Tri-annual review of sports therapy theory and practice

Journal of Sports Therapy

WINTER 2009, VOLUME 3 ISSUE 1

Contents

Welcome to the third edition!

We have made a number of changes to both the overall appearance of the publication, and have also added another regular feature to the contents – that of a series of discussions and guidelines that is intended to support academics, practitioners, and students in terms of the concepts and methodologies required to successfully conduct research. We hope you find the series both thought-provoking and useful.

Today's athletes often have access to a highly skilled multi-disciplinary team of physiotherapists, sports therapists, sports doctors, physiologists, strength and conditioning specialists, performance analysers, biomechanists, psychologists, and nutritionists, with each providing specific, specialist services to the athlete. Sports medicine and sports science practioners play a vital role within this team in preparing athletes in terms of both injury prevention and rehabilitation, in addition to providing a competitive edge over opponents. It is essential that sports therapists possess knowledge of the roles that each of these professionals plays within the team, because the methods employed by each professional will subsequently impact upon the treatment given by the sports therapist. In addition to this, non-athlete clients will normally have been treated and possibly referred by a doctor, physiotherapist, or other healthcare practioners before arriving on the sports therapist's couch. Moreover, the clients' involvement in recreational exercise or sports may have contributed to their injuries. Thus, to treat non-athletic clients sports therapists still require knowledge of the effects that treatments delivered by other healthcare professionals may have on clients' conditions. In addition to this, the sports therapist will need to develop a rehabilitation plan based on a client's condition in order to restore optimal function. The Journal of Sports Therapy wishes to reflect this need for sports therapists to be knowledgeable across a number of disciplines, and therefore, invites articles from area's including sports medicine, biomechanics, performance analysis, strength and conditioning, nutrition, and sports psychology.

Please feel free to offer us the benefit of any comments on the material contained in this journal, and also to share your views as to how we may improve and develop the material published here in the future.

Ian Lahart and David Jenkins

AN ONLINE JOURNAL HOSTED BY UCB University College Birmingham
IN COLLABORATION WITH Coventry University

http://jst.ucb.ac.uk Volume 3. Issue 1. Journal of Sports Therapy

Original Research

The design of a judo-specific strength and conditioning programme

Part I: The needs analysis.

Paul Robertson BSc and Ian Lahart MSc, CSCS.

KEY WORDS

Judo.
Physiology.
Strength and Conditioning.

ABSTRACT

Effective strength and conditioning programmes are designed to optimally prepare athletes to meet the specific demands of their particular sport. To appreciate the unique demands of any sport a needs analysis of that sport must first be performed. This article presents has been separated into two parts. The first part of this article explores the latest findings from the literature in regards to the specific technical and metabolic demands that Judo competition exerts on participants. In addition to this, physiological characteristics of elite competitors are explored to find possible determinants of successful performance in each sport. These determinants are then used to establish a sample judo specific testing protocol. Part II of this article shows how the information gathered from part I can be applied to the design of a judo-specific strength and conditioning programme.

Introduction:

In accordance with the law of specificity, effective judo strength and conditioning programmes must stress the physiological systems specific to judo competition. Therefore, an understanding of the physiological effects elicited during and after judo competition first needs to be understood. In addition to this, by analysing the demands placed on the judoka (judo athlete) during competition specific determinants of successful performance can be identified. A judo-specific strength and conditioning programme can then be designed to both effectively simulate in a training environment the physiological stresses imposed on the athlete in competition, and enhance identified determinants of successful performance.

Judo Needs Analysis

Technical characteristics

Judo is a predominantly anaerobic, intermittent combat sport (Franchini et al., 2003) consisting of numerous explosive efforts separated by constant pulling, pushing, lifting, grappling and gripping movements (Harrison et al., 2007). In addition to the physical demands, the sport has a large technical and tactical component and with the requirement of judoka to wear a gi (jacket type garment secured with a belt) the technical aspect is further emphasised (Amtmann & Berry, 2003).

Judoka utilise throwing techniques to force an opponent to the ground, and once there groundwork is used to pin an opponent or force them into submission. As in other combat sports judoka are split into weight categories and at senior level bouts are scheduled for 5-min real-time (i.e., clock is paused when the bout is paused). The judoka accumulating the most fractional points over the course of the match will win. However, if an ippon (full point) is achieved by a judoka before the 5-min period ends, the bout will cease and that player awarded the victory. An ippon can be achieved by accumulating sufficient fractional points using numerous combinations, throwing an opponent directly onto their back, pinning an opponent on their back for 25s, or by forcing an opponent to submit utilising a chokehold or joint lock (International Judo Federation, 2003). If scores are level at the end of the 5-min period then the first judoka to score any form of point will win the contest during a subsequent 5-min "golden score" period. If no score is achieved during this period then the judges' decision will decide the bout.

The physiological demands of judo competition can vary due to the variety of tactics and techniques available to the judoka. Tachi-waza (standing combat) predominates over ne-waza (groundwork combat) in simulated combat with twelve sequences of tachi-waza lasting on average 21s compared to six sequences of ne-waza lasting on average 11s (Franchini et al., 2005), furthermore in elite judo competition judoka utilise ashi-waza (leg techniques) in preference to te-waza (arm techniques) possibly due to a lower O2 requirement for ashi-waza (Franchini et al., 2005). Furthermore, Franchini and colleagues (2005) found that use of te-waza was positively correlated with post-bout blood lactate concentrations.

Almansba et al. (2008) observed that judoka of different statures may adopt different approaches with lighter judoka (< 66kg) adopting more arm techniques such as seoi nage (one-arm shoulder throw) as their stature allows them to perform throws at a

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quicker rate and with less effort. However, Blais and colleagues (2007) in their 3-dimensional analysis of the morote seoi nage (two-arm shoulder throw) technique identified that the main driving moments and greatest energy expenditure in this so-called arm technique come from the lower limbs and trunk through all phases of the throw. Therefore perceived demands may not necessarily match actual demands for certain techniques.

Physiological analysis of judo competition

Sikorski et al. (1987) observed that 39% of judo competition consisted of high intensity activity lasting 11-20s with 80% of rest/breaks lasting 0-10s. Furthermore, this study reported a mean period of work time of less than 25s and rest periods of no more than 10 s duration. Previous judo research have estimated work-to-rest (W: R) ratios of 1.5 and 3: 1 (Franchini et al., 2003, Franchini et al., 2007). Average heart rate values of 92% of age-predicted maximum heart rate (HRmax) have been measured during 5-min of simulated judo combat (Degoutte et al., 2003), while similar heart rate values of 91.4% of HRmax have been reported during actual judo competition (Bonitch et al., 2005).

The anaerobic energy systems provide the short and explosive all-out bursts of maximal strength and power characteristic of judo competition (Harrison et al., 2007). This anaerobic nature of judo combat is confirmed by post-bout blood lactate concentrations of 10 (± 2.1) mmol/L-1 found in male national and international Brazilian judoka (mass < 100 kg) (Franchini et al., 2003). These findings highlight the contribution of anaerobic glycolysis to energy production, and are similar to other post-bout blood lactate concentrations found in judoka across weight categories and competitive levels (Franchini et al., 2003; Franchini et al., 2005; Degoutte et al., 2008).

However, whilst post-bout blood lactate concentrations indicate significant anaerobic contribution to energy production the high levels of aerobic power seen in judoka point to an important role played by aerobic metabolism during judo competition. An efficient aerobic system is required for the sustained effort necessary for potentially 5 min duration (Harrison et al., 2007). Degoutte et al. (2003) found significant increases above resting values in free fatty acids, triglycerides and glycerol when measured 3 min after a simulated 5-min combat situation, thus implicating lipid metabolism despite mean post-bout plasma concentrations of lactate of 12.3 mmol/L-1. However, it should be noted that the mean carbohydrate intake of the athletes in this study was < 332g/day, well below the recommended daily amount for a non-athletic population. Therefore, the judoka glycogen stores may not have been at maximum resulting in a greater reliance on aerobic metabolism for energy production during the bouts.

Injury analysis

In addition to the demands of throwing actions placed upon the judoka, being thrown and avoiding conceding an ippon places significant stress upon the cervical region of the spine (Amtmann & Cotton, 2005; Kochhar et al., 2005) The o goshi (hip toss) technique is executed in an average time of 0.29s and has been found to subject the body and head to forces similar to those observed in road traffic accidents (Kochhar et al., 2005). Furthermore, Kochhar and colleagues (2005) observed that in elite judokas impact with the floor resulted in a mean posterior translation of the head of 6.2cm from a starting position of 4-5cm anterior translation, followed by mean anterior translation of 4-5cm, suggesting a significant risk of cervical injury that may be exacerbated by poor technique and inexperience. Additionally, when thrown judoka will often attempt to "post" on their head in order to avoid conceding an ippon (landing wholly on their back) further increasing the risk of cervical spine injury (Amtmann & Cotton, 2005).

However, whilst the action of being thrown does have the potential to result in severe traumatic injury to the cervical spine, it is the knee (Souza et al., 2001) and upper extremities (shoulder, elbow and fingers; Green et al., 2007) that appear to be at the greatest risk of injury. Green and colleagues (2007) noted that the shoulder that was the most commonly injured site, and the action of being thrown accounted for the majority of injuries to female judokas in three university-level judo tournaments. For male competitors, grip-fighting was the most common injury mechanism and consequently the fingers were the most injured site. Bruising was the most common injury, while sprains and strains were the second most common injury, unfortunately, the most common type of injury for each body site was not reported. Interestingly, Green et al. (2007) also observed that those judokas who had engaged in rapid weight loss and lost greater than 5% of their body mass prior to the tournament in order to make a certain weight category were at a significantly higher risk of injury than those losing less than 5% of their body mass. No other significant risk factors for injury were found, although judokas engaging in less than three hours training per week had a higher risk of injury than those engaging in greater than three hours of training.

