SPORTS AND ENVIRONMENT EDUCATION

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Sports and Environment Education

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Preface

Sports and Environmental Education represents a comprehensive approach to merging physical activity with environmental consciousness. The foundational principles, highlighting how sports activities can serve as a catalyst for environmental awareness. It explores the potential of sports to inspire individuals to become stewards of the environment, fostering a sense of responsibility for nature's well-being.

The developing environmental awareness within the context of sports activities. It introduces concepts such as ecological sustainability, biodiversity conservation, and environmental ethics, providing a framework for understanding the interconnectedness between sports and the environment.

The emphasizes outdoor sports and nature exploration as avenues for connecting with the environment. It explores activities such as hiking, camping, and nature walks, highlighting how these experiences enable individuals to develop a deeper appreciation for nature while engaging in physical exercise.

Sustainability practices in sports facilities and events take center stage. It examines strategies for reducing environmental impact, such as energy conservation, waste management, and eco-friendly facility design. Additionally, it discusses the importance of promoting sustainable practices during sporting events to minimize carbon footprints and preserve natural resources.

Community engagement and environmental advocacy through sports. It discusses how sports organizations and community groups can collaborate to raise awareness about environmental issues, implement conservation projects, and advocate for sustainable policies at local and global levels.

By integrating environmental education into sports programmes, individuals develop a holistic understanding of the interconnectedness between human

activities and the natural world. They acquire knowledge and skills to make informed decisions about environmental issues, adopt sustainable behaviours, and advocate for environmental conservation efforts.

The role of education in promoting environmental literacy and responsible citizenship through sports. It discusses educational initiatives, such as environmental education programmes, eco-sports clubs, and green sports certifications, aimed at empowering individuals to become agents of positive change in their communities.

The future directions of sports and environmental education, discussing emerging trends, innovative practices, and opportunities for collaboration between the sports and environmental sectors. It emphasizes the importance of continued research, advocacy, and action to address pressing environmental challenges and build a more sustainable future through sports.

The book on Sports and Environmental Education provides insights into integrating environmental awareness and sustainability principles into sports activities, fostering a deeper connection with nature while promoting physical health and well-being.

–Author

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Teaching Sports in Physical Education

Beliefs about teaching and learning are well established by the time physical education teacher education (PETE) pre-service teachers commence tertiary courses (Grossman, 1991; Mills, 2006; Pajares, 1992). PETE students begin their studies with clear images of schools and teachers from their school experiences.

Research suggests that the influence of the lived experience of school physical education is more influential than PETE teacher preparation in the eventual practice of physical educators. International researchers have recognised that the educational experiences of pre-service teachers when school students plays a significant part in shaping and moulding their understanding of what it is to be a physical education teacher and how teaching should be enacted.

Lortie (1975) referred to this as an apprenticeship of observation. Schempp (1989) suggested that "the apprenticeship of observation is an ally of continuity rather than of change". How then, might physical education teacher educators work towards pedagogies that are innovative, rather than reproductive, when beliefs from the past develop expectations of what PETE will offer? The purpose of this study was to consider pre-service physical education teacher education as a site for pedagogical innovation through the provision of a teaching context presenting a description of 'the possible' for sport teaching in secondary physical education. This description centred on a curriculum and pedagogical model that contrasted to the PETE pre-service teachers' prevailing experience of being taught physical education at school, and their typical observations of sport teaching in physical education during professional teaching practice.

The authors acknowledge that this research challenges the technical and textbook discourse of the "physical education method" (Metzler, 2011, p. 173)

that the physical education community of practice (Holmes, 1999; Lave & Wenger, 1991) has traditionally shared. It was anticipated that the research would further inform the limits, constraints and possibilities of PETE pre-service coursework and PETE pre-service teachers as contextual factors (Rogers, 1995) affecting conceptual change towards curriculum alternatives.

As Kirk (2010) has highlighted, while the apprenticeship of observation is a powerful influence upon ideas about how to teach (Lortie, 1975) the professional socialisation (Wright, McNeill & Butler, 2004) of university PETE is where those ideas can be confronted and their acuity challenged.

USING RELAXATION TECHNIQUES FOR REHABILITATION

Regardless of the type of relaxation to be used, several prerequisites are necessary for effective relaxation. Flint (1998b) states that learning how to relax is a skill, and as with any other skill, must be learned and practised for it to be effective. Crossman (2001) proposed that when relaxing, athletes will pass through three levels of relaxation: symbolic level, mental level, and physical level. During the symbolic level, the breathing becomes deeper and slower. During this initial phase, a realisation of creating tension (during PMR) or relaxation (in passive relaxation) will take place. The mental level will create a sense of calm in the athlete, and their focus will start to digress from the anxiety causing distractions. At this level, athletes are reasserting control over themselves by being in control of their muscles and bodies. The final level, i.e., the physical level will be achieved through practice. Once an athlete is able to achieve physical level of relaxation, they become able to evoke a deep relaxed state, and to control any physical or psychological anxieties which may be hindering their injury recovery process. As an individual passes through these levels, their state of relaxation increases and their sense of control over their bodies is enhanced.

