



# University of HUDDERSFIELD

## University of Huddersfield Repository

Concannon, Michael and Pringle, Bob

Psychology in sports injury rehabilitation

### Original Citation

Concannon, Michael and Pringle, Bob (2012) Psychology in sports injury rehabilitation. *British journal of nursing*, 21 (8). pp. 484-490. ISSN 0966-0461

This version is available at <http://eprints.hud.ac.uk/id/eprint/13804/>

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: [E.mailbox@hud.ac.uk](mailto:E.mailbox@hud.ac.uk).

<http://eprints.hud.ac.uk/>

## Sports Injury – Involving Psychology in Rehabilitation

### Key Phrases

- Effective injury management requires practitioners to adopt a holistic approach to treatment.
- Both the physical and psychosocial aspects of injury should be considered.
- Careful assessment and accurate diagnosis is essential.
- All members of the primary and secondary care teams should be aware of a more holistic and interdisciplinary referral pathway to include psychological intervention
- Good communication between practitioner and patient, as well as high levels of support and patient involvement are equally important in the rehabilitation of young athletes.

### Key words

Sports injuries, psychology, Achilles tendinopathy, Sever's, Behaviour Change, patient practitioner partnership, psychosocial aspects of injury

### Case Study

James is an 18 year old track athlete who was referred to podiatry and sports psychology by the local practice nurse as a means to advance his unresolved injury profile. For the last 3 years, he has been suffering from chronic, recurrent Achilles problems that are becoming more frequent and, in the athlete's opinion, more severe.

He has been training and competing with the local athletics club since he was 9 years old, but since the age of 16 has been training and competing at a regional level. At the recent UK Athletic Championships and whilst competing in the 200m, he felt significant discomfort/pain in his Achilles tendon such that he withdrew from competition.

Before the injury, he was training in the gym three mornings per week, and training on the track five nights per week. Additionally, he would sometimes participate in as many as three competitions per month.

James has enjoyed a reasonable level of success and, having been inspired by the build up to the London 2012 Olympics, he has been selected to take part in national trials for the British athletics team for the IAAF World Championships in 2013. He intends to compete in the 200m and 400m.

When he was 12 years old James was diagnosed with Sever's disease but is unsure if this is resolved or continues to be related to his current injury problems. In stepping up his training for the trials, he feels his injury is starting to cause fresh concerns. At the request of the club coach he has seen his GP and has had several treatment sessions, mostly focusing on anti inflammatory mechanisms. Pharmacologically he has been prescribed Ibuprofen which he thinks has helped a little but not resolved the problems. The physiotherapist attached to the GP practice used ultrasound therapy and gave him stretching exercises to do at home. He found the treatment to be helpful but it did not lead to a full recovery, and he currently feels that the symptoms are getting worse. After discussing the situation with his coach, he is urged to seek further advice from his GP.

During this second round of GP visits, James mentions to the practice nurse that he is starting to have serious doubts about his ability to overcome the long-standing complaint and he is starting to feel anxious about the forthcoming trials. His concern is that if he continues to train at the level needed to perform at a national standard, the injury may manifest to the point where he cannot compete at all.

The practice nurse discusses the issue with him and immediately recognises that the athlete's inability to distinguish between the long standing problems relating to Severs disease, and the more recent Achilles injury, are having an adverse impact on the athlete's psychological well-being. Although there are clear psychological issue affecting his confidence, the practice nurse recognises that the young man has by no means exhausted his injury management options and refers him to both a sports psychologist and a podiatrist to discuss the issues.

## Intro to subject

With the forthcoming Olympics Games 2012 coming to London, the UK's sports enthusiasts may draw inspiration and motivation from the event. This enhanced motivation may contribute to competitive and recreational athletes developing sports related injuries. In the last Olympics, in Beijing 2008, the International Olympic Committee (IOC) decided to conduct an injury surveillance study. From over 200 countries and nearly 11 000 participants, that took part in the study, over 1000 injuries were documented. This represents that 10% of the athletes sustained an injury, half of which involved "time loss" (Junge et al 2009).

In the UK, sport and exercise is the single leading source of injury, accounting for approximately 33% of all injuries (Uitenbroek, 1996), whilst there is evidence that athletic injury can have adverse psychological consequences for the athlete concerned (Leddy et al., 1994; Quackenbush and Crossman, 1994; Smith, 1996).

Health care professionals are often the first people to discuss injury related emotional and behavioural problems with athletes. In the past, these professionals have stated that they felt limited in their abilities to deal with psychological components of injury, and injured athletes have also reported that health care professionals do not consciously consider the emotional impact of injury (Pearson & Jones, 1992; Gordon et al., 1991).