Souza et al. (2006), using recall of injuries sustained in both training and competition in the previous twelve months, reported that the knee was the most frequently injured site with the shoulder and fingers second and third respectively. Competition resulted in more injuries than training with standing and attempting to execute throws accounting for the most injuries in both scenarios. Unlike Green et al. (2007) Souza and co-workers did report the type of injuries sustained for each body site with sprains, dislocations and contusions being the most common for the shoulder and fingers, and sprains and ligamentous and meniscal injuries being the most common for the knee. Moreover, Majewski et al. (2006) noted that judo, along with skiing, presents the highest risk for injury to the medial collateral ligament (MCL) of the knee when compared to a wide range of sports including soccer, volleyball, wrestling, gymnastics and track and field.

Physiological Characteristics of Elite Judoka

Judo combat places a range of physical demands upon a judoka and it would be expected that judoka of different competitive levels exhibit dissimilar levels of physical capacity. However, physical deficiencies can be compensated for through technical and tactical superiority meaning differences in physical capacity may not always be evident.

Competitive judo is organised by weight divisions (women <48 kg to 78+ kg, men <56 to 100+ kg). Perhaps due to the role that technique and tactics play in judo competition, there exists a wide range in body mass, height and body fat is evident within and between divisions (Marchocka et al., 1984). However, a moderate to low body fat percentage may play some role as male judoka, regardless of competitive level, do not appear to have greater than 13% body fat (Franchini et al., 2003; Franchini et al., 2007). Kubo and colleagues (2006) reported greater fat-free mass (FFM) in competitive elite judoka when compared to non-competitive university judo club members, suggesting that to reach a high standard of competition a certain body composition is required. Furthermore, Kubo et al. (2006) observed significantly higher values for elbow extensor and flexor thickness in competitive university judo club members in comparison to non-competitive members. The authors suggested that this may be due to the importance, for the competitive judoka, to control the distance between themselves and a resistive opponent. Therefore, the measurement of body composition may provide a valuable tool to indicate when a reduction in body fat is required, to signify when a move to a higher weight classification may be necessary due to an increase in FFM, and to assess elbow extensor and flexor muscle thickness (Harrison et al., 2007).

Muscular strength, endurance and power are all essential prerequisites for judo performance and reflect the nature of attacking and defensive manoeuvres as well as the duration of the match (Harrison et al., 2007). Franchini et al. (2007) reported a significant positive correlation between muscle thickness measures and indices of strength, but this did not differentiate between the A (starters) and B and C (reserve) teams of the Brazilian national judo squad. However, all of these athletes could be classed as elite and were likely to undergo similar training as members of the same national squad. Moreover, all athletes demonstrated high levels of strength as measured using 1 repetition maximum (1RM) protocols in the bench press (1.24 kg/kg-1 of body weight), row (1.16 kg/kg-1 of body weight) and squat (1.44 kg/kg-1 of body weight). This provides an indication that certain physical capacities, such as strength, may be required to reach the elite level but that these may not differentiate performance once at that level.

The maximal oxygen uptake (VO2 max) of judoka have been reported to range from moderate (48.3 ml-1·kg-1·min-1) to high (69.9 ml-1·kg-1·min-1) in elite competitors (Degoutte et al., 2003; Franchini et al., 2003; Franchini et al., 2005). However, as with body composition and strength assessment the measurement of VO2 max has not been able to differentiate between judoka of differing competitive levels. Franchini et al. (2003) noted that whilst judoka with higher VO2 max values performed better in an intermittent judo-specific throwing test, maximal aerobic power did not differentiate between competitive levels (Franchini et al., 2003). Nonetheless, given the duration of a competitive judo match and the moderate to high VO2 max of elite judoka, assessment and training of the aerobic energy system is warranted.

However, while aerobic power does not appear to differentiate between competitive levels indices of anaerobic capacity do appear to provide such a distinction, and highlight the importance of the ability to perform repeated bouts of high-intensity work. Franchini and co-workers (2003) demonstrated that performance in high-intensity intermittent exercise (four x upper body Wingate test, with three min passive recovery) significantly distinguished between levels, with the two higher-level groups achieving a greater amount of work over the four trials than the lower level group. Moreover, Franchini et al. (2005) found positive correlations between the number of attacks initiated in combat, performance in two upper body Wingate tests separated by three min recovery, and performance in the intermittent specific judo test. Subjective observations appear to support the link between offensive strategy and anaerobic capacity, suggesting that judoka with higher anaerobic fitness may fight more offensively, while those with a high level aerobic fitness may adopt a more defensive fighting style (Fagerlund et al., 1991; Horswill, 1992; Callan et al., 2000).

Conclusions:

In summary, judo combat is primarily a high-intensity, intermittent anaerobic activity, as evidenced by the high average heart rates (92% of maximal heart rate) and lactate concentrations (~10 mmol/L-1) observed during simulated and actual judo competition. The ability to produce high levels of work repeatedly characterizes high-level judo performance and distinguishes judoka of different competitive levels. Elite status may be achievable with moderate to high levels of aerobic capacity. High levels of aerobic capacity may help to maintain power output when anaerobic energy production decreases and aid recovery from high-intensity activity. In addition to this, due to the possible requirement to compete in multiple judo bouts in a single day, high-levels of aerobic fitness may allow more complete recuperation between bouts.

Judoka are at a high risk of knee, shoulder, elbow and finger injuries due mainly to being thrown, the execution of throws, and grip fighting. Sprains, dislocations and contusions to the shoulder are common, while knee injuries tend to consist of sprains, and ligamentous and meniscal injuries. In addition to this, being thrown and avoiding conceding an ippon can potentially place significant stress upon the cervical region of the spine. Therefore, to reduce injury risk throwing and landing techniques should also be emphasized, and specific strengthening of the neck, shoulder and

knee musculature should be included in judo strength and conditioning programmes as part of a prehabilitation plan. A carefully designed strength and conditioning programme should be designed so that judoka comfortably achieve their weight classification prior to the tournament, and therefore, eliminate the need for rapid weight loss pre-tournament. Furthermore, it is recommended that any programme should consist of over three hour of training in order to fully prepare the judoka for the rigours of competition.

Elite judoka possess relatively low adiposity and high levels of FFM and muscle thickness, therefore, it is important that judo training promotes the attainment of optimal levels of both adiposity and of FFM and muscle thickness. The high bench press, row, and squat 1RM values achieved by elite judokas indicates the need for high strength levels. Furthermore, judoka must deal with an external resistance (i.e., their opponent) therefore a certain level of both upper and lower body strength and power is required, although judo advocates that it is technique and the ability to utilise the mass of an opponent that can bring success.

Tests	Equipment	Comments
Body composition:		
Skinfold measurements	Calipers	To reduce error use sum of skinfold's rather than % body fat. Use to monitor skinfold thickness at each site
Strength, power, and muscular endurance:		
Handgrip strength	Handgrip dynamometer	Complete for both dominant and non-dominant hands
Back Pull	Back pull dynamometer	
1RM Bench Press	Bench, rack, Olympic bar and plates	
1RM Squat	Squat rack, Olympic bar and plates	
1RM Power clean	Olympic bar and plates	
Countermovement vertical jump	Just jump mat/vertec/jump belt	Hands on hips throughout movement
Pull-up test	Wall mounted pull-up station, stopwatch	As many full repetitions (start with arms fully extended, raise body until chin clears top of bar and back to starting position) as possible without rest.
Anaerobic power and capacity:		
Upper and lower body Wingate tests	Monarch arm ergometer and Monarch cycle ergometer, and associated software	
Aerobic power:		
Maximal oxygen uptake test	Laboratory, gas analysis equipment and associated software	Continuous, graded treadmill protocol. Take absolute (L·min-1) and relative measures (ml-1·kg-1·min-1)
Judo specific:		
Special judo fitness test (Sterkowicz and Franchini, 2001)	Tatami (judo mats), stopwatch, 2 x uke (unresisting opponents to be thrown), heart rate monitor	Tori (person executing throws) must be competent in ippon seoi-nage (one arm shoulder throw). Uke must be competent in ukemi (receiving throw and falling).

Table 1. Suggested testing protocols for judo

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http://jst.ucb.ac.uk Volume 3. Issue 1. Journal of Sports Therapy

Reviews and invited commentary

Where do we go from here?

A discussion of future trends in the sports medicine industry.

Edward O'Gorman BSc, MSST.

KEY WORDS

Future of sports medicine.
Sports medicine industry.
Trend.

ABSTRACT

This article principally sets out to investigate the current state of the sports medicine industry in order to make reasonable predictions about the potential development of the industry in the future. The number and diversity of providers of sports medicine has increased in recent years and includes physiotherapists, medical practitioners, osteopaths, massage therapists and sports and athletic trainers (Anderson 2003; Brukner and Khan 2005). These professions all provide sports medicine in different ways and to differing degrees. The effect of market forces on the various professions will be discussed before conclusions can be drawn on the industry as a whole.

The author has conducted a review of the available literature as well as conducted interviews with professionals in the field and these are used in order to draw the personal opinions stated in the conclusion.

Background

Sports medicine is a relatively new subspecialty of medicine. Interest in this area has increased in recent years, as has professional recognition and research (Milne 1999; Abernethy et al. 2002; Rich 2002; Howe 2004; Brukner et al. 2006). Howe (2004) surmises that as the number of people participating in regular exercise increases, there will be a proportional increase in the number of sports-related injuries, and hence a greater demand for the expertise of those who practice sports medicine.