Rotella (1982) believes that the first step in any relaxation training should be education. The athlete should be educated about the purpose, the benefits, and the rationale for the use of relaxation, and any possible questions and qualms about the technique should be highlighted and resolved. On a more practical level, it is also vital to ensure that relaxation takes place in a quiet, calm, comfortably warm area with subdued lighting. Athletes should be positioned lying down or in a chair, with the emphasis being on athletes feeling comfortable in the position adopted. Athletes should use loose and comfortable clothing, and to remove any unnecessary items such as shoes, watches, glasses, contact lenses (Crossman, 2001; Rotella, 1982). It has also been proposed that pre-recorded audio recording of the relaxation script and the use of audio equipment (i.e., CD, iPod, MP3 player) during the relaxation process can be beneficial in facilitating the relaxation process (Taylor & Taylor, 1997). Taylor and Taylor also propose relaxation as being most effective when integrated into the structure of daily physical sessions (e.g., using deep breathing during the times when

pain is prominent and hindering the rehabilitation process). They also regard ending physiotherapy sessions with relaxation as beneficial, since it can be a rejuvenating experience following the painful and unpleasant experience of rehabilitation.

RELAXATION TECHNIQUES

It appears that a range of relaxation techniques can be of use for injured athletes during rehabilitation. As demonstrated above, relaxation can facilitate athletes' ability to manage and alleviate pain, and to deal with range of anxieties during rehabilitation. Much of the research to date has investigated the effectiveness of relaxation interventions on physiological outcome measures (e.g., muscle strength, joint stability, pain, and ROM), and relaxation interventions have been currently used in combination with, or as complimentary to imagery intervention. Recent studies have investigated the effects of imagery and relaxation on injured athletes' mood or other psychological factors; however to date, existing research on the effectiveness of relaxation techniques continues to be equivocal.

SELF-TALK

Another psychological skill often utilised by athletes in the hope of shaping and improving their sporting performance is self-talk (ST). All athletes engage in some form of ST, but the extent, frequency, content, and type will vary depending on the situation and the individual athlete (Zinsser, Bunker, & Williams, 2006). Research findings on ST tend to suggest that both male and female athletes use ST, and some support for males using more external and negative ST than females has been found (Hardy, Hall, & Hardy, 2005). Hardy and his associates also found no significant differences in the ST content due to athletes' skill level; however it appeared that individual athletes used more ST than team athletes.

Over the past twenty years, a number of global definitions of ST have been put forward by a range of researchers. For example, Hackford and Schwenkmezger (1993) defined ST as an "internal dialogue in which the individuals interpret feelings and perceptions, regulate and change evaluations and cognitions and give themselves instructions and reinforcement" (p. 355). Another definition was later put forward by Theodorakis, Weinberg, Natsis, Douma, and Kazakas (2000) in which two important aspects of ST acknowledged in the earlier definition by Hackford and Schwenkmezger (1993) were highlighted and clarified further: ST involves statements addressed to oneself and not others, and it can be articulated either overtly (external ST) or covertly (internal ST). In particular, according to Theodorakis et al. (2000), "self talk is what people say to themselves either out loud or as a small voice inside their head" (p. 254).

ST as a construct has been typically classified into three main types: positive (i.e., motivational), instructional, or negative. Positive ST refers to the positive

statements or individual words (e.g., now) an athlete may use to enhance their effort, increase their energy levels, and to maintain positive attitude with no reference to specific task-related cues (e.g., keep going, I can do this). Instructional ST on the other hand consists of task-related cues, and is used to help the individual in focusing on technical or tactical aspects of their performance (e.g., keep your eye on the ball, bend your knees, and relax shoulders). In contrast, negative ST is critical and self-demeaning (e.g., I can't do this, I am such an idiot for making such an error), and can affect athlete's ability to complete the required task and subsequently have an impact on how well the set goals are reached.

In conclusion, ST has been proposed as being one of the most pervasive cognitive strategies employed by all athletes alike (Theodorakis,

Hatzigeorgiou, & Chronic, 2008), and has been proposed as one of the most important methods for cognitive control (Zinsser et al., 2006).

The use of positive and instructional ST can be useful for athletes in enhancing concentration, breaking bad habits, initiating action, sustaining effort, and acquiring skill (Weinberg & Gould, 2007). The use of ST is often seen as a fundamental part of other intervention strategies employed in sport (Conroy & Metzler, 2004), however until very recently research on ST has been sparse. Much of the work on ST has also been lacking theoretical foundations (Hardy, 2006), which consequently has led to the development and application of a range of theories and models. To date, many of the existing theories and models are lacking rigorous empirical support (Hardy, 2006), which according to Theodorakis et al. (2008), has left the researchers relatively unaware of all the different constructs of ST and how it works.

SELF-TALK IN SPORT INJURY REHABILITATION

Similar to using ST for performance enhancement, it can also facilitate the actual physical recovery. A recent review of literature indicated that ST was found to be useful for joint restoration, muscular strengthening, and rehearsing sport related skills (Beneka et al., 2007). ST can also assist injured athletes with the psychological aspects of injuries, particularly in the form of coping with their sport injury rehabilitation process. Once injured, many athletes cognitively appraise the injury as detrimental (Flint, 1998b), and as a result are likely to engage in negative thoughts and self-defeating personal dialogue. If such thoughts are left unchallenged, they can have a hindering effect on the athlete's mood, adherence, compliance, and ultimately on the psychological and physical rehabilitation outcome. Thus, applying ST and managing thoughts during sport injury rehabilitation is seen as vital, since it can assist an athlete in restructuring hindering thoughts into positive and taskorientated thoughts leading to more positive and motivated attitudes towards injury and rehabilitation process. A limited amount of research into the use of ST as part of rehabilitation exists. Twenty years ago Weiss and Troxel (1986) were the first to document

injured athletes' post-injury experiences. In their study with ten injured athletes representing a range of sports, Weiss and Troxel found that many athletes experienced a range of emotions and feelings once injured. The most frequently reported responses to injuries were disbelief, fear, anger, depression, tension and fatigue. It was also found that many injured athletes may feel panic and helplessness as a result of engaging in irrational and negative thoughts (Weiss & Troxel, 1986), and therefore the use of positive (self)statements during rehabilitation would be appropriate and beneficial.