In a more recent survey of sports medicine physicians, Mann et al. (2007) highlight the lack of resources available for health professionals to deal with the psychological problems of their patient athletes. All members of the interdisciplinary team, working in primary and secondary care, can offer benefits to the patient by considering the wider members of a team that could be included in the referral pathway at the appropriate stage. Mann et al conclude that sports medicine physicians would benefit from increased collaboration with sport psychologists who are specifically trained to deal with the unique needs of athletes and who have a greater understanding of the psychological issues associated with the management and education of injured athletes.

## Prevalence & Epidemiology of Achilles injuries

Overuse injuries may account for up to half of all athletic injuries and that, of those injuries, it is the Achilles tendon that is among the most prone to overuse. Tendon problems account for up to 18% of injuries in runners and 4% of patients presenting to sports medicine clinics (Magnussen 2009; van Usen & Pumberger 2007).

According to Kingma et al. (2006) up to 9% of participants in sports that involve running or jumping will experience this disorder. One serious consequence of a chronic injury to the Achilles is the potential to rupture. Poor tendon vascularity contributes to degenerative changes, and the area with the poorest blood supply is most susceptible to rupture (often described to be the mid portion of the tendon). It is suggested that this might account for around 20% of all tendon ruptures (Chen et al., 2009). It must be remembered, however, that recent studies have shown that around a third of chronic Achilles tendinopathies are in inactive people, thereby suggesting that physical load should be considered more as a factor that provokes the disorder rather than an aetiological cause (Kingma et al., 2006).

## Aetiology of Achilles Tendonopathy

There are various theories concerning the aetiology of Achilles tendinopathy, but by and large it is widely accepted that, to date, the aetiology remains unknown (Magnusen, 2009; van Usen & Pumberger, 2007; Kingma et al., 2006).

In the case of James, one of the key treatment tools has been concentrated on anti-inflammatory management yet there is a current stream of evidence that suggests Achilles tendinosis is a non-inflammatory condition that involves intratendinous degeneration and atrophy due to a failed healing response along with repetitive microtrauma, aging or a combination of these (Heckman et al., 2009; Alfredson and Cook, 2007; Öhberg et al., 2004; Cook et al., 2002).

For musculoskeletal therapists, load appears to be a primary issue in directing the focus of management. Poor adaptation to load and loading may be, in part, due to poor conditioning which may involve overload or under load. This requires attention to conditioning of the tendon for fitness for purpose.

However one must also consider various alternative contributing factors as seen in Table 1 below.

Table 1 Achilles Tendonopathy: Causes and/or Risk Factors	
<b>Specific Causes</b>	
<b>Inflammatory</b>	<b>Mechanical</b>
RhA	Soft tissue contracture of triceps surae
Ankylosing Spondylitis	Bony abnormality of talocrural joint
	Overuse
	Pathomechanical structure and/or function
	Fracture
<b>Metabolic</b>	<b>Others</b>
Cholesterol	Tumour
Menopause	Infection
<b>None Specific Causes</b>	<b>None specific factors increasing risk of developing chronic pathology</b>
Unknown causes	Being overweight
	Smoking
	Pregnant
	Long term use of medication (e.g. corticosteroids)
	Stress
	Depression
	Occupation

Health care practitioners involved in rehabilitation of an injury to the Achilles tendon should also consider biomechanical analysis and appropriate intervention to any altered pathomechanics. This, when contextualised, refers to the functional application and use of the structures involved.

### Severs Disease

Severs is a disease is a common condition affecting 2-16% of MSK injuries in children (James et al., 2010) and which was first described by Sever in 1912. It is an inflammatory condition at the site of the calcaneal apophysis. Originally it was associated with physically active and overweight children but, with the onset of organised sport, it is now commonly associated with increased sporting activity, particularly in young boys. According to Porter and Schon (2008), Sever's disease is a traction apophysitis causing pain on the secondary calcaneal ossification centre. This is under the influence of the Achilles tendon which creates strong traction forces longitudinally across the surface of the epiphysis. James et al. (2010) suggest that calcaneal apophysitis is an overuse syndrome thought to be caused by repetitive micro trauma due to the increased traction of the Achilles tendon. Due to the growth

centre (apophysis) appearing around 7 years of age and fuses in girls at around 13 and boys at 15 years old, this is why is recognised to be a self limiting issue for pre-adolescents. According to James et al., (2010) the aetiology may be due to:

- Tightness of the triceps surae
- Growth periods that increase the tension and therefore traction of the pull on the insertion of the Achilles at the growth plate.
- Poor biomechanics (pathomechanics)
- Infection
- Trauma (repetitive or single) although it is acknowledged that there is a poor evidence base to support this.
- Obesity

### Impact on the person

Whilst the exact aetiology and diagnostic testing and management vary considerably, it is recognised that in chronic Achilles tendinopathy, subjects initially only feel the effects during the loading periods but in time this also occurs during rest periods. Eventually many patients significantly reduce their physical activity levels or completely cease sporting activities. This, in turn, may have a negative impact on their overall health and general well-being (Kingma, 2006).