Modern sports medicine was born out of the unique requirements of Olympic athletes; team doctors found their work becoming focused not just on injury prevention and treatment, but also on the optimisation of athletic performance (International Federation of Sports Medicine, 2006). This led to the establishment, in 1928, of the Fédération Internationale de Médicine du Sport (FIMS) an organisation that now encompasses the sports medicine associations of most countries. The rapid evolution of medical science in the 20th century coupled with the increasingly sophisticated systems of athletic training allowed for an extensive expansion of sports medicine (ibid.). It stands to reason that as sport has become more established, more organised and more professional over the past century sports medicine should also develop in this way. Howe (2004) contributes to this assertion by describing the relationship between the commercialisation of sport and sports medicine as 'symbiotic'. The profession may have been founded from the specific needs of athletes but later the industry was driven, like most industries, by money. For a club or athlete, injuries are bad for business and so there is a demand for a practitioner that can not only cure, but also prevent injury.

Sports medicine practitioners were able to expand out of the elite setting as mass-participation in amateur sport took off in the second half of the last century. This surge in sports-participation is illustrated by FA reports (cited by Coghlan 1990) asserting that between 1945 and 1980 the number of football clubs rose from around 12,000 to somewhere in the region of 40,000. The same authors claim demand for sport depends on the state of the British economy, as well as social changes and technological developments. These factors are also important when considering the sports medicine industry.

According to the Barclays Spaces for Sports survey in 2005 (cited on www.physioroom.com - accessed 18/12/06) sporting injuries are sustained by 13.4 million individuals per year in the UK. Yet the Department of Trade and Industry (cited on BASEM website) states that only 700,000 people attended A&E in 2002 with such injuries. It may be reasonable to suggest that the NHS handles the most serious acute sports-related injuries however many chronic and overuse injuries are treated in the private sector (Rowell and Rees-Jones 1988), often as a referral (Finch and Kenihan 2001). This

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sector of the industry is open to the full influence of market forces, on the other hand sports medicine in the NHS may be more directed by politics and policy. This division of one industry into both public and private spheres makes analysing development a more complex issue.

Current issues

So far it has been surmised that sports medicine as an industry has spread from the elite-athlete domain to serving amateur sportspeople, and more recently to serving the wider active population. However recognition of this specialty has not been as simple. It is only within the last decade that the potential of the profession has been officially recognised in the UK. The Government only awarded sports and exercise medicine (SEM) the status of a distinct medical specialty as recently as 2005 (Cullen and Batt 2005). The rationale for this decision was based mainly on the Government's commitment to deal with the endemic problem of obesity (ibid.). The Annual Report of the Chief Medical Officer (2002) states that obesity costs the economy £2.5 billion a year through NHS expenditure and the cost of sick-days. According to Cullen and Batt (2005) this figure compares favourably with the cost to the NHS of sport and exercise related injuries, which is around £590 million yearly. These figures do not reveal the economic windfall that a physically active population can produce; the vast majority of authors agree that the economic benefits of exercise far outweighs the drawbacks of activity-related injury (Batt and MacCleod 1997, Gratton and Taylor 2000, Henry 2001, Peterson and Renström 2001, Coakley 2003, Moore 2004, Howe 2004,).

In the space of just a century developments of the sports medicine industry have been extensive. Recent socio-political and legal developments in the UK may open the way for further changes to the industry. Recognition of the profession has been a slower process in the UK than in other countries (Thompson et al. 2004; Cullen and Batt 2005). In terms of numbers practising, NHS physiotherapists now dominate sports medicine. Physiotherapists do not specialise in sports medicine but it has become a standard component of their training and it appears that sports medicine practised in the NHS has been incidental whereas in private practice the subject continued to develop as a specialty in its own right.

Accreditation of sport and exercise medicine within the NHS has only occurred recently and the process of accreditation of the occupation in the private sector is ongoing. How official recognition will influence the market for sports medicine is largely unknown. How recent Government policy is likely to steer the industry is also a concern for those in the trade (McCrory 2006). McQuarrie (1996) provides a general rule stating that whenever uncertainty increases, the need for market research becomes more acute.

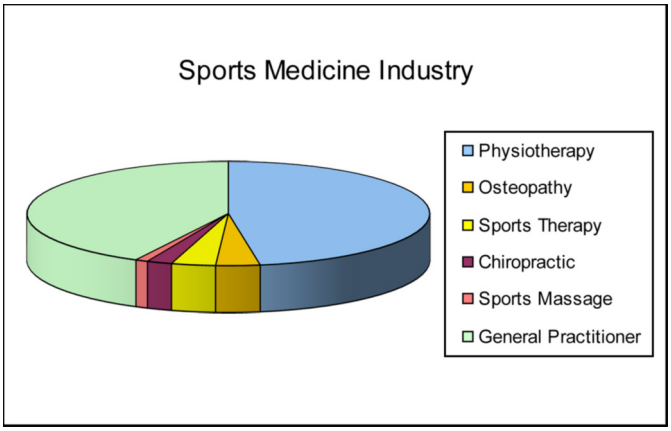
As shown above the development of sports medicine has been rather convoluted and disjointed. For many practitioners the subject has only been an appendage to their existing specialty, sports medicine is now carried out by physiotherapists, doctors of various specialities, orthopaedic surgeons, osteopaths, and chiropractors. Courses have evolved where solely sports medicine is taught and these specialists practise under the title of sports therapist, athletic trainer, sport masseur, sports rehabilitator and a host of other names. In reality many of these professions offer similar services and this puts them in competition with each other.

It is estimated that the total number of individuals practising sports medicine is 99,000 but as the information has been predominantly gathered from the websites of the professional bodies of each profession the true number is likely to be greater than this as sports therapists and sports masseurs are not yet obliged to register with any governing body.

Figure 1. – Size of the sports medicine industry
(The figures provided are accurate at time of writing)

Profession	Numbers Practising
General Practitioner	42,000
Physiotherapy	47,000
Osteopathy	3,500
Sports Therapy	3,500
Chiropractic	2,000
Sports Massage	1,000

Figure 2. - Percentage breakdown of professions within the industry



The chart in Figure 2 offers a general picture of the structure of the sports medicine industry; however the proportion of private and Health Service practitioners is not shown. National Health Service practitioners appear to have a numerical domination of the industry. However this in no way reflects the level of service provided by each profession. Since

all these professions provide sport and exercise medicine to some degree, they are all in competition with each other.
Brukner et al. (1996) identify that the number of sports medicine providers has increased over the past twenty years. As the number of providers increases, and as their services become increasingly homogeneous, competition will increase. This many affect the industry in several ways (Bowman 1990). Generally prices will fall as individual businesses seek to undercut each other to gain a greater market share. Advertising and the number of outlets increase, making sports medicine more recognised and available. Often the quality of service rises in order to attract more customers. A competitive environment may also encourage innovation, as individuals and firms seek to gain an advantage.

However, there may be several barriers to entering the sports medicine industry. Sports therapy and sports massage have only become formally established recently, with the formation of professional bodies to represent the practitioner (The Society of Sports Therapists was established in 1990 and the Sports Massage Association in 2002). Therefore these occupations, along with the others that have applied for Health Professions Council (HPC) recognition, will be referred to as 'new' professions; although in reality they have existed for some time. Osteopathy and chiropractics became firmly established in the medical industry in 1993 and 1994 respectively upon the formation of their regulatory bodies. All of these professions are continually moving into the domain of mainstream medicine. However there has been opposition to this in the past and these professions have all faced barriers to entering the realm of accepted or 'orthodox' medicine and there has been some political marginalization of alternative therapies.
Despite this there appears to be an increased public demand for alternative medicines, Kerridge and McPhee (2004) claim that 35% - 50% of the populations of Australia, North America and Europe use these therapies. Undoubtedly, as Saks implies, the formation of the National Health Service in 1946 has reinforced the "de facto monopoly" of orthodox medicine. The share of the marketplace taken by alternative medicines may have been larger without the NHS, but those who do practise alternative medicine have not lost out financially and may even have benefited from the restriction of direct competition.
The NHS does not hold a monopoly on sports and exercise medicine perhaps because the sports medicine industry is not yet 'mature' and there are variations in quality of service. Most professions in the sports medicine industry serve slightly different demographic groups. Broadly speaking, chiropractors specialise in back injuries, osteopaths in joint injuries, and orthopaedic surgeons in severe, acute sports injuries. GPs and NHS physiotherapists (the largest providers in the industry) do not specialise in sports medicine and, despite being effectively free, are not the 'first choice' for those with non-serious or chronic injuries (Rowell and Rees-Jones 1988). The vast majority of consumers are willing to pay for the services of a specialist – the GOsC Public Awareness Survey 2001 shows that 91% of respondents would be willing to pay for osteopathic treatment. This is the fundamental difference between medical industries and standard commercial industries, quality of service is, understandably, far more important to the consumer than price. It is quality then, not price that consumers or 'buyers' may wish to influence; indeed the primary justification cited by most regulatory bodies for their existence is the provision and enforcement of a consistently high standards of service within their industry.

It is difficult to describe the shape of the sports medicine industry when so little quantitative data is available and so few researchers have investigated this area before. In basic terms the industry is split into public and private spheres. Sports medicine in the NHS serves predominantly severe acute injuries and deals with post-operative rehabilitation (Rowell and Rees-Jones 1988). Private providers of sports medicine are usually more specialist and serve a wide market in clinical, team and sometimes hospital settings.