Following on, Ievleva and Orlick (1991) were the first to study the impact of different psychological intervention methods on athletes' (N = 32) recovery from sport injury. In their retrospective study with athletes already recovered from their sport related injuries, Ievleva and Orlick found a strong positive correlation between athletes' recovery time and the use of positive self-talk.

Along with goal setting and imagery, the fast healing athletes (n = 4) reported greater use of positive self-talk than their slow healing counterparts (n = 5). Qualitative findings revealed that overall; the fast healing athletes had a tendency to be highly positive (e.g., 'I can do anything'), whereas slow healing athletes had a tendency to be totally negative ('it will probably take forever to get better') and unforgiving ('dumb mistake', and 'you stupid fool!'). The athletes who recovered at an average rate appeared to be a combination of both of the above. Such findings provide support for athletes' ability to influence and control thoughts during injury and the rehabilitation process, subsequently also supporting the use of positive self-talk during rehabilitation.

In a study by Ross and Berger (1996) the authors investigated the effects of stress inoculation training7 on athlete's postsurgical subjective pain, anxiety, and physical functioning. A total of 60 male athletes were randomly assigned into intervention and control groups. Similar to the findings by Ievleva and Orlick (1991), the use of cognitive-behavioural interventions appeared to facilitate athletes' recovery rate. In addition, stress inoculation training was also found to be beneficial in reducing athlete's levels of anxiety and pain.

Gould and his associates published a series of articles exploring range of coping strategies employed by injured athletes. For example, in their study with Olympic level wrestlers (N = 20), 80% of the participants reported the use of thought control strategies as means of coping with their injuries (Gould, Eklund et al., 1993). In a study with national championship level figure skaters (N = 17), rational thinking and self-talk were reported as the most popular (76%) coping strategies employed by the athletes (Gould, Finch et al., 1993). Few years later, 21 US alpine and freestyle skiers (76%) regarded the management of thoughts and emotions as the third most important technique when coping with season-ending injuries (Gould et al., 1997). In a qualitative study with US ski team members (N = 21), thinking positively was regarded as the third largest general dimension to emerge from the data, with 81% of the athletes citing a theme within the dimension (Udry et al., 1997). Similar to the findings by Udru et al. (1997), Taylor and Taylor (1997) highlighted the use of positive statements

as beneficial. In particular, using such statements at the beginning and at the end of each rehabilitation session can be seen as having the potential to generate positive emotions in athletes, which in turn can facilitate the quality of the rehabilitation.

In addition to enhancing the quality of the rehabilitation, positive self-talk has also been found to enhance home exercise adherence with athletes who undertook ACL rehabilitation (Scherzer et al., 2001). In their study with 54 patients undergoing rehabilitation, most participants denied the use of self-talk. Why such was the case was not clarified and warrants for further research.

Amongst those who did report using ST during rehabilitation, both the use of positive ST and GS were found to have a positive correlation with home exercise completion. Despite finding no significant relationships between positive ST and home cryotherapy (use of ice) completion, sport injury rehabilitation adherence scale rating, and physiotherapy attendance, in light of the other existing research (e.g., Ievleva & Orlick, 1991), the authors proposed that ST has the potential to help athletes to stay motivated to adhere to their rehabilitation. Such findings might suggest that once athletes have adopted ST as part of the rehabilitation process, it appears to be beneficial. However, as very few athletes reported using ST, educating athletes further about the benefits of ST might be useful.

PEDAGOGICAL REFORM IN SPORT TEACHING

TGfU (Bunker & Thorpe, 1982; 1983) and Sport Education (Siedentop, 1994) are classified as models by Metzler (2011) that have been widely researched and supported as capable of reforming and re-directing sport teaching in physical education towards more substantial learning outcomes. Bunker and Thorpe (1982) described TGfU as a response to their observations that many children complete school neither knowing the sports, nor knowing how to play the sports, supposedly learnt in physical education. Frequently students lacked the knowledge and motor skill proficiency necessary for effective play (Thorpe, Bunker & Almond, 1986) and, therefore, continued involvement in the games encountered in physical education. It was Bunker and Thorpe's (1983) belief that the reliance on skill and drill pedagogy, and its focus on specific motor pattern reproduction, did not adequately take account of the contextual use of motor patterns in games. The TGfU model did not suggest that motor skill learning was unimportant. Rather, Bunker and Thorpe (1982, 1983) proposed that effective motor skill learning must contextualised movement performance to the requirements of the game (Thorpe & Bunker, 2010). A curriculum model outlining a sequential cycle of teaching repositioned the development of game related decision making as fundamental to learning that would facilitate participation in games occurring prior to the teaching of sophisticated sport specific movement techniques. In the TGfU model, game appreciation and understanding was presumed to "always precede the response factors of skill execution" (Werner & Almond, 1990, p. 26).