James' emotional response to the injury is quite common, and similar responses have been well documented. In a study of athlete responses to season-ending ski-injuries, Udry et al. (1997) identified three categories of response. Most injured athletes initially undergo a period of self-reflection or injury-relevant information processing where they consider the circumstances leading up to the injury, the extent of the injury, the likely consequences of the injury in terms of pain and/or restricted movement, as well as the likelihood of an eventual return to training etc. This period of contemplation is frequently accompanied by considerable emotional upheaval. Thatcher et al. (2007), citing the work of Udry et al. (1997) and Pearson and Jones (1992), suggest that athletes suffering from a sport related injury "are likely to experience a range of negative psychological and emotional responses such as fear of re-injury, loss of identity, anger, frustration, depression and disbelief". Over a period of time, which can vary, the athlete will in most cases accept the reality of being injured, start to develop coping strategies and adopt a more positive attitude to recovery and a return to sport activity.

The practice nurse in this instance has shown considerable discernment in referring the patient to a sport psychologist; several studies examining the role of psychological intervention in injury rehabilitation have reported positive outcomes. In a study of athletes recovering from ACL reconstructive surgery, Cupal and Brewer (2001) demonstrated that guided imagery, coupled with relaxation exercises, had a significant impact in reducing patient anxiety about possible re-injury and also facilitated faster gains in knee strength. This latter conclusion supports the earlier work of Ilevleva and Orlick (1991) who reported that faster healing athletes demonstrate greater use of psychological skills such as goal-setting, positive self-talk and imagery. This may be because, as Scherzer et al. (2001) reported, goal setting

and positive self-talk improves adherence to home-based exercise rehabilitation programmes.

Weinberg and Gould (2011) suggest that a holistic approach to injury recovery, combining physical therapy with psychological skills training, requires a good understanding of the process of psychological rehabilitation. Citing the work of Bianco et al. (1999), Weinberg and Gould describe three phases of injury recovery and the type of help required at each phase. In the initial injury phase, where diagnosis and its subsequent implications may be as yet undetermined, the clinician should focus on helping the athlete deal with the emotional upheaval. During the second rehabilitative phase, the focus should be on helping the athlete sustain motivation and adherence to rehabilitation protocols. The third phase is where the athlete returns to full activity and where it has been noted that *“even though an athlete may be physically cleared for participation, his recovery is not complete until he can return to normal functioning within his sport”* (Weinberg and Gould, 2011).

In the case of James, it is the practice nurse who provides the initial support to the athlete during the immediate post-injury period. This is a time when athletes typically display the greatest negative emotions (Quinn & Fallon, 1999). To help the athlete overcome these emotions, the practice nurse must be honest in coming to a shared understanding of the injury. Like all sports medicine/injury rehabilitation personnel, the practice nurse should respond to anxieties about treatment and its potential for success (Christakou and Lavalley, 2009). Weinberg and Gould (2011) emphasise the importance of building rapport with the injured athlete, noting that health care professionals should demonstrate their understanding of the psychological impact of injury, provide emotional support. The practice nurse should describe the injury, and its cause, avoiding terminology that the athlete may not understand. He/She should discuss the proposed treatment including the exercise protocol, likely timescales, and the expectations of pain. She must be realistic and quite honest about the likelihood of full recovery and an eventual return to sport. Weinberg and Gould (2011) also note that the health care professional should be positive and stress a team approach to recovery.

### Assessment

The case study that has been presented illustrates how a low grade and chronic problem such as Sever's or Achilles tendinopathy can be, to a certain extent, ignored. Sever's is a condition that is recognised to have a level of self limitation and therefore allows the sufferer to continue with activities in the knowledge that, if they can tolerate the pain, then perhaps they can continue without causing any long term effects. A mild but chronic Achilles tendinopathy, as is found in this case, can arise concomitantly with the Sever's. The correct diagnosis is essential and will influence the management plan from a physiological perspective. X-rays may be beneficial in ruling out fractures or tumours but may not be diagnostic for either Sever's disease or Achilles tendinopathy (Porter & Schon, 2008). What is essential for the clinicians involved is to ensure that all the predisposing factors that contribute to this disease aetiology are considered in the assessment process. This must include the obvious issues which relate to the traction apophysitis and therefore the external forces that

are being placed on the area by the Achilles. This therefore indicates the need for a functional assessment of the leg and foot and especially during gait.