PEST analysis of the sports medicine industry

Political / Legal environment

The most pertinent matter presently affecting the sports medicine industry is the issue of regulation. The professions of sports therapist, sports masseur and sports rehabilitator are all currently seeking regulation by the Health Professions Council. The HPC is the organisation that regulates physiotherapists and eleven other health professions. While regulation is statutory the HPC is a largely independent body, not a government department (www.hpc-uk.org – accessed 29/12/06). The HPC is able to recommend that a profession is regulated however the final decision lies with the government.

In all there are more than fifty health professions seeking statutory regulation, these range from psychotherapists and ambulance personnel to acupuncturists and horticultural therapists. The HPC list the benefits of regulation and one of the advantages stated is that health professions can have "proper professional relations with other medical professions like medical practitioners and nurses" (www.hpc-uk.org – accessed 29/12/06). This hints at the possibility of a potentially more integrated Health Service. In the same point the HPC also hints at the prospect of greater opportunities for employment within the NHS. Therefore, should all these professions become officially recognised, it can be assumed that healthcare in general will become more holistic in nature. It appears that regulation will benefit both patients and the 'new' health practitioners.
Understandably regulation is an important aspiration for many therapists yet Stone (2005) notes that some may see

regulation as a mechanism of control being externally imposed and also suggests that a substantial hike in registration fees would ensue. Parker (2003) takes this view when discussing the regulatory agenda in Australia, which largely mirrors that in the UK. Parker also argues that many therapies, as they become assimilated into orthodox medicine will lose their truly alternative status by conforming to "scientific explanations" that are "consistent with the Western clinical model of medicine." However it is also remarked that most complementary medicines have not been assessed for efficacy.

Economic environment

Kotler et al. (2001) describe the economic environment as the combination of factors that impact consumer spending patterns. Where there is a general economic downturn consumer purchasing power is reduced and customers buy more carefully and seek greater value in the services they acquire. Sports medicine as a service can be considered both a necessity and a luxury, many minor injuries are able to improve or heal independently. Therefore the state of the economy will affect each profession differently.

The NHS has been able to weather the "fiscal crisis of state resulting from the tendency for welfare spending to increase over time" (Scrambler 2005). The solution to recurrent crises has typically been to increasingly privatise certain areas. In the past "managed competition" or "quasi markets" were introduced; the current Labour government terms this trend "commissioning health care" (ibid.). It is doubtless that sports medicine will survive in the Health Service although whether it will remain entirely free is uncertain especially since some regard sports injuries as self-inflicted.

Coghlan (1990) discusses the economic impact of sport and injury; he concludes that it is not only beneficial to invest in "physical health-giving activities" from a social perspective but also from an economic perspective when "the annual bill for the National Health Service is considered." The broader economic benefits of sport that have not been financially assessed consist of reducing anti-social behaviour and improving health, fitness and quality of life (Gratton and Taylor 2000). Hamlyn and Hudson (2005) have a more measured opinion of the benefits of sport participation. They explain that a "legacy of health gain" among the population was crucial to the bid document submitted for the 2012 Olympic Games. A poll carried out by Sport England in 2004 reveals that 26% of the public in England had been inspired by British successes at the Athens Games to play more sport (www.sportengland.org - accessed 31/01/07). Hamlyn and Hudson (2005) argue that sports injuries may negate any benefits derived from increased participation in sport and provide the following equation:
"Overall gain equals the benefits of exercise minus the injuries from the sport participated in."

Sociological environment

Cullen and Batt (2005) identify a second, and more enduring, reason for the decision to allow sport and exercise specialists to work in hospitals and that is to "defuse the public health time bomb posed by spiralling national levels of physical inactivity and obesity." The scale of the problem is illustrated by the Department of Health:

"Obesity levels in England have tripled in the past two decades; around a fifth (21%) of men and a quarter (24%) of women are now obese whilst almost 24 million adults are now overweight or obese." (www.dh.gov.uk - accessed 01/02/07)

The overall cost to the economy, through sick days and NHS expenditure, is at least £2.5 billion (ibid.). The cause of rising obesity levels is twofold – an increase in calorie intake and a reduction in physical activity. This is where many see a future role for sport and exercise specialists in the NHS; Cullen and Batt (2005) suggest their function may be to "promote physical activity"; Till and Batt (2006) see the role as "mobilising an increasingly sedentary population". How exactly this can be achieved by specialists based in hospitals is not specified although McCrory (2006) suggests "exercise prescription" may be one solution. Moore (2004) states that exercise prescription is useful in almost all chronic diseases and yet he identifies that most doctors have very little knowledge of exercise or sport and so often do not recommend exercise to those patients that would benefit the most.

Howe (2004) perceives a growing interest in preventative medicine as society has become more concerned about limiting the onset of illness. He sees the potential to "implant" concerns about activity levels and health into the population using the media, rather than medical specialists. Zola (1972 – cited in Howe, 2004) views the "medicalisation of life" as "an important tool of social control." More specifically Coakley (2003) regards government involvement in sport as having several functions - to maintain the health of citizens, to promote prestige and a sense of identity, and to support economic development.

Technological environment

The advent of new technologies, such as joint replacement, ligament reconstruction, and advanced scanning techniques have had a profound effect on the capabilities of surgical sports medicine. Brukner et al. (2006) notes that new technology has "changed perceptions and management of common injuries." New advances in medicine are likely to continue to enhance the way that injuries can be addressed.

Technology has not had such an impact on non-surgical sports medicine. Howe (2004) states that "the technologies

that are available in most clubs' treatment rooms have done little to increase individuals 'field' performance." The technology referred to here is electrotherapy, including modalities such as ultrasound, which are widely used but largly unproven. A study by Robertson and Baker (2001) concludes that there is "little clinical evidence for the efficacy of therapeutic ultrasound" and that the main benefit of the technology is its placebo effect, a view shared by Howe (2004).

CONCLUSION

The outlook for sports medicine

There is evidence that the population is becoming increasingly overweight, and a crucial factor in this is inactivity. The Annual Report of the Chief Medical Officer 2002 indicates that around two thirds of adults "do not do the recommended 30 minutes moderate intensity physical activity on five days a week." http://www.dh.gov.uk/PublicationsAndStatistics/Publications/AnnualReports/AnnualReportsBrowsableDocument/fs/en?CONTENT_ID=4094860&MULTIPAGE_ID=4875027&chk=6lWQj/ - accessed 18/12/06. Despite this there is an increased interest in therapeutic exercise rather than formal sport amongst certain groups, in particular the elderly and many interviewees concluded that the older generations that are becoming increasingly interested in the health benefits associated with exercise.

Another consideration is that a sedentary lifestyle can still lead to injury, whether it is from poor posture or through overuse injuries occurring at work. McCrory (2006) also envisages changing roles for providers of Sport and Exercise Medicine (SEM). McCrory perceives "physical activity as a solution to the spiralling burden of chronic illness in society." In order to achieve this a "cohort of SEM practitioners who can prescribe exercise" is needed. Moore (2004) further suggests, "Exercise prescription is useful in almost all chronic diseases." He continues to explain that most doctors have very little knowledge of exercise or sport and so fail to prescribe exercise to those who may need it the most. To remedy this situation Till and Batt (2006) advocate "developing higher specialist training programmes".

What no authors seem to have recognised is that there are several groups of sport and exercise medicine specialists that are likely to be in a position to work in the NHS in just a few years. There are dozens of healthcare professions that may eventually be regulated by the HPC and that will entitle those services to be available within the Health Service. There were mixed opinions appearing from interviews about whether occupations such as sports therapy and sports rehabilitator will be able to operate in the NHS. Some saw the propensity for aspects of the Health Service to drift towards privatisation as continuing. In this case sports medicine would thrive in the private sector, particularly as several respondents would expect GP referrals to increase following HPC regulation. Klein (1998 - cited in Scrambler 2005) covers the previous points with the following prediction:

"Future governments will become more interested than ever in a system that is more pluralistic and diverse in both its source of financing and the distribution of responsibility for the delivery of health care, for example making more use of independent suppliers of health services."

From all the accumulated evidence it seems that sport and exercise medicine has a favourable future. The industry will continue to slowly expand, particularly in the sphere of private practise. HPC recognition of the 'new' sports medicine providers seems inevitable and this may open the way for hospital-based work in the more distant future.

The population may be aging and becoming more overweight but there appears to be an emerging interest in health from some demographic groups. This interest extends to a realisation that exercise is key to prevention of illnesses such as heart disease and diabetes. Consequently providers of sports medicine may find themselves having a role in the application of preventive medicine and exercise prescription may be a part of this.

The 2012 Olympic Games presents a unique opportunity for the government and other organisations to significantly increase sports participation and improve the health of the nation. However unless those organisations begin to capitalise on this opportunity now it is unlikely that the Games will result in any lasting benefits for the population of the UK. The 2012 Olympics will benefit the sport and exercise medicine industry, but whether this effect is lasting remains to be seen.

The general picture that has emerged of sports medicine in the future is one of more options and greater opportunities.

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http://jst.ucb.ac.uk Volume 3. Issue 1. Journal of Sports Therapy

Reviews and invited commentary

Towards a complementary research framework - part one

David Jenkins MSc, MA.

KEY WORDS

Research philosophy
Research paradigms
Research methods
Research methodology
Complementarity of method
Positivism
Interpretivism
Critical Realism
Subjectivity
Objectivity
Qualitative data
Quantitative data

OVERVIEW

This article is intended as an introductory text for a series of six discussions on research concepts and methodologies. In particular, the ongoing debate regarding the roles of positivism, critical realism, and interpretivism in relation to quantitative and qualitative research methods is addressed with the aim of perhaps liberating those sports therapy researchers who feel their quantitative empirical work should always be couched in positivist terms of reference, and others who may be methodologically constrained by the belief that their qualitative data can, or should, only be represented in interpretivist frameworks. The main thread here, and throughout the series, is the promotion of complementarity between qualitative and quantitative data analyses and the nature of the utility, application, and contingency of these methods within positivist, critical realist, and interpretivist research mindsets, or paradigms.