The development of TGfU presented a clear contrast to established physical education pedagogy in terms of the skills, knowledge and understanding that were foregrounded in teaching and learning, and in parallel, the ways in which teaching could most effectively engage with the new learning priorities. The pedagogical use of questioning as teaching in TGfU emphasised a shift from the transmission method of instruction inherent in the traditional physical education approach to a more dialectic teaching approach (Bell, 2003) where the teacher acts as facilitator (Mitchell et al., 2006), leading students rather than informing. In Australia, the TGfU model was developed as a sport teaching approach called *Game Sense* - articulated both as the outcome of sport teaching and as a game-centred model for sport teaching. Contextual sport skill learning became the tenet of Game Sense. Thinking players (den Duyn, 1997b) became the objective of sport teaching and learning.

The Sport Education model is also directly pertinent to this research. It emerged from similar concerns about the form and function of sport teaching in physical education within the dominant multi-activity model. Siedentop (1994) highlighted the limitations of the multi-activity model in three areas: the transferability of learning to sport outside of schools; the authenticity of many aspects of school physical education when compared to sport structures and participation opportunities beyond school; and the lack of inclusivity inherent in many traditional physical education curricula.

The distinctions between Sport Education and the traditional sport teaching approach relate to curriculum structure, content and focus, and pedagogical approaches and their relationship to learning objectives. Sport Education emphasises greater depth of content coverage by extending the time spent engaged with one sport and establishing an expanded set of curriculum goals. These include movement technique and tactical understanding, personal and social skill development, and sport cultural and social understanding. The model encompasses opportunities for learning relating to multiple roles in sport in addition to that of player (such as coach, manager, referee, journalist). Kirk and Macdonald (1998) asserted that advocates of Sport Education have grasped the need for a form of physical education that offers students meaningful, authentic and differentiated participation. The results of an Australian study of teachers' perceptions of Sport Education supported the view that Sport Education can be a context for pursuing a broader range of outcomes than is possible via a traditional physical education method (Alexander & Luckman, 2001). Shehu (1998), however, warned of the potential for Sport Education to be a sealed methodology, both in form and content making it more likely to be a sport management strategy than a framework illuminating the character of physical education. Suggesting that the model was flawed in a fundamental way, Shehu argued for a substantial rethinking of the philosophical character of the model so that sport is placed back into the field of physical education from which it is abstracted. Alexander and Penney (2005) identified with Penney, Clarke and Kinchin's (2002) suggestion for further development of the model to promote

sustained connections with sport beyond the classroom, arguing the potential for form to triumph over substance and the model resulting in sport without the education.

While TGfU and Sport Education have often been presented as alternative choices for sport teaching in physical education (Metzler, 2011) increasingly, synergies between and within have been acknowledged (Dyson, Griffin & Hastie, 2004; Siedentop et al., 2004) and a number of hybrid models developed. Sport literacy integrates the two models to re-consider the purpose of sport teaching in physical education and the nature of game appreciation and game understanding. As explained earlier, sport literacy is the integration of the curriculum expectations and pedagogical elements of TGfU/Game Sense and Sport Education. It is an innovation for sport teaching in physical education that seeks to move curriculum and pedagogical considerations away from questions of which model and towards a framework for sport teaching that considers the nature of being sport educated.

Sport literacy is defined as the functional use of sport knowledge for active and engaged citizenship (Pill, 2009). Remaining true to Arnold's (1979) definition of education in physical education, sport literacy aims to integrate teaching and learning to value in learning in, through and about sport. Specifically, learning in sport the sport skill acquisition that enables an individual to be able to move and make tactical decisions efficiently and effectively in game situations; learning about sport so as to be able to recognise that sport is structured in certain ways to bring about certain things; and learning through sport an embodied experience of play.

Sport literacy has two principles for sport teaching: Sport in physical education can enhance students' access to practices and ideas that can enable them to make a positive contribution to society; and sport helps students to understand the self and the society in which they live. The role of physical education in promoting sport participation in school and beyond is linked with the development of skills and understandings enabling the functional use of sport knowledge within active and engaged citizenship (Drummond & Pill, 2011).

FINDINGS AND DISCUSSION: ISSUES FOR TEACHER EDUCATION

As indicated in the introduction to this paper, many of the matters raised by this research have relevance to teacher education broadly, not only PETE. That said, a strong case also emerges for further research that specifically pursues PETE as the context for pedagogical innovation. Discussion here addresses selected themes that arose from the research and that are most pertinent to debates about the content and structure of teacher education courses and their capacity to prompt and support curriculum and pedagogical reform in schools. Data arising from the study provided rich insights into the limits and possibilities for PETE to provide the context, content and environment in which future teachers can rethink sport teaching in physical education.

PRIOR LEARNING AND ESTABLISHED UNDERSTANDINGS

It was very apparent that the PETE pre-service teachers' expectations and understandings going into the sport literacy curriculum studies topic were informed by ritualised curriculum practices and the habituated enactment of sport teaching existing during their apprenticeship of observation (Lortie, 1975; Schempp, 1989). Their understanding of sport teaching in physical education and perceptions about the design and enactment of sport teaching appeared nested in experiences of physical education at school, school observation experiences as part of their university course work to date, and community sport/sport coaching interactions. Notably, all of these prospective influences appeared to have reaffirmed rather than disrupted a traditional, behaviourist approach to sport teaching in physical education.