To ensure holistic injury recovery, Brewer (2007), and Bauman (2005) have suggested that both physical and psychosocial aspects of the injury need to be addressed. Wiese-Bjornstal et al. (1998) identified a range of psychosocial variables such as life stress, motivation, and social support that may impact upon an athlete's well-being, rehabilitation progress, and return to sport following injury. In a more recent study, Rees et al. (2010) cite other research studies in stating that there is empirical evidence to show that social support enhances the well-being of injured athletes by reducing stress (Bianco et al., 1999), preventing perceptions of isolation and fear of re-injury (Podlog and Eklund, 2004), increasing motivation (Bianco, 2001) and rehabilitation adherence (Johnston and Carroll (1998), and increasing self-confidence (Magyar and Duda, 2000).

### Possible barriers to management

One of the key issues for James' recovery is the fact that he may find it difficult to separate the two conditions, i.e. that of Sever's disease and the Achilles tendinopathy which may or may not, be linked. If a gait assessment highlights an obvious contribution to the pathomechanics of the functioning of the Achilles then it may be treatable and even treated conservatively. One barrier to recovery, or at least to the holistic well being of this young man, is the fact that he is suffering from an ongoing condition that has reduced his confidence in achieving a permanent recovery.

### Management

The Department of Health have attempted to improve the outcomes of long term musculoskeletal conditions under 'The National Service Framework (NSF) for Long Term Conditions'. One of the initiatives to achieve this is the development of the Musculoskeletal Framework (MSF) which describes best practice, built around evidence and experience. The central tenet of this is to:

- Provide the appropriate level of high-quality information, support and treatment to those with musculoskeletal conditions.
- Support and treatment should be offered as close to home as possible.
- Be holistic in approach, addressing psychological and social needs as well as the physiological.
- For many people with musculoskeletal conditions, assistance with the management of their condition will be as important as its treatment.

With James, some clear issues that the practice nurse has identified are directly related to the core themes of the MSF. The first point above indicates how essential it is to establish what level of pathology exists and to which structures. This can then be targeted with an appropriate and evidence based management strategy.

The understanding here is that the Sever's disease is not related to the Achilles and that James' confidence in recovering has been affected by the lack of clarity and appropriate referral pathways to resolve the aetiological factors involved in his diagnosis of Achilles tendinosis.

The second key issue for the practice nurse to recognise is the holistic approach in addressing the psychological and social needs that is proposed in the MSF. A referral to include a sports psychologist should be in the management planning from an early stage once this has been recognised.

### The Rehabilitation process

The aim of the rehabilitation process is a twofold focus on;  
a) physiological and b) psychological approaches:

#### Physiology – the general principles of physiological rehab are:

- Reduce initial pain & swelling (appropriate use of: - rest, ice, off loading orthoses, strapping, pharmacological intervention e.g. NSAIDS).
- Maintain & improve mobility & flexibility - Restore a good balance of muscle length and strength (eccentric and concentric activities that are proportional to the mechanical assessment with particular reference to the dorsiflexion capacity at the ankle. One must also be assured of the cessation of any active Severs when using eccentric activities). This will concentrate on patient activity concentrating on the separate structures within the triceps surae.
- If passive and active physical stretching does not improve things then night splints may be used to progress this.
- Perturbation including electrotherapies, deep transverse friction massage, and proprioception training.
- Behaviour and training modification (starting to consider cause of problem and the key to unlocking a successful return to activities – this is inextricably linked to the therapeutic psychological input).
- Consideration of and appropriate referral to elective surgical input.
- A controlled return to normal and competitive activities

#### Psychological

As noted earlier, the psychological focus during the second rehabilitation phase should be on helping the athlete to sustain motivation and so adhere to rehabilitation protocols. Empirical research has identified a number of psychological skills, including goal setting, positive self-talk, imagery and relaxation which are considered to enhance rehabilitation adherence (Petitpas and Danish, 1995).