Introduction

The focus of this first introductory piece is to set out a research philosophy platform from which to construct a logical typology of research methods which the sports therapy academic, practitioner, or other interested party may readily employ as a catalogue from which to select the most appropriate process(es) for the collection of raw data, the organization of those data into information, and the establishment of an analytical methodology to either examine or test an existing theoretical framework via a *deductive* research approach, or, to identify and build a suitable *inductive* treatment of observations from which to offer explanations for identified or perceived gaps or inconsistencies in existing explanatory frameworks.

The paper is organised into three further sections. The following section offers an outline treatment of the contending positions in the philosophy of research; closely following, the second considers the underpinning conceptualisations which ultimately determine these positions by looking at issues of knowledge, objectivity, and subjectivity; the concluding section begins to reify the discussion by introducing a practical cross- reference mechanism for matching data inputs to analytical outputs employing both qualitative and quantitative techniques, and ends by introducing the topics to be covered in the next edition.

What are these mindsets or paradigms?

One way of considering the positivist, realist, and interpretivist paradigms for research purposes is as series of calibrated positions running along a horizontal continuum from left to right, respectively from the pure objective to the pure subjective. In short, these positions can be seen to reflect how an individual, in any given context, attempts to understand the essence of the subject under review, the individual researcher's *ontological* position; and by what means of knowledge, his or her *epistemological* position. However, care must immediately be taken with assuming that these extreme, 'pure' positions really exist. As I argue below, it is very difficult to only imagine the world through the use of numbers, and just as vexing to depend entirely on words or meanings for such comprehension. And, it is this impurity of perspectives that allows us to advance the utility and desirability of complementarity, and more readily accept the usefulness of mixed method methodologies. For a full discussion on research methods complimentarity and the qualitative-quantitative debate, see Roberts (2002); and, for an extended treatment of the methodological implications of combining qualitative and quantitative methods, see Morgan, (2007)

Positivism depends on an understanding of the world through the first five basic[1] human, or Aristotelian, physical senses (sight, hearing, taste, smell, and touch) and associated measurements, which constitute physiological methods of perception, and can be seen as our empirical or natural sense metrics. Many proponents of the positivist paradigm may well go as far as saying that the environments in which we exist can *only* be understood in such terms. Put crudely, if something cannot be measured, it does not advance our knowledge and understanding of the world. Interpretivists, and often including interactionists (although it is fair to say not all interpretivists would necessarily welcome being described as interactionists) on the other hand, argue that the world is as the individual decodes its images into unique building blocks and then reassembles them into his or her own unique and personalised construct of images, through their (social) interaction with

[1]There are, of course at least another five primary additional human senses such as pain, balance, sense of time, sense of temperature, and motion and acceleration, and others beyond these.

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other individuals. In essence, we all 'see', or *interpret* the world in our own, different ways, but are *influenced* by others in such understanding. Contrasting with the positivist physiological methods of perception, interpretivists employ non-empiric, empathetic, and Verstehen[2] methods of perception. And, where the positivist may assert that the world can only really be understood by sense measurement, the interpretivist may counter that individuals understand the world as they see it, and that we are all interactionists anyway!

Occupying the imaginary space or middle ground between the positivist and intepretivist lay a number of calibration points that represent the realist family of sub-paradigms. Again, moving from the left, the main types of realism are direct (or naïve) realism, indirect (or critical) realism, and multi-level (or transcendental) realism. Realists believe the world consists of social and physical 'facts' (Morrison, 2009) (quotation marks added), although I would prefer to adopt a more Popperian[3] treatment of facts as potentially falsifiable accepted wisdoms, and which exist whether we know them or not. Essentially, the points along this section of the continuum reflect the level to which the individual relies on, or can rely on, what the human or empiric senses appear to relay or portray. So, for the naïve realist to know a subject (or the world) as it really is, we must strip away or box out all our pre-existing beliefs and prejudices and aim to be as objective as possible by discovering the simple 'facts'. In this sense the direct realist position is closer to that of the positivist end of the proposed continuum, and, I would argue by far the most attractive to those who prefer more concrete rules and protocols from which to proceed in their research endeavours.

Critical realism is, however somewhat different. With an imaginary position perhaps just beyond half-way towards the interpretivist end on our scale, critical realism is, at first, a more elusive concept. The basic premise here is that our senses, and their associated empirical measurement, do not always provide us with either the most reliable or useful understandings of a subject. Take the simple example of sitting on a stationary train and glancing out towards another, moving train and your sense-data informs you that you are moving as well – your sight sense and its counterpart brain measurement are all out of kilter, and you receive a false (and potentially dangerous) understanding of the subject under consideration. Or, when you are watching a football match on television, what are you actually seeing? Nothing more than an, two-dimensional *(empirical)*observation, of a three-dimensional actuality (the *event*) happening somewhere else, of which, the underlying mechanisms that cause the event may, or may not be known (the *reality*),relayed to your senses by a collection of electronic dots, and *re*-interpreted by them into some form of understanding, or sensation of reality for *you*.

There are two broad views of critical realism: one following Locke and Descartes, which considers two types of sense-data; and the work of Roy Bhaskar in the 1970s[4], which offers us the notion of transcendental realism. For Locke and Descartes, there a two types of sense-data, one of primary qualities and the other of secondary qualities. Primary sense-data appear to us exactly as they are; for example, a coin spinning in the air *appears* elliptical in shape as it rotates following being tossed. Secondary sense data alludes to representation, that is, how we represent an event is unique to us, and such representation does not exist as an object in the real world.

For Bhaskar, and his transcendental realism, there are, as with Locke and Descartes, sense-data, but they can operate on multiple levels, or as Morrison (2009) suggests a stratified ontology – different levels of representation. We might be in a lecture theatre sitting among a100 others where the (empirical) temperature on a thermometer in the room reads 22 degrees Celsius. However, within that environment, it is feasible that some people would represent that data as very warm (it is nearly 72°, after all!), some would 'feel' pleasantly warm, others 'just right', some would prefer it to be warmer, and maybe some would experience 'cold'. Moreover, the same hundred people on a different day, but with the temperature the same may represent the data 'differently' than before, or even some may feel the same, or represent the data as the same as they did on the previous day, but where the empirical temperature may be 10 degrees less!

In sum, critical realism accepts that there are realities in the world whether they have become known to us through empirical observations or not. Whether, or how, we know them, is more elusive, and it is to the subject of knowledge, if indeed knowledge is a subject, and the related issues of subjectivity and objectivity that I now turn.

Knowledge, subjectivity, and objectivity

Andrew Morrison's excellent use of former United States (US) Secretary of State, Donald Rumsfeld's accidental brush with philosophy (Morrison, 2009), starts us off on the road to considering how the above paradigms are perhaps accepted and embedded in our various attempts to understand the world. Introducing Rumsfeld as 'not having enjoyed the happiest of

[2]Verstehen is a German word not directly translatable into English, but which implies understanding or interpretation. Introduced by German philosopher Wilhelm Dilthey as a means of considering the first-person perspective on social phenomenon, as opposed the third-person objective explanatory perspective, it has been particularly associated with the work of German sociologist Max Weber.

[3]Referring to the ideas of Karl Popper (1902 -1994), and the need to understand that 'truths' and 'facts' are not absolutes but have both measurable properties, and have a finite life which ends when they are falsified via new knowledge and discovery. For example, it was once believed that the world was indeed flat , and as such was regarded as a 'fact'(or, preferably, an accepted wisdom) but, as we now know, only until falsified, and therefore with a finite life.

[4]The most accessible text regarding this work, although not an easy read, is The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences (see references for details)

relationships with the English language' and suggesting his 'malapropisms vie only with his erstwhile boss, George Bush, for a place in the gobbledygook Hall of Fame' for once, offered us something of real value. Speaking to a Department of Defense news briefing in February 2002, discussing the proposed US invasion of Iraq, Rumsfeld said

> "The message is that there are known knowns, there are things that we know that we know. There are known unknowns, that is to say there are things that we now know we don't know, but there are also unknown unknowns, there are things that we do not know we don't know, and each year we discover a few more of these unknown unknowns." (2009:1),

Although he was blissfully unaware of it, Rumsfeld offered us a real insight into the ways in which we choose to understand the world. For the positivist, known knowns come about by objective distance from the observations that forms the empirical base from which to use the natural senses to measure or evaluate those data. For the interpretivist, things are known from how they appear to the 'knower'. And for the realists in general, there will always be things that we know we don't know - but we know they are there, and the critical realist would add whether our senses can represent them or not. As for the unknown unknowns, although tricky to comprehend at first, they are a logical progression from the other two. There are things 'out there' waiting to be discovered just like electricity and radio were 300 years ago, but we are not(as then) even yet aware of our ignorance of their existence. The much-publicised Hadron Collider experiments in Switzerland see scientists grappling with both known unknowns and unknown unknowns. For the contemporary sports therapist there is still a lot to know and different types of knowns!

Of course, Rumsfeld missed one out, what about 'unknown knowns', the things that we do know, but that we only *unconsciously* hold up as accepted wisdoms ('truths' or 'facts') and therefore direct our actions? These have a very powerful influence over the ways we perceive the world, act as part of it; and for some, those political decision-makers that we subcontract to guide and shape our societies, eventually to determine how we may behave in the future (see *The Guardian* article by Slavoj Zizek, 2008). And, this again can be related to critical realism and its associated representationalism.

