threat States (TCTSA), and where possible enhanced by the protocol for assessing cardiovascular responses to the psychological stress. In our typical protocol we have collected data using impedance cardiography. Baseline data is collected while players relax (e.g., for five minutes) and then a psychological stressor is introduced. For example players may be told they are about to take part in an important task and to prepare themselves for that task, or they may be asked to imagine what it would be like to be faced with a psychologically stressful scenario. It is the change from baseline in cardiac output and total peripheral resistance that indicates a challenge or threat state. Players are provided with individual feedback on whether their cardiovascular responses indicated a challenge or threat state along with suggestions of how stress can be viewed more positively (if appropriate). These suggestions are based on the TCTSA which outlines that athletes who feel confident, in control and are focused on what can be achieved (rather than avoiding failure) will respond to situations in a challenge state. The benefit of this approach is that it provides an objective measure of athletes' responses to psychological stress that predicts performance [3, 4] and is grounded in a theory outlining how these responses can be changed [2]. This type of assessment eliminates the social desirability inherent in self-report measures given that an individual may be reticent to admit concern or doubts about a specific event to a significant other (e.g., coach or psychologist) in case it is interpreted as a sign of weakness.

In the work with the players at Nottinghamshire County Cricket Club Academy and Senior Team [6] and the England under 19 cricket squad we have tested to date >80 players. This includes four

separate testing sessions at Nottinghamshire County Cricket Club and three sessions with the England under 19 cricket squad. Data were collected on psycho-physiological responses to being told they were about to take part in a batting test [see 4 for a description of our initial work]. After data were collected each player received individual feedback and suggestions for dealing with psychological stress. If required a longer term intervention was developed for the player. Work using this protocol is still ongoing at Nottinghamshire Country Cricket Club and further coach education and mentoring reinforce the concepts in the TCTSA. Specifically coaches aim to enhance confidence, feelings of control and an approach focus in players during training sessions and in preparation for games. These concepts have also been disseminated through the wider cricket coaching community to >40 coaches through coach education sessions (run annually since 2010) for Nottinghamshire county coaches.

In our testing with academy players at Stoke City Football Club during the 2012-2013 season, we tested 35 players from the U21, U18 and U16 squads. Data were collected on psycho-physiological responses to imagining a stressful scenario (i.e., making a debut for the first team). Each player received individual feedback and suggestions for dealing with psychological stress based on the TCTSA. There is further testing planned during the 2013-2014 season [7]. The incorporation of innovative sport science initiatives, such as this, contributed to Stoke City achieving Category 1 Academy status in 2012 and the sport science provision receiving the maximum possible score [8]. The impact of category one status is significant, within the context of the Premier League's Elite Player Performance Plan, as it indicates that an optimal infrastructure is in place to help develop the young soccer player.

We have also conducted educational sessions based on the TCTSA that has not involved collecting cardiovascular data, with squads including the Staffordshire County Cricket Club Emerging Player Program, Nottingham Forest Football Club Academy, and the British Equestrian Federation-Elite Performance Squad.

The interest in this approach is growing in the sporting community and the Great Britain Senior Rowing Team have funded testing for all 60 of the senior squad to take place in 2014 [9]. In consultation with the Head of Sport Science and Medicine, and National Performance Psychologist a protocol specific to rowing has been developed. First, each athlete will outline a hierarchy of Olympic Games stressors. The greatest stressor identified will be used as the stressor from which psychological and cardiovascular data will be collected, using a protocol similar to that employed with the academy players at Stoke City Football Club (i.e., the stressor is imagined). The stressors used will differ across the rowers, so the data collected will be relevant to each individual rower. For example, one rower may be concerned about changing boats close to competition, another may be concerned about an upcoming World Championships and the influence this may have on selection. Each rower will receive a profile on how they respond to that stressor and if necessary guidance on developing a challenge response. The rowers will be tested on at least four occasions in the period in the lead up to the Rio 2016 Olympic games to monitor progress. We are also planning to use a similar protocol with the England Futsal team in the 2013-2014 season and apply it to an England age-group international football team specifically relating to helping players develop a challenge approach to penalty shoot-outs [10]. A similar protocol will also be used with Great Britain Shooting during 2014.

The impact of our work has broadened out beyond sport to be applied in training days at companies and third sector organisations. The TCTSA has underpinned training delivered for Sony Europe and Sony Mobile since 2010. This includes training delivered as part of the senior leadership development programme within Sony Europe (2010, 2011). It also underpinned a training and development programme comprising five sessions delivered to 25 staff for dealing with the stress of change in the workplace (2012-2013). The success of these sessions has meant that Sony Europe have asked for input in the European Graduate Training Programme along with further input into in-house training programmes, including the development of software for mobile devices on stress management and leadership [11]. We have also used the TCTSA to underpin training sessions delivered to business leaders at the North Staffordshire Chamber of Commerce and as part of the 'Leadership Cafe' to managers at the South Staffordshire and Shropshire Health

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Care NHS Foundation Trust. Staffordshire University has also funded research (£4,868) beginning in January 2014 to explore the use of this protocol to help students deal with the psychological stress of examinations. This will be a similar protocol to that used in sport whereby data will be collected on students' psycho-physiological responses to the exam (e.g., imagining sitting the examination) and if needed, in line with the TCTSA suggestions around enhancing confidence, control and an approach focus will help students develop a challenge approach to the psychological stress of the examination.

The impact of this work is evidenced in dissemination through public engagement events and invited talks. Jones has disseminated his research on challenge and threat states using the Olympics as a context at prestigious public science festivals (British Science Festival 2012; Cheltenham Science Festival 2012, 2013). Jones has also outlined how understanding challenge and threat responses to psychological stress may be relevant to osteopaths in an invited talk at the College of Osteopaths Annual Conference (2013), while Turner addressed a similar topic to chiropractors in an invited talk at the British Chiropractic Association Annual Conference (2013). Barker has presented this research as part of a session on dealing with psychological stress to coaches at the Great Britain Archery Sport Forum (2013).

Collectively we have engaged with individual athletes (> 100), and coaches; we influence practice through engagement with professional clubs and national governing bodies; and disseminated through public engagement events and invited talks. This novel and exciting approach to dealing with psychological stress has been warmly received by the sporting and business communities and is evidenced in the amount of work planned that builds on our impact to date.

5. Sources to corroborate the impact

[6] Academy Director, Nottinghamshire County Cricket Club

[7] Head of Sports Science and Athletic Development, Stoke City Football Club

[8] Stoke City achieve Category 1 status - <http://www.stokecityfc.com/news/article/academy-granted-category-one-status-274069.aspx>

[9] Lead Sport Psychologist, GB Rowing.

[10] Research Manager for Psychology, Football Association.

[11] Senior Vice President Human Resources, Sony Mobile Communications.