According to Christakou and Lavallee (2009), “realistically achievable goals create positive expectations and beliefs about goal attainment, thereby enhancing motivation and adherence to the rehabilitation programme”. In the case study, the podiatrist will seek to reduce pain & swelling with appropriate use of rest, ice, orthoses, strapping etc. before prescribing exercises to restore an appropriate balance of muscle length and strength, with particular reference to the dorsiflexion capacity at the ankle. The podiatrist and athlete should agree upon some simple, short term goals and these should be monitored. Initially, these might include the number of times per day that ice should be applied and the duration of each application. Theodorakis et al. (1996) found that personal performance goals helped to reduce recovery time in a study of knee-injured participants. Once the athlete has commenced the exercise regimen, the podiatrist should set performance goals with

respect to the number of exercise sets and repetitions to be performed per day, as well as specific improvements in muscle strength and ankle flexion. Longer term goals might include specific dates for a return to training and competition.

Christakou and Lavallee (2009) noted that “athletes who have negative cognitive appraisals of an injury tend to have negative thoughts that can lead to emotional disturbance and subsequently possible non-compliance to rehabilitation programmes”. In the case study, the athlete feels that he has not recovered from a previous injury and is thinking negatively about the likelihood of full recovery. These negative thoughts may include fear of re-injury, loss of identity, anger, frustration, depression and disbelief (Thatcher et al., 2007). Scherzer et al. (2001) support the use of positive self-talk in enhancing adherence to rehabilitative exercises. The podiatrist should encourage the athlete to recognise negative thinking and to practise thought stoppage techniques such as shouting “NO” or clapping his hands to break the train of negative thoughts. Once broken, the athlete should engage in positive self-talk making statements such as “I am achieving my rehabilitation goals, my calf strength is improving, and I will beat this injury”.

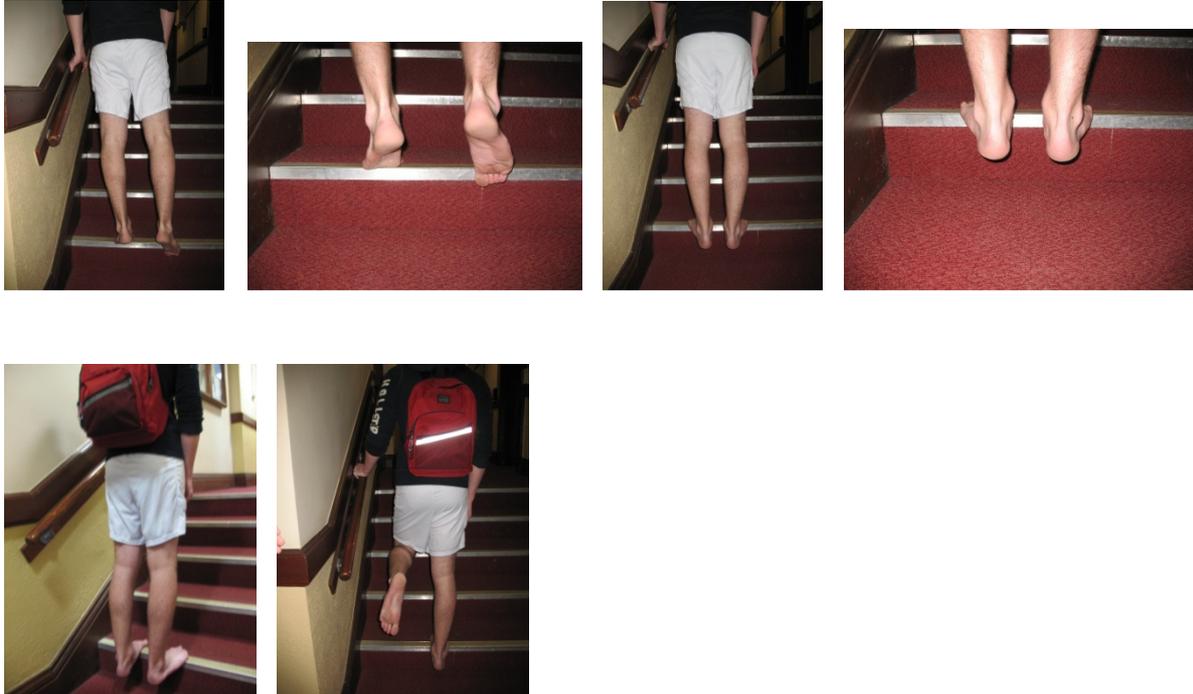
Although many athletes are trained to use imagery to improve performance, fewer athletes use imagery to aid recovery from injury. Ievleva and Orlick (1991) reported that positive healing imagery and mental rehearsal of performance can speed up recovery and help to maintain technical skills. The practice nurse has already provided a detailed description of the injury and the healing process. The sport psychologist, to whom the athlete has been referred, has the specific skills needed to devise a psychological skills training programme that will help the athlete to visualise the healing that is occurring during and after treatment sessions. To maintain motivation, he should practise visual rehearsal of effective sprint training and a successful return to competition.