The various philosophical positions described are important to us researchers as they largely determine both the subject areas we choose to investigate, and also how we go about evaluating the findings gleaned from their associated data collections. In turn, how we make these decisions is obviously determined by the level of importance we place on the relationship between objectivity and subjectivity, one which effectively forms the basis for the positional continuum introduced above. One way of approaching this is to consider three types of objectivity and three corresponding versions of subjectivity. These are illustrated in Table 1 below

Table 1. Typologies of objectivity and subjectivity

Type	Objectivity	Subjectivity
One	Value-neutral, indifferent, value-free.	Value-laden, value-intensive
Two	As in the search for objective knowledge, often used as a synonym for 'true' or 'fact'. Perhaps better employed as 'accepted wisdom' or 'practically adequate'	Implies an idea that it may not be so. That it is not necessarily 'true', and may be just a matter of opinion.
Three	Pertaining to objects being separable from subjects. Refers to the nature of things regardless of what the observer may think of, or about, them	Pertaining to subjects in terms of what the observer experiences, thinks, feels, and 'believes' about them.

Source: primary

Ultimately, the researcher has to ask the questions 'How do I attempt to understand the world from the way I see it? Where do I position myself on the objectivity-subjectivity scale? And, assuming you cannot have a pure objective view of the world because you are a human being, and have feelings, emotions, beliefs, prejudices, likes and dislikes; and you cannot understand the world on the basis of subjective interpretations alone – how would you ever know the time? - how can objectivity be usefully reconciled with, or employed alongside, subjectivity? The answer lies in an assumed mutual dependence of the two when considering data analysis.

For example, take the following scenarios. First, if a simple t test[5] is taken to compare the mean values of two samples, and a 95% confidence level is sought in order to determine whether there is a statistically significant difference between them, and the resulting *p* (probability) value is > 0.051 (5.1%), a purely positivist analysis would not reject the null hypothesis, and claim that there is no statistically significant difference between the samples, but would do so only on the fine calibration of one tenth of one percent. Had the *p* value been 0.049, the same positivist analysis would confidently (95% confidently) reject the null hypotheses, and claim a significant difference; even though this represents a shift from confident acceptance of the null hypothesis to confident rejection across a range comprising just 3 tenths of a percentage point. The same decision may well have been made had the two *p* values been 0.04999 and 0.05001 respectively, with only 3 hundredths of one percent representing the differentials. The point is that the positivist finds himself having at once to make two judgments that require levels of (subjective) interpretation: the selection of the appropriate confidence level before the testing of the sample in the first instance, and then in the decision-making analysis of the computed *p* value, where for some the p>0.051, representing a 94.9% confidence level, would be enough

to reject the null hypothesis and consider an alternative hypothesis. But surely for the sake of a tenth of one percent, you may ask, does this really matter? The answer is a resounding yes! It does matter a great deal. What about if you are testing the efficacy of a new anti-cancer drug and its side-effects, or the efficiency and effectiveness of a new airliner's computer-controlled landing gear mechanism? But, although high levels of objectivity are both of the highest importance and relevance, there has also to be a level of human subjectiveness about what level of confidence should applied or what is contingent.

Second, what of the qualitative researcher's need to organize raw data following a series of interviews or discourse reviews? The only way to elicit meaningful information is to identify emerging issues, useful patterns, outliers, contrasts, commonalities, consensus, inconsistencies, and new ideas. There has to be some form of categorisation, typology, or coding, and, of course while the researcher would be expected to reduce personal bias to an acceptable level, or, if you like, control for subjectivity, the very purpose of the work is to extract meaning and understanding from the subjects under review, it can only operationalised with the use of numbers or numerical (objective) intervention or assistance – how many in each category is a theme, what number is needed to establish a trend, or are there too many categories of 'three and under' to be conclusive?

It is really difficult to separate objectivity and subjectivity to any real extent, and who would want to? Complementarity of methods is not only effectively unavoidable in research methods, but the more it can be employed the better! Of course, as an aircraft passenger travelling on the new airliner you would not want to hear that the landing gear had been exclusively tested only by interviewing pilots and cabin crew after they had landed smoothly on a number of previous occasions, or not, as the case may be. But neither would you be happy if a computer had made the decision about the level of confidence for the tests without the experiential inputs of a well-qualified aerospace engineer!

Conclusions

The cross-tabulation of quantitative and qualitative data collection techniques

So how can we draw up an effective toolkit of methods to take full advantage of the opportunities that complementary or mixed-methods research offer? If we consider the process of research as setting out a research enquiry by identifying a question, or set of questions (or objectives), establishing either a body of explanatory comparators or theoretical framework for deductive work, or identifying a gap in, or non-existence of, such a construct which requires filling, for inductive research, collecting either primary or secondary raw data, organising those data into information, analyzing the information, and revealing findings, conclusions, and recommendations, then any such raw data gathered can be viewed as input variables, with the corresponding and resulting organised informational data considered as output or response variables. Taken this way, our cross-tabulation mechanism can be reduced down to consist of one, qualitative input variables leading to, or converted into, qualitative response variables for analysis, expressed as meanings and understandings. Two, qualitative data input variables re-organised and translated into quantitative response variables (usually expressed as proportions). Three, quantitative data input variables converted into quantitative output response variables, often expressed as continuous scales. And four, quantitative data input variables which lead to qualitative response variables. In short, the translation of words into meanings, meanings into statistics, numbers into statistics, and numbers into meanings.

The next article in the series will start with the third of these; quantitative inputs analytically expressed in terms of quantitative responses, and also introduces a range of techniques for descriptive, illustrative, associative, inferential, and predictive analytical purposes.

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[5]The statistical modelling and explanation for this sort of testing is discussed in full in the next article in the series

http://jst.ucb.ac.uk Volume 3. Issue 1. Journal of Sports Therapy

Professional and Pedagogical Practice

A review of 1st year BSc Sports Therapy Students Performance at Coventry University, United kingdom.

Dr Rob S. James, Director Sports Science Applied Research Group, Coventry University.
Philip Smith MCSP Grad. Dip. Phys. Course Director, BSc Sports Therapy, Coventry University.

INTRODUCTION AND BACKGROUND

Coventry University began offering the undergraduate degree in Sports Therapy in the academic year 2007/2008 with a cohort of 40 students. Entry to the degree course was considered for applicants who had achieved 240 UCAS points at either A-Level or via other qualifications such as BTEC nationals etc. and all students achieved this minimum standard.

During that academic year three students (7.5%) withdrew from the course, and a further two students needed to resit therapy modules (5%) and a further five failed to achieve the requisite 110 credits in order to progress meaning that 11 students (28%) did not progress to year 2 on the first attempt.

The intake for 2008/2009 was increased to 48 students and entry points were increased to 260 for non- A-Level students; although there was one entrant; a mature student; who came on to the programme via a university access course.

The rationale for this increase was a feeling by the teaching team that BTEC students showed a generally lower level of achievement than A-Level students and it was therefore decided to subject this to statistical analysis at the end of academic year.

Analysis

In order to ensure a valid comparison between the two cohorts it was decided to compare results at 1st attempt rather than consider resit examination results. The cohort was spilt simply into A-Level and non A-Level groups rather than considering factors such as subjects studied at A-Level or BTEC, points gained etc. although this may well be considered in future analyses. Analysis was performed using Microsoft Excel with a simple comparison between mean credits achieved and standard deviation of both groups.

The maximum number of credits it is possible to achieve is 120 and there is only one condonable (non-therapy) module on the programme; meaning that all students must successfully achieve 120 credits in order to progress.

Results

Type of student	No.	Mean credits achieved	No. Achieving 120 credits	% progression (at 1st attempt)
A-Level	21	89.5 $\pm$ 39.43	9 (43%)	53% (n = 11)
Non A-Level	26	70.4 $\pm$ 45.21	7 (27%)	30.77% (n = 8)
Total	48	81 $\pm$ 43.35	16 (33.33%)	39.58% (n = 19

Discussion

So do these results indicate a true difference between A-Level and non A-Level students?

In a comparison using a students' t test the p value between A-Level and non A-Level students equals 0.0642 which falls above the value of statistical significance ($p < 0.05$) but does show a trend toward significance in this group of students.

In any event this brief analysis raises several interesting questions:

1. Is there true academic equivalence between A- Levels and other qualifications such as BTEC and/or OCR national diplomas?
2. Should Sports Therapy undergraduate programmes have differential entry points depending on type of qualification?
3. Was this particular group of students weak in comparison to the previous cohort (progression of 39.58% vs. 72% at 1st attempt)
4. The course saw the addition of a clinical anatomy module in 2008/2009 academic year – has this had a negative effect on progression rates?

In order to begin to answer these questions it is proposed to further investigate the entry qualifications of both the previous (2007/2008) cohort and the incoming 2009/2010 cohort in the same manner in order to ascertain whether or not this possible trend is evident in other groups of students. If possible a comparison with other institutions could also be made to determine if a similar trend exists.

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Occasional Piece

Interview with Charles Meisner, Director of The Australian College of Sports Therapy.

A discussion about the sports therapy industry in Australia.

Robert Di Leva

Charles you have been involved in the only Sports Therapy programme in Australia for several years. How has the Sports Therapy programme developed in Australia?

I initially received a Bachelor of Psychology from City University of New York and later became interested in body work. After studying shiatsu and massage I decided to pursue a qualification in that area and completed a Bachelor Degree in Acupuncture.