Prior to the sport literacy topic, the pre-service teachers viewed sport in physical education as substantially concerned with teaching the technical skills of various sports and how to progress or extend the development of those skills, and the rules of sport. While tactics were also commonly cited as knowledge integral to teaching students how to play a sport, there was no evidence in the responses of a requirement for physical education teachers to have a broader understanding of sport in order to plan and enact sport units of work. Curriculum and pedagogical thinking appeared focused upon and limited to sport-specific, skills-based teaching. For example, this was typical of the comments articulating the recognised knowledge base for teaching sport: "A basic knowledge of the sport to enable them to plan a unit around this in relation to how to do the skills, how the game is played (i.e., rules), tactics of the game" (PETE pre-service teacher comment, Survey 1). Some responses pointed towards greater depth of understanding of pedagogy and planning, but retained a similar orientation. One PETE pre-service teacher commented that;

PE teachers require in-depth knowledge of the skills, rules and tactics that they wish to cover in each unit throughout the year - importantly making connections between the units where necessary. [In-depth knowledge of the skills, rules and tactics] will allow PE teachers to plan effectively i.e., taking into account the need to adapt their [PE teacher]units depending upon what year level and ability group they are teaching and how to devise appropriate assessment methods which meet their [PE teacher]desired outcomes (PETE pre-service teacher comment, Survey 1).

The pre-service teachers regarded experience as a sport participant or player as essential in providing the knowledge for sport teaching, and saw that experience in a specific sport as essential if they were to design and enact sport teaching for quality learning. A theme evident from the analysis of data across all of the data sources was that the pre-service teachers appeared to assume that the development of sport knowledge and cognition had to wait until after the development of enabling sport skills. Furthermore, they expressed uncertainty as to whether thinking and problem-solving activities were as important as teaching motor skill responses by repetitive drill practice. The persistence of

this behavioural paradigm into this final year of the PETE students' degree highlighted the challenge of shifting thinking beyond the view of sport teaching established in the apprenticeship of observation. Encounters with constructivist physical education models for sport teaching (such as TGfU and Sport Education) during PETE course work had seemingly had little impact on students' understandings of the form, function and potential of sport in physical education.

THE LIMITS AND POSSIBILITIES OF INNOVATION

To enable the pre-service teachers to experience the intentions of a sport literacy framework first hand during their coursework they were placed into learning situations indicative of teaching with a sport literacy intention. The emphasis was not on learning to play the sport as a school student would learn to play, but rather to experience the curriculum and pedagogical emphases associated with learning to teach volleyball through the lens of sport literacy. Key tenants of the experience were, therefore, learning to play volleyball, learning through volleyball personal and social competencies, and learning about the sport of volleyball as a social and cultural construction.

Both quantitative and qualitative data arising from the study indicated that the PETE pre-service teachers' response to the pedagogical strategies of sport literacy were positive and viewed favourably in relation to the design and enactment of sport teaching in secondary school physical education. For example, one PETE pre-service teacher commented:

I believe it is important to develop students' sports literacy because sport plays such a huge role in the community. There are so many different aspects to sport that playing and mastery of specific skills is just one component. The alternate roles (such as coaches, umpires etc) may well appeal to different people who are less proficient at the specific skills but who's interest is still valid as it is very much another component of sport (PETE pre-service teacher comment, Survey 1)

The model was viewed as enhancing their ability to plan quality sport teaching within physical education (90.7%). It was seen as consistent with the intentions of the Middle and Secondary Years Outcomes of the South Australian Curriculum Standards and Accountability (SACSA) Framework (Department of Education and Children's Services, 2004) as it assisted their capacity to plan (86%), teach (93%) and assess (90.7%) sport units of work that address student achievement of the curriculum (SACSA) outcomes addressing *physical activity and participation* and *personal and social development*. Most signalled an improved game knowledge (81.4%) and game understanding (79%). All those signalling undecided or disagreement with the proposition that game knowledge or understanding had improved were experienced in competitive volleyball.

Data suggested that practical and theoretical interactivity with a pedagogical curriculum model promoted critical reflection on acculturated and institutional experiences of sport teaching. Experiencing a curriculum model 'as enacted curriculum' permitted examination of the proposed benefits from a personalised

perspective that would not be possible if instruction has been restricted to theoretical posturising and textbook interrogations of technique. This comment by one of the PETE students captured the feeling about the potential of course work topics such as this to create an enhanced understanding of possibilities for sport teaching in physical education:

It's [sport literacy] altered my philosophy of teaching PE. Doing the curric studies topic and learning about tactical games was easily one of the best topics. Opened my eyes, there is more to the game than being able to do the skill correctly. Even little things like the students being aware of their movement off the ball, like when they are not doing a set, not just standing there, moving and anticipating. I wouldn't have talked about time and space, I would have just talked about how to perform the set correctly. Made me aware that there is more knowledge required to be successful in a game than simply skill acquisition. Saw sport as, learn these skills and then play a game, but now I understand the game differently (PETE pre-service teacher comment, PTP4 interview)

Perhaps the most significant point to note from a progressive standpoint, was that the data analysis clearly indicated that the sport literacy coursework topic was instrumental in the pre-service teachers feeling that they had the curriculum and pedagogical knowledge to *design and enact sport teaching differently* to the format and approach that they had been exposed to during their apprenticeship of observation. For example,

I love the fact that skills are not the number one factor. I have witnessed how alienating skill based teaching can be and believe a lifelong participation in sport would be much more likely (PETE pre-service teacher comment, Survey 2)

It [sport literacy] put students towards the forefront of their own education, giving them a deeper sense of ownership and feeling of being a worthwhile member of the class (PETE pre-service teacher comment, Survey 2)