Pain tolerance is an important factor in adherence to rehabilitation, as athletes may cease to adhere to an exercise programme if they perceive it to be too painful. Fisher et al. (1988) reported that adherents to a rehabilitation programme were better able to tolerate pain than non-adherents. Pain increases muscle tension so techniques to reduce muscle tension can be beneficial in the healing process. Whitmarsh and Alderman (1993) stated that relaxation techniques such as progressive relaxation can be used to relieve pain and stress which often accompany the recovery process. There are a variety of scripts freely available to guide the athlete through the stages of progressive relaxation. Also, when a person is tense, “breathing is frequently short, shallow and irregular” and controlled breathing techniques can restore deep, rhythmic breathing and so trigger a relaxation response (Weinberg and Gould, 2011).

### **Outcome of the Practice Nurse Referral**

After the referral from the Practice Nurse, James’ management plan was changed considerably to address both his physical and emotional needs. The podiatrist instigated a gait analysis which highlighted an early heel rise when walking and jogging. Since he was a sprinter this may have been due to the amount of time he spends forefoot running and in some way bringing about an overuse and contracture of the posterior sural muscle group. It may have been due to the altered functioning of the Achilles tendon which was a consequence of his Sever’s disease where he adopting an antalgic gait for a long period of time. An MRI was used to confirm the

cessation of any active Sever's disease. From here, the podiatrist spent some time with the James and initiated an exercise program which included Alfredson's Eccentric Drop program. James can be seen learning this technique in images 1-6 below.



The eccentric exercises are aimed at reducing the stiffness and improving the function of the tendon. There are also suggestions that this form of exercise also stimulates remodelling and tissue repair in the tendon substance (van der Plas et al., 2011). This remains the preferred management option for this condition by many therapists and is founded on best current evidence (van der Plas et al., 2011; Alfredson and Cook, 2007; Wasielewski et al., 2007; van Usen and Pumberger, 2007; Kingma et al., 2006; Öhberg et al., 2004; Cook et al., 2002; Mafi et al., 2001).

Following this, a strengthening program was started to ensure the appropriate balance of the stretch shortening cycle of this tendon in normal use which was part of the return to activities as advocated by Allison and Purdam (2009). Finally, the podiatrist considered the use of orthotic therapy which may be of benefit to the James. In a systematic review by Munteanu and Barton (2011) foot orthoses are thought to reduce the risk of individuals either; developing and/or improve the effectiveness of; interventions to manage Achilles tendonosis. This is thought to be achieved through normalising specific transverse plane tibial moments and rearfoot kinematic variables including; ground reaction force and plantar pressures.

With assistance from the sport psychologist, the athlete responded well to short term goal-setting. He agreed to maintain a simple wall chart to record details of his exercise regime and so became active in monitoring progress. As he noted gains in muscle strength and improvements in ankle flexion, his confidence in making a full recovery has increased and he is starting to talk about a return to competitive sport. Although there have been setbacks in the recovery process, he is less prone to

negative thinking and more proficient in the techniques of thought stopping and positive self-talk. With thoughts of a return to competition in the near future, he has started to practise visual rehearsal of training drills and to experience the emotions of winning.

At a three month follow up from the return to normal activities James reported a significant reduction in pain and an increased confidence in his ability to continue at his expected level of competition.

### Conclusion

Physiology and psychology have their importance in management of sports injuries. Recognising the key issues and then acting with decisive points of intervention is crucial in optimising outcomes for the injured athletes.

Research suggests that health care practitioners, involved in the rehabilitation of sports injuries, should adopt a holistic approach to treatment addressing both the physical aspects of the injury, as well as the psychosocial needs of the athlete. This requires practitioners to be aware of, and sensitive to, typical emotional responses to injury. These might include stress and anxiety concerning recovery and return to competition, as well as decreased confidence and motivation due to a deteriorating physical condition. In the case of James, the injured track athlete, a team of health professionals which included his GP, the practice nurse, a podiatrist, and a sport psychologist were all involved in his treatment. Between them, the team provided an accurate clinical diagnosis, an appropriate intervention of rest, ice, orthoses, strapping as well as strengthening and flexibility exercises. They also educated the athlete about the injury and the recovery process, and taught some specific psychological coping skills.