I was Clinic Director of 'HealthCare' Natural Therapy Centre in Queensland for many years, and an associated natural therapies college grew. I relocated to Melbourne to study chiropractic and became a registered Doctor of Chiropractic in Australia and The United States. My post graduate studies included a chiropractic speciality which qualified me as chiropractic, sports physician. I have subsequently worked with athletes in a wide range of sports.

"The education (of Sports Therapy) is fantastic. We are putting out well rounded practitioners with a high level of knowledge and skills"

I was diagnosed with severe plantar fasciitis, and I couldn't walk for almost 18 months and decided that I needed to redirect my career path since I could not practice and couldn't just sit around and watch videos.

In my role as a chiropractic sports physician, I noticed that professional and elite amateur athletes got focused care but those that weren't in the limelight were neglected. I recognised that there was a gap in care for the majority of the sporting and active community. Even though I'm American, I didn't know anything about other people doing anything like this. I decided I was going to offer a Diploma of Sports Therapy and I put my energies into writing a sports therapy programme.

I approached the State Education Department in Victoria and achieved accreditation for The Australian College of Sports Therapy with the mission of providing an avenue for the pursuit of professional excellence and service, contributing to the community and nation in the fields of health, sports therapy and physical fitness through education, research and promoting awareness in the fields of sports health and allied therapies.

The College focal point is our three year sports therapy qualification specialising in sport injury prevention, treatment and management. Sports injury prevention is a critical element to any sports activity or programme and we recognised that our course needed components that addressed prevention, first aid, treatment of injury and rehabilitation with the goal of timely return to play. In addition the graduates are well schooled in helping people perform better through their understanding of sports and exercise sciences such as biomechanics, nutrition …et al.

We have presented the course from an academic view point with a competency based practical programme, similar to the university model with a high level of practical clinical experience.

How do you balance the practical elements of sport therapy with academic rigour?

The rationale was that people, who do strapping, massage and professional therapists work from what they have learnt as a set pattern that has been set down before them.

If someone has practical knowledge and can think outside the box in different situations, they are able to adapt their treatments appropriately. For example, if you hurt your ankle, we'll tape it. Utilising knowledge of anatomy, an understanding of the ligaments, joints and bones; knowing how injuries occur, and how to prevent exacerbating the injury the Sports Therapist can adapt the taping specifically for the injury. My view is to teach people the treatments and techniques, but also the theoretical underpinning rationale for why they are treating and how you would customise your treatment according to findings. The programme has a very strong component of assessment, including physical examination, orthopaedic assessment, neurological assessment, and keeping accurate records.

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What are the work opportunities for a sports therapist in Australia?

It is a new profession here, something that is very much needed. It's for people who want to work in a similar manner to chiropractors, osteopaths, or other practitioners who work independently of the medical system.

There is some support from the sports medicine system but as you know, anywhere in the world, medical doctors and physiotherapists will generally accept allied health practitioners into their domain working under instruction.

We train sports therapists to work in their own practices, and they do get jobs in sports medicine centres, working with chiropractors, working within medical sports practitioners' offices. The ideal is to work in private practice, in fitness centres and independently in sports environments. Football teams aren't all available everyday of the week so some (sports therapist's) are multifaceted and work at football clubs, fitness centres as well as private practice.

"There is a strong need for marketing the sports therapy profession"

There is a strong need for marketing the sports therapy profession. The fortunate thing, when you say you're a sports therapist people have an idea of what you do. Sports therapists in the future will wisely define themselves as sports and musculoskeletal therapists, people will be able to identify the expertise at the foundation of the profession.

It broadens the recognition of the skill set of the sports therapist expanding the potential client base, for example, if someone is swinging a golf club, and they hit the ground, and hurt their shoulder, how do you differentiate between that from who's pushing a shovel and hits a rock and hurts their shoulder? It's a similar mechanism of injury, similar symptoms, there's little difference. So you're not just a sports therapist, you have a lot of knowledge of that particular area plus a comprehensive knowledge of musculoskeletal therapy.

What are the potential obstacles to developing sport therapy in Australia?

There is a 'glass partition' between chiropractic, osteopathy and physiotherapy in Australia. Perhaps that's an advantage for us in some ways and at the same time a disadvantage in the sense that there is no one who dislikes sports therapists. The wonderful thing is the growing need for musculoskeletal therapy no matter who does it, or how they do it.

There is an aging population, a population of people who have the financial means to afford treatment. Compared to other places in the world, we are in prosperous times, and people are used to and enjoy being looked after.

What development do you consider important for the sports therapy industry?

We need recognition as a profession both here and in England, officially recognised with the government and health funds in order to make our mark. It's natural process that is happening in a lot of professions already. In general there is a lot of opportunity and it's a matter of introducing the profession to the public as well as to other practitioners, to establish our niche in the community.

The education is very good, not just here but all the education I see in the USA and Canada, and Great Britain. The education (of Sports Therapy) is fantastic. We are putting out well rounded practitioners with a high level of knowledge and skills. One area we need to grow is research; to get established post-graduate degrees and start to publish. I admit that there is research being done, but it isn't being disseminated outside the academic element of sports medicine.

Are UK graduate sports therapist able to work in Australia? What are the processes available for work experience in Australia?

We get a lot of emails a year, where people want to come from England and work here. There is no registration requirement s in Australia at this time. So they can come and work here. But then at the same time there aren't any particular advertised jobs for sports therapists. For the people who come here would normally have to organise to get a job within an existing clinic. If you are only coming here for the short term, then of course they would have to work within an established clinic.

In the UK, it is a very exciting time for sports therapy development? How is sports therapy viewed in Australia?

It is also an exciting time for us in Australia with the proliferation in major sporting events and the promotion of sports by the government and sporting bodies for the improvement of health and fitness. The level of interest reflects that the concept of sports therapy has captured peoples' imaginations and we are only seeing the tip of the iceberg.

Continued Professional Development. Conference Review:

First Annual Society of Sports Therapists Student Conference

London Metropolitan University 10 -11 June 2009

Marie Woodward, University College Birmingham.

Introduction

The Society of Sports Therapists was first established in 1990 to address the growing demands of the industry. In 1996 the first degree in Sports Therapy was piloted in London Metropolitan University and has steadily grown throughout the United Kingdom to 18 Universities running degree programmes, and six running Masters programmes.

This is the Society's first Student Conference and London Metropolitan University has again been chosen to host this occasion.

Review of the Conference

The conference was held over two days in June at the end of the academic teaching calendar, and aimed to give students an opportunity to listen to several professional speakers from a variety of backgrounds. It also provided a chance for students to present work for peer review.

Who Was the Conference Suitable For?

The Conference aimed to enthuse and enlighten students, both current and recently graduated. The theme of the conference was 'Prevention, Rehabilitation and Performance' and a high calibre of speakers were invited from a variety of disciplines, amongst whom were Prof. William Prentice, author Lecturer, and Athletic Trainer in America. He was the keynote speaker at this conference. His approach was enthusiastic and encouraging, even after a three hour journey across London from Heathrow (thanks to London Underground).

He focused his attention on functional movements rather than individual components of fitness. The presentation gave a succinct and precise overview of rehabilitation which was both interesting and informative. This served as good revision for those who had recently graduated, and managed to bring together the many aspects of treating the whole athlete. Key points were raised regarding rehabilitation and re-education of muscles and muscle groups, together with therapeutic evaluation of specific functional exercises. The presentation was delivered quite quickly so that all aspects could be discussed. A hard copy of the presentation would have been very useful as much time was spent taking notes.

Glen Hunter, a Chartered Physiotherapist and Consultant in Medical Science for the Research and Innovation Team at UK Sport, gave a novel twist to his talk on hamstring injuries by discussing a top 10 of what not to do and the consequences. This possibly does not get as much attention in taught sessions as lectures concentrate on good practice and the correct protocols of working. He ended with his top tip regarding ignoring stiffness, and gave some insightful comments on muscle stiffness as oppose to muscle strength and the value to the sports person with regard to re-injury.

Ian McDermott, a Consultant Orthopaedic Surgeon who is currently practising in the Sports Orthopaedic UK Group, specialises in hip and knee surgery. His focus related to meniscus injury and gave useful observations to aid with diagnoses and he discussed the position of a surgeon regarding treatment. He gave an entertaining and informative talk on meniscus injury which sparked much debate.

Many speakers gave a good/honest insight into working with athletes and students were given perceptive comments by the speakers. Many identified the need of the Sports Therapist to market themselves better amongst other professions.

Student speakers gave confident performances and presented work of a high standard with clear intention and direction. Poster presentations were professionally displayed and student presenters gave knowledgeable and clear interpretations of their work. It is encouraging for the profession to see this type of work being offered for peer review and one would hope to see more research being undertaken by graduate Sports Therapists.
Three workshops allowed delegates to develop and widen their experience. They gave therapists quick and easy tips to aid in diagnosing and treating injury. These proved to be interesting and informative. Group sizes were effective for learning and inclusion, although 20 minutes made them a little rushed.

Quality of the take away notes?

There were limited resources for the delegates which meant that much time was spent taking notes. Organisers have stated that these will be made available at a future date.

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How was the conference organised?

The conference took place in the sports hall at the Science Centre. After a late start on Wednesday, 12.30pm, just over an hour was allowed for Registration and Trade Exhibition. This was a little long as there were no refreshments available and only a few trade exhibitors. Travel to the event was hampered by a London Underground strike over these two days; a cup of tea would have been much appreciated after the struggle to get across land!

This was also an issue with delegates getting to and from hotels for the Evening dinner at the Emirates.

The second day flowed smoothly with delegates treated to a wonderful buffet lunch. There was some confusion amongst delegates regarding finish times of the conference as initial information stated that the conference finished at 6pm not 4pm as was the case and therefore booked trains accordingly.