The opportunity to live the curriculum as learners can thus be seen as valuable in pre-service teachers coming to know, understand and appreciate the efficacy and value of a curriculum pedagogical model in achieving student learning. At the same time, however, the data analysis clearly indicated that coursework interventions and experiences such as the sport literacy topic are, of themselves, insufficient in constructing PETE as an agency for curriculum renewal. The research findings leant support to the contention that university coursework has a central role to play in exposing pre-service teachers to alternative ways of viewing curriculum form and function. However, it was equally apparent that consistent and sustained action and support directed towards enabling pre-service teachers as agents of curriculum and pedagogical change in the field is required in PETE courses. One of the challenges seen for PETE in this regard reflects that the pedagogical content knowledge of physical education teachers can be highly context specific, due to the variability of experience with the sports they are likely to teach (Griffin, Dodds & Rovegno, 1996), and that the enacted curriculum is, in Ennis' (1995) view, closely connected to pedagogical content

knowledge. Therefore, the range of sports a teacher has been pedagogically exposed to during PETE appears destined to constitute a constraint on the development of a physical education teacher's ability to implement a progressive curriculum approach such as sport literacy. The reality in PETE, throughout Australia and internationally, is that courses can never directly engage with the full spectrum of sports that teachers may subsequently encounter and be required to teach in schools. Providing pre-service teachers with the opportunity to formulate a framework through which to both interrogate specific sport knowledge and frame content and pedagogical knowledge emerged as a vital function of PETE courses. It was evident from the data analysis that for this group of PETE pre-service teachers university course work experiences had been limited in this regard. The pre-service teachers remained focused on sport-specific experiences, feeling that they had not been exposed to enough practically based sport experiences during their course work. This quote typifies the PETE pre-service teachers' feelings about practically based sport experiences during their course work:

I really believe that we have not done anywhere near the amount of practical we should have. For us to have a unit plan and at least a session or a block of practical experience for most sports, so that we feel confident and we have the knowledge of skills, rules, safety and understanding of the game to deliver a range of sports to students (PETE pre-service teacher comment, Survey 1)

The nature of a university teacher education programme, where learning is packaged into discrete learning modules (called topics at this institution, and referred to as units or papers elsewhere) was positioned as problematic from the PETE student perspective and emerged as an impediment to the notion of enabling students as agents of change. The discrete learning structure equated to a fragmentation of learning from a student perspective. Fragmentation of pedagogical and content knowledge may inhibit the capacity of PETE to nurture and embed new thinking about the curriculum and pedagogy of physical education. As Humphries (1981) observed three decades ago:

It is taken for granted, apparently, that in time students will see for themselves how things fit together. Unfortunately, the reality of the situation is that they tend to learn what we teach. If we teach connectedness and integration, they learn that. If we teach separation and discontinuity, that is what they learn. To suppose otherwise would be incongruous (Cited in Lake, 2000, p. 5)

A further structural and pedagogical feature of teacher education is that teaching and learning involves both university and school-based components. For PETE generally and for this study in particular, a key question which arose was whether students would have the opportunity to enact the new pedagogies that they had encountered in their university course, when on school practicum placement, and furthermore, would they feel supported in the school context to take what might well be deemed pedagogical risks? As Wright (2001) emphasised, both the mentor teacher and PTP school placement are dominant influences in the development of teacher understanding about their role and

function as professionals. Exposure to sport literacy principles in action in school settings emerged as an enabling factor in pre-service teacher understanding of the application of sport literacy pedagogical strategies. The contextual development of pre-service teachers' curriculum and pedagogical content knowledge and understanding through teaching practicum was important in coming to know and appreciate the practical application of sport literacy to frame sport teaching. At the same time, however, this experience highlighted the fragility of new pedagogical knowledge. One of the pre-service teachers reflected: "I hadn't a lot of experience or observation of sport literacy as a model. I hadn't experienced it as [a school] student. It's limited, sort of at the infancy stage of doing, and if those ways don't work then I am stuffed" (PETE pre-service teacher, post PTP 4 interview).

Opportunities to see evidence of planning to achieve sport literacy in school physical education curriculum documents, and observation of teachers enacting sport teaching using the principles of a sport literacy design were on the pre-service teachers list of desirable practicum experiences. The data arising from this study suggested, however, that a traditional approach to sport teaching prevails in most secondary school settings, presenting pre-service teachers with a sharp contrast in pedagogical thinking and approach to that central to sport literacy. Furthermore, while the pre-service teachers desired supportive and knowledgeable school mentors to expand their understanding of the planning and enactment of the type of sport curriculum advocated by sport literacy, they were unlikely to be encouraged to pursue this vision for sport teaching. For example,

When I showed my plan to my mentor and asked him to check that it met the curriculum expectations he was like, 'that's great they are teaching you that stuff at Uni, but we don't pay too much attention to it, just do what you think (PETE pre-service teacher comment, Survey 1)

Pre-service teachers are more likely to receive encouragement, support, constructive feedback and ideas from effective mentor teachers who have had adequate preparation for their role (Oh, Ankers, llamas & Tomyoy, 2005; Tannehill & Zarajsek, 1990). Gillespie (2011) recently drew attention to mentor teachers' influence in relation to how pre-service teachers conceive their role as teacher and the appropriateness of curriculum and pedagogical choices, and pointed to a need for PETE to therefore place more emphasis on mentor value orientations in their placement of pre-service teachers. This research leant support to this call and Gillespie's (2011) accompanying emphasis of the significance of PETE students' value orientations in considering prospective engagement with curriculum and pedagogy in physical education. In this study the analysis of the post PTP4 interviews indicated that beliefs and value orientations of the PETE pre-service teacher are influential in deciding to implement and persisting with the implementation of a progressive sport teaching framework such as sport literacy.