### Conflicts of interest

There are no conflicts of interest

## **References**

- Allison GT., and Purdam C Ecentric loading for Achilles tendinopathy strengthening or stretching? (2009) *Br. J. Sports Med.* 2009; 43;276-279
- Bauman, J. (2005). Returning to play: the mind does matter. *The Journal of Clinical Sports Medicine*, 15, 432-435
- Bianco, T., Malo, S., & Orlick, T. (1999). Sport injury and illness: Elite skiers describe their experiences. *Research Quarterly for Exercise and Sport*, 70(2), 157-169.
- Chen, C.T. et al (2009) The Arterial Anatomy of the Achilles Tendon: anatomical study and clinical implications, *Clinical Anatomy*; 22:377-385
- Bianco, T. (2001). Social support and recovery from sport injury: elite skiers share their experiences. *Research Quarterly for Exercise and Sport*, 72, 376-388
- Brewer, B.W. (2007). Psychology of sport injury rehabilitation. In G. Tennenbaum & R.C. Eklund (Eds.), *Handbook of Sport Psychology* (3<sup>rd</sup> ed.). Wiley and Sons Inc., 219-233
- Christakou, A., and Lavallee, D. (2009). Rehabilitation from sports injuries: from theory to practice. *Perspectives in Public Health*, 129(3), 120-126.
- Cook JL., Khan KM., Purdam C (2002) Achilles Tendinopathy. *Manual Therapy* 7 (3) 121-130
- Cupal, D.D., and Brewer, B.W. (2001). Effects of relaxation and guided imagery, reinjury anxiety, and pain following anterior cruciate ligament reconstruction. *Rehabilitation Psychology*, 46(1), 28-43.
- Department of Health (2005) National Service Framework for Long Term Conditions. DH, London
- Department of Health (2006) The Musculoskeletal Services Framework. A Joint Responsibility: Doing It Differently. <http://bit.ly/nQSSba> (accessed 16 August 2011)
- Fisher, A.C., Domn, M.A., and Wuest, D.A., (1988). Adherence to sports-injury rehabilitation programmes. *Phys Sportsmed*, 16, 47-52.
- Gordon, S., Milios, D., and Grove, R.J. (1991). Psychological aspects of recovery process from sport injury: The perspective of sport physiotherapists. *Australian Journal of Science and medicine in Sport*, 23(2), 53-60.
- Håkan Alfredson, J Cook (2007) A treatment algorithm for managing Achilles tendinopathy: new treatment options. *Br J Sports Med* 2007;41:211–216. doi: 10.1136/bjism.2007.035543
- Hardy, C.J., & Crace, R.K. (1990). Dealing with injury. *Sport Psychology Training Bulletin*, 1(6), 1-8.

Heckman DS., Gluck GS., Parekh SG., (2009) Tendon disorders of the foot and ankle Part 2. *Am J Sports Med* June 2009 vol. 37 no. 6 1223-1234

Ivleva, L., & Orlick, T. (1991). Mental links to enhanced healing. *The Sport Psychologist*, 5(1), 25-40.

James AM., Williams CM., Haines TP., (2010) Heel raises versus prefabricated orthoses in the treatment of posterior heel pain associated with calcaneal apophysitis (Sever's Disease): study protocol for a randomised controlled trial. *Journal of Foot and Ankle Research* 2010 3:3

Johnston, L.H., and Carroll, D. (1998). The context of emotional responses to athletic injury: a qualitative analysis. *Journal of Sport Rehabilitation*, 7, 206-220.

Kingma JJ., Knikker R de., Wittink HW., Takken T., Eccentric overload training in patients with a chronic Achilles tendinopathy: a systematic review. *Br J Sports Med* 2007 41: e3 originally published online October 11, 2006 (accessed online: 21<sup>st</sup> January 2012)

Leddy, M.H., Lambert, M.J., and Ogles, B.M. (1994). Psychological consequences of athletic injury among high level competitors. *Research Quarterly for Exercise and Sport*, 65, 347-354

Mafi N., Lorentzon R., Alfredson H. (2001) Superior short-term results with eccentric calf muscle training compared to concentric training in a randomized prospective multicenter study on patients with chronic Achilles tendinosis. *Knee Surg, Sports Traumatol, Arthrosc* (2001) 9: 42-47

Magnussen RA, Dunn WR, Thomson AB., (2009) Nonoperative Treatment of Midportion Achilles Tendinopathy: A Systematic Review. *Clin J Sport Med* Volume 19, Number 1, January 2009

Magyar, T.M., and Duda, J.L. (2000). Confidence restoration following athletic injury. *The Sport Psychologist*, 14, 372-390.