Would the course have been better over one day or two days?

The pace of the conference felt comfortable with speakers' in general giving full and interesting presentations. It may be beneficial to have had a shorter registration on the first day to prevent the rush in the evening.

Value for Money

The conference could be prebooked for £100 (£110) for members or students; other delegates £120 (£140) for the two days. Day delegate packages were also available giving good value for money.

Would you recommend it to a colleague?

This is the first Student Conference held by the SST and was very enjoyable. A great deal of work had been put into making the event a success and there were only a few small issues which will be addressed at the next conference. This will again be at the London Metropolitan University. Provisional dates for this are 9th/10th June 2010. Hopefully they will continue to attract the high quality of speakers and encourage many more delegates to attend.

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Continued Professional Development. Course Review:

Sports Injuries and the Ageing Back

Old Trafford, Manchester 15th May 2009

Keith Ward BSc (Hons), MSST, MHFST, University College Birmingham.

Introduction and Course Aims

A one-day 8 hour certified CPD conference, organised by F2F Events Ltd, promoted as "an opportunity to listen, learn and discuss the latest thinking and developments on the topic of sports injuries and the ageing back". Aimed at physiotherapists, osteopaths, chiropractors and other health professionals. There was no mention of Sports Therapists in the pre-course literature, or even on the day, which I felt was quite a significant oversight.

Organisation of the Course

The schedule for the day took the form of registration, introduction and welcome, panel discussion, six lectures from a range of practitioners and surgeons, a second panel discussion, lunch and coffee breaks and a short tour of "The Theatre of Dreams". There were approximately 13 speakers on the day, with around 150 delegates in attendance - predominantly from the physiotherapy, osteopathy and chiropractic professions. A small trade show was also present.

Topics Presented and Discussed

i} Panel Discussion – History, Assessment and Red Flags
ii} The Spine: An elite sport perspective
iii} Sports Injuries and Chronic Pain
iv} Outcomes: Evidence-Based Practice
v} Chronic Back Pain: What Surgery?
vi} Radiology: Sports Injuries and How They Present on Scans
vii} Panel Discussion: The Degenerative Spine
viii} Adolescent and Ageing Sports Players

Session Appraisals

Due to word count limitations, I have chosen to appraise three of the above sessions (i, ii and viii) in some detail, and pose some thought-provoking questions for the sports therapy practitioners out there. The editors welcome your response!

i} Panel Discussion – History, Assessment and Red Flags

This took the form of a panel of three elite sports practitioners (physiotherapist, osteopath and chiropractor) and a spinal surgeon, chaired by a consultant spinal surgeon. Each speaker gave a short individualised overview of their work, regarding how they approach assessment and treatment of sports-related back injuries. Clearly, due to the time constraints, the speakers were each unable to expand much beyond a fairly generic approach to practice. Distinctly different in approach, perhaps unexpectedly, was the osteopath, an apparently highly experienced practitioner and lecturer, who explained that, aside from the standard assessment and treatment approach, a major part of his intervention would incorporate cranio-sacral therapy (CST), a branch of osteopathic practice that has poor evidence-base to support its use. I felt here was an opportunity missed, as did my colleague (an osteopath) to explain current osteopathic practice, as the speaker was unable to provide a firm explanation of the methodology of CST and conceded to both the chair and audience that the rationale for its delivery was purely anecdotal and intuitive. The spinal surgeon offered a straightforward explanation of his role in sports spinal care, highlighting the need for good history taking, examination, referral networking and, in particular, anatomical imaging – because "hard physical signs are uncommon in spinal practice". He explained that history, examination and imaging "tend to need to sit together" in order to offer best indication for and prognosis from spinal surgery.

Q: How could an experienced sports therapist approach the task of presenting an overview of their work to an audience of healthcare practitioners and surgeons?

The final part of this session took the form of two real case studies, which were discussed by each speaker in turn - how they might assess and manage the case. This should have proved a useful comparative exercise so as to gain differing professional perspectives. In reality, the practitioners were not overly convincing in their probable line of approach, and very much treading on similar ground, with strategies that one may expect undergraduates to follow.
The first case study was a 30 year old professional rugby player with severe left-sided back pain who had undergone left-sided abdominal wall surgery three months previously. The outcome of this case, which was not picked-up as a possibility by the panel, was that the player actually had a grade 1 spondylolisthesis, which had resulted in inhibition of segmental stabilising muscles, leading to compensatory muscle imbalance and unilateral mechanical back pain.

Q: How should an autonomous sports therapist manage such a scenario?

The second case study was a 28 year old elite female hockey player with chronic left hamstring strain and low grade back pain. The outcome of this case, which was best discussed by the osteopath in considering the potential for structural imbalances, was that due

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to the unilateral nature of the sport a unilateral rotational strain had developed, which had responded to a short course of pelvic and spinal manipulation. Little emphasis had been placed on long-term management by the panel for either of the case studies.

Q: What long-term management protocols might a sports therapist recommend for the above case?

ii} The Spine: An elite sport perspective

This was presented as an overview of the type of injuries and conditions, incidents that occur in rugby and the management approaches commonly provided. The speaker, a sports physician and advisor to the English Institute of Sport, was clearly experienced in this field. He highlighted the rigorous demands of the sport – "in the scrum, there is likely to be up to two tonnes of loading force going through the props necks, especially with the pack behind". He explained simply that, in elite sport, the clear objective is "to be able to push the boundaries to get and keep players fit" which is a continual challenge given the nature of the sport, and the level, and the need for the players to be both routinely available for selection and also at the peak of their performance.

As well as the common spinal pathologies seen in elite rugby players, such as simple mechanical back pain (MBP), disc dehydration and bulging, annular tears and prolapse and stingers. The speaker also discussed the relationship of hamstring and calf problems relating to disc pathology and the very common presentation of pars interarticularis defects shown on MRI. The common feature of MBP in rugby players is that it tends to present in players as a continual soreness, with "ongoing issues but nothing sinister". The speaker made clear how crucial good on-field decision-making and first-aid management are at this level, especially given the high incidence of cervical spinal injuries. Management strategies discussed included the usefulness of epidural injections for pain relief in the acute phase of disc bulge and their potential to influence recovery. He also suggested that spinal surgery for rugby players frequently offers good prognosis, with a typical 3-4 month full return to sport.
Regarding prevention of injury, technique was considered to be the most important factor, with technique being the second, and third! Further key factors were core stability, strengthening and flexibility.

Q: For the sports therapist, what practical and ethical considerations need to be made when on the pitch attending to a player with suspected spinal injury and making the decision as to whether a player is fit to continue or not?

viii} Adolescent and Ageing Footballers

This session was delivered by a senior physiotherapist from a premiership football club. The session began with a dynamic (and loud) musical slide show to the tune of "Rock Star", complete with numerous images of elaborate goal celebrations, fast cars, WAGS, horrific injuries and jubilant and dejected supporters, all of which are normal associations with the modern game. The speaker then went on to present an honest and experiential account of the role played by a senior physiotherapist in top flight football. He explained about the way in which players are screened prior to signing for a club and the basis that the manager and medical team have for making the decision on a signing, which includes analyses of injury history matched against games played and consistency of performance. The speaker detailed the way in which his club assessed players and monitored their fitness, which alongside standard postural and movement analysis and such classic special tests as FABER, Thomas and core activation assessment, put significant emphasis on players' performance in the Vladimir Janda modified sit and reach test (graded on a 1-7 scale). Although he did not delve much into treatment or rehabilitation, injury prevention was seen to be an important aspect of player management by way of functional sports-specific screening. This was a useful insight into contemporary practice at high level.

Q: From a sports therapy perspective, where do you think there is scope for development in the assessment and management of players, beyond the methodology discussed in the session above?

Summary

This conference was a good attempt to bring together a strong collection of elite multidisciplinary practitioners and surgeons to discuss spinal problems in sport. The course began quite tentatively, but gathered more pace and purpose as the day went on. The panel discussions could have been more informative and offered more in terms of current elite sports practice. The individual speakers were more enlightening and the topics were pertinent. Audience participation in terms of intelligent questioning appeared to raise the output during the panel discussions. The cold lunch buffet, given the nature of the event and venue was quite poor, but nice to finish with a quick look at the stadium. Overall, a very useful day of shared knowledge discussing a key area of sports healthcare.

Q: As a sports therapist, what else do you think would have been useful to have been discussed regarding sports spinal care, and how?

Notes to contributors

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Bender, J., Bloggs, B. and Swistak, P. (1997) 'The evolutionary stability in cooperation', American Political Science Review 91(3): 290-297.

Book
Giddens, A. (1990) *The Consequences of Modernity*, Cambridge: Polity.
Kay, J., Mayer, C. and Thompson, D. (1986) Privatization and Regulation, Oxford:Clarendon Press, pp. 105-129.
Brown, C. (ed.) (1994) *Political restructuring in Europe: Ethical Perspectives*, London: Routledge.

Chapter in book
Hook, G.D. (1998) 'Japanese Business in Triadic Globalization', in H. Hasegawa and G.D. Hook (eds.) *Japanese Business Management: Restructuring for Low Growth and Globalization*, London: Routledge, pp. 19-38.

Conference paper
Altenstetter, C. (2001) 'Multi-level implementation networks: The case of medical devices and patient care'; Seventh Biennial Conference of the European Community Studies Association (US), Madison, Wisconsin, 31 May-2 June.

Thesis
Zito, A. (1994) 'Epistemic communities in European policy-making' Ph.D. dissertation, Department of Political Science, University of Pittsburgh.

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