The pre-service teachers provided with teacher mentor support or indifference towards an alternative framing of the learning environment were more likely to

indicate willingness to attempt the objectives of sport literacy. Notably, the mentors of PETE pre-service teachers in South Australian schools, where this research was conducted, currently receive no guidelines or professional learning in the mentoring of pedagogical content knowledge in specific subject disciplines. Furthermore, as is the case for many teacher education institutions, the allocation of pre-service teachers to school mentors is an imprecise process and based to a large extent on mentor availability. Currently, notions of master teacher (Schon, 1987) and of highly accomplished teacher (Darling-Hammond, 2006) do not feature in the mentor and PETE pre-service teacher partnership allocation.

The personal challenge of teaching for a broader suite of objectives and expectations of students' learning were evident in the positive responses about future intentions of using sport literacy for the design and enactment of sport teaching. This is reflected in the following comments by two different PETE pre-service teachers. Talking about what would influence them to continue with a sport literacy intention with their sport teaching, they said:

Teaching a skill and drill approach I would be bored. Using a combination of TGfU-Sport Ed, being flexible to the class and the sport will be important to me. I think if you are inclined to be reflective about your teaching you are more likely to teach this way. I don't know, possibly you care more about your teaching and what you are trying to achieve. I don't think there is a point turning up every day and not giving a flying uncle about what the kids learn. If you don't care what the kids are learning it is time to give the game away. I feel I am more engaged in a TGfU-Sport Ed. I find it enjoyable to teach this way (PETE pre-service teacher comment, PTP4 interview)

I also felt it opened me up as a teacher. As I went on I didn't feel like I had to control everything and this helped me to assess kids. Kids are running it. You could look at if the students are achieving the outcomes you want them to achieve. You've got time to look at things a bit. I don't see it as separate models anymore. I could apply the things that I think are valuable for the kids learning. I observed kids doing tennis and they were just mucking around. But in this approach, I could see them linking into the questions and this focussed them. I linked the waterpolo to soccer and the soccer kids started asking me questions, could we apply this to soccer, how could we apply this to soccer, and that's deeper understanding. Kids come out of their shell. You didn't previously see them that capable physically, maybe academically as well. But this style of teaching got them involved a lot more, especially the sport education teams (PETE pre-service teacher comment, post PTP interview)

Many of the PETE-PS teachers recognised that their practice needed to be different from the practice that they had experienced firstly as students in PE and secondly, that which they typically observed and experienced while they participated in PTP placements. Thus, for these pre-service teachers, their PTP experience had not served to support the notion of PETE as an apprenticeship for innovation in physical education curriculum and pedagogy.

PHYSICAL EDUCATION - OVERVIEW, PREPARATION OF TEACHERS

"Physical education is the study, practice, and appreciation of the art and science of human movement".

While movement is both innate and essential to an individual's growth and development, it is the role of physical education to provide instructional activities that not only promote skill development and proficiency, but also enhance an individual's overall health.

Physical education not only fulfills a unique role in education, but is also an integral part of the schooling process.

HISTORICAL PERSPECTIVES

From the late 1700s to the mid-1800s, three nations–Germany, Sweden, and England–influenced the early development of physical education in the United States. German immigrants introduced the Turner Societies, which advocated a system of gymnastics training that utilized heavy apparatus (e.g., side horse, parallel and horizontal bars) in the pursuit of fitness. In contrast, the Swedish system of exercise promoted health through the performance of a series of prescribed movement patterns with light apparatus (e.g., wands, climbing ropes). The English brought sports and games to America with a system that stressed moral development through participation in physical activities. The influence of these three nations laid the foundation for sport and physical education in America.

The 1800s were an important time for the inclusion of physical education in schools across America. The Round Hill School, a private school established in 1823 in Northampton, Massachusetts, was the first to include physical education as an integral part of the curriculum. In 1824 Catherine Beecher, founder of the Hartford Female Seminary, included calisthenics in her school's curriculum and "was the first American to design a programme of exercise for American children" (Lumpkin, p. 202). She also advocated the inclusion of daily physical education in public schools. However, physical education was not offered in the public schools until 1855, when Cincinnati, Ohio, became the first city school system to offer this type of programme to children.

In 1866 California became the first state to pass a law requiring twice-per-day exercise periods in public schools. Beecher's influence started the American system of exercise, and, along with her contemporaries Dio Lewis, Edward Hitchcock, and Dudley Allen Sargent, she was an early leader in physical education. In the profession's early years, between 1855 and 1900, there were several debates, referred to as the *Battle of the Systems,* regarding which system (American, Swedish, German, or English) could best provide a national physical education programme for America.

During the 1890s traditional education was challenged by John Dewey and his colleagues, whose educational reforms led to the expansion of the "three R's" to include physical education. It was also during this time that several

normal schools (training schools for physical education teachers) were established. All of these schools offered a strong background in the sciences that included courses in anatomy and physiology, with many of the early professors holding medical degrees.

In 1893 Thomas Wood stated that "the great thought of physical education is not the education of the physical nature, but the relation of physical training to complete education, and then the effort to make the physical contribute its full share to the life of the individual" (National Education Association, p. 621). During the early twentieth century, several educational psychologists, including Dewey, Stanley G. Hall, and Edward Thorndike, supported the important role of children's play in a child's ability to learn. In line with the work of Wood in physical education, and the theoretical work of prominent educational psychologists, *The New Physical Education*was published in 1927 by Wood and Rosalind Cassidy, who advocated *education through the physical.*

This position supported the thesis that physical education contributed to the physical well-being of children, as well as to their social, emotional, and intellectual development. However, Charles McCloy argued against this expanded role of physical education, arguing that *education of the physical,* which emphasized the development of skills and the maintenance of the body, was the primary objective of physical education. The testing of motor skills was a part of McCloy's contribution to physical education, and his philosophy of testing paralleled the scientific movement in education.