Mann, J.M., Grana, W.A., Indelicato, P.A., O'Neill, D.F., and George, S.Z. (2007). A Survey of Sports Medicine Physicians Regarding Psychological Issues in Patient-Athletes. *The American Journal of Sports Medicine*, 35(12), 2140-2147

Munteanu SE., and Barton CJ., (2011) Lower limb biomechanics during running in individuals with Achilles tendinopathy: a systematic review. *Journal of Foot and Ankle Research* 2011 4: 15

Öhberg L., Lorentzon R., Alfredson H (2004). Eccentric training in patients with chronic Achilles tendinosis: normalised tendon structure and decreased thickness at follow up. *Br J Sports Med* 2004; 38: 8-11

Pearson, L., and Jones, G., (1992). Emotional Effects of Sports Injuries: Implications for Physiotherapists. *Physiotherapy*, 78(10), 762-770.

- Petitpas, A., & Danish, S. (1995). Caring for injured athletes. In S. Murphy (Ed.), *Sport psychology interventions*, Champaign, IL: Human Kinetics, pp. 255-281
- Podlog, L. and Eklund, R.C. (2004). Assisting injured athletes with the return to sport transition. *Clinical Journal of Sport Medicine*, 14, 257-259.
- Porter DA, Schon LC (2008) Baxter's The Foot and Ankle in Sport, 2<sup>nd</sup> edition Elsevier pp 543-544
- Quackenbush, N. and Crossman, J. (1994). Injured Athletes: a study of emotional responses. *Journal of Sport Behaviour* 17, 178-189
- Quinn, A.M., & Fallon, B.J. (1999). The changes in psychological characteristics and reactions of elite athletes from injury onset until full recovery. *Journal of Applied Sport Psychology*, 11, 210-229.
- Rees, T., Mitchell, I., Evans, L., and Hardy, L. (2010). Stressors, social support and psychological responses to sport injury in high- and low-performance standard participants. *Psychology of Sport and Exercise*, 11, 505-512.
- Scherzer, C.B., Brewer, B.W., Cornelius, A.E., Van Raalte, J.L., Petitpas, A.J., Sklar, J.H., Pohlman, M.H., Krushell, R.J., and Ditmar, T.D., (2001). Psychological skills and adherence to rehabilitation after reconstruction of the anterior cruciate ligament. *Journal of Sport Rehabilitation*, 10, 165-172.
- Smith, A.M. (1996). Psychological impact of injuries in athletes. *Sports Medicine*, 22, 391-405
- Thatcher, J., Kerr, J., Amies, K., and Day, M. (2007). A Reversal Theory Analysis of Psychological Responses During Sports Injury Rehabilitation. *Journal of Sport Rehabilitation*, 16, 343-362
- Theodorakis, Y., Malliou, P., Papaionnou, A., Beneca, A., and Filactakidou, A. (1996). The effect of personal goals, self-efficacy, and self-satisfaction on injury rehabilitation. *Journal of Sport Rehabilitation*, 5, 214-233.
- Udry, E., Gould, D., Bridges, D., & Beck, L. (1997). Down but not out: Athlete responses to season-ending ski injuries. *Journal of Sport and Exercise Psychology*, 3, 229-248.
- Uitenbroek, D.G. (1996). Sports, exercise , and other causes of injuries: Results of a population survey. *Research Quarterly for Exercise and Sport*, 67, 380-385
- Van de Plas A., de Jonge S., de Vos, RJ van der Heide, HJL., Verhaar JAN., Weir A., Tol JL (2011). A 5-year follow-up study of Alfredson's heel-drop exercise programme in chronic midportion Achilles tendinopathy. *Br J Sports Med* Published online 10<sup>th</sup> November 2011.

Van Usen C. and Pumberger B., (2007). Effectiveness of Eccentric Exercises in the Management of Chronic Achilles Tendinosis. *The International Journal of Allied Health Sciences and Practice*. Vol 5 no 2

Wasielowski NJ. and Kotsko KM., (2007). Does Eccentric Exercise Reduce Pain and Improve Strength in Physically Active Adults With Symptomatic Lower Extremity Tendinosis? A Systematic Review. *Journal of Athletic Training* 2007; 42 (3): 409-421

Weinberg, R.S., & Gould, D. (2011). *Foundations of Sport and Exercise Psychology* (5<sup>th</sup> ed.), Champaign, IL: Human Kinetics, 447-461.

Whitmarsh, B.G., and Alderman, R.B., (1993). Role of psychological skills training in increasing athletic pain tolerance. *Sports Psychology*, 7, 388-399.

Wiese-Bjornstal, D.M., Smith, A.M., Shaffer, S.M., and Morrey, M.A. (1998). An integrated model of response to sport injury: psychological and social dynamics. *Journal of Applied Sport Psychology*, 10, 46-69