The evolution of physical education, along with other educational professions, reflected contemporary changes in society. Throughout the early twentieth century, into the 1950s, there was a steady growth of physical education in the public schools. During the early 1920s many states passed legislation requiring physical education. However, shifts in curricular emphasis were evident when wars occurred and when the results of national reports were published. For example, as a result of the bombing of Pearl Harbor and the United States' entrance into World War II, the emphasis in physical education shifted from games and sport to physical conditioning. Similar curricular shifts were noted in 1953 when the Kraus-Weber study found that American children were far less fit than their European counterparts. As a result of this report, the President's Council on Physical Fitness was established to help combat the falling fitness levels of America's youth.

During the 1950s and the 1960s, physical education at the elementary level experienced tremendous growth. Today, many physical education programmes emphasize overall fitness, referred to as *wellness,* as well as skill development. However, since the 1970s the number of schools offering daily physical education has drastically decreased–1995 statistics from the Centres for Disease Control and Prevention (CDC) show a drop from 43 percent in 1991 to 25 percent in 1995.

RATIONALE

In the 1990s three national reports–*The Surgeon General's Report on Physical Activity and Health* (1996), *Healthy People 2000* (1990), and the CDC's

Guidelines for School and Community Programmes (1997)–have focused on the deplorable physical condition of Americans. These reports cited physical inactivity as a national health risk, based on statistics such as: (1) 13 percent of young people are classified as overweight; (2) only half of all youths are physically active on a regular basis (and this percentage decreases with age); and (3) inactivity and poor diet cause at least 300,000 deaths per year.

These reports advocated the need for daily physical activity, citing the following health benefits from moderate participation: improved strength and endurance, healthier bones and muscles, weight control, reduced anxiety and increased self-esteem, and, often, improved blood pressure and cholesterol levels. Physical education is the major vehicle for improving the health and fitness of the nations' youth. *Healthy People 2000* recommended the increase of daily physical education to a level of at least 50 percent of students in public schools by the year 2000.

In addition to the health benefits, cognitive performance can also be enhanced through physical education. There is a growing body of research that supports the important relationship between physical activity and brain development and cognitive performance. C. Edwin Bencraft (1999) found that "sensory and motor experiences play a prominent role in reinforcing … synaptic connections and neural pathways".

Eric Jensen's 1998 research revealed that the cerebellum is not solely dedicated to motor activity, but includes both cognitive and sensory operations. Further, Jensen points out the strong relationship of the cerebellum to memory, perception, language, and decision-making, citing physical activity as a way to enhance cognition. In a summary of research findings, Bencraft suggests providing the following applications that could increase cognitive performance: (1) challenging motor tasks before the age of ten can increase cognitive ability due to a heavier, more dendrite-rich brain;(2) aerobic exercise improves cognitive functioning by increasing the number of capillaries serving the brain through the delivery of more oxygen and glucose and removal of carbon dioxide; (3) cross-lateral movements increase the communication ability between the brain's hemispheres; and (4) physical activity reduces the production of stress chemicals that inhibit cognitive processing.

From the mounting evidence favouring physical activity, it appears that physical education in schools plays a dual role in serving both mind and body. The challenge to physical educators will be to implement programmes that address the health crisis while building the child's mind through physical activity.

CURRICULUM

According to the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), a quality physical education programme for grades K–12 includes instructional periods totaling at least 150 minutes per week at the elementary level and 225 minutes at the secondary level, qualified physical education specialists, and adequate equipment and facilities. In general,

the curriculum should consist of: (a) instruction in a variety of developmentally appropriate motor skills that challenge students to develop physically, cognitively, socially, and emotionally; (b) fitness activities that educate and help students understand and improve or maintain optimal fitness levels; (c) instruction in concepts that lead to a better understanding of motor skills and fitness development; (d) opportunities to engage in experiences that enhance cooperation and develop multicultural awareness; and (e) experiences that foster the desire for lifelong participation in physical activity.

More specifically, the elementary curriculum should include many enjoyable activities that lead to the acquisition and refinement of fundamental motor patterns (e.g., running, skipping, jumping, catching, throwing, striking, balancing) that can be applied in game, sport, dance, and gymnastics contexts. The *movement-based curriculum* proposed and adapted by George Graham, Shirley Ann Holt/Hale, and Melissa Parker in 1998 introduces skill themes (fundamental motor patterns) and movement concepts that describe how a movement is performed (e.g., speed, direction, relationship). This curriculum pattern teaches children to move while challenging them to explore, modify, and refine motor patterns, and it can be used as a vehicle for teaching physical education. The *activity based* approach is the most common curriculum pattern used in both middle schools and high schools. This curricular pattern uses activity units in sport, fitness, and dance (e.g., volleyball, aerobic dance, swimming) to teach physical education.

Middle school curriculums should include a wide variety of team and individual sports utilizing motor skills introduced and refined at the elementary level. High school curriculums should focus on lifetime sports skills (e.g., golf, tennis, aerobic dance), with a secondary emphasis on team sports. During the high school years, students should become highly proficient in one (or more) sport and/or fitness activity of their own choosing. However, regardless of the level of schooling, fitness forms the base of the curriculum and it is an integral part of the programme.

TRENDS, ISSUES, AND CONTROVERSIES

School accountability, a major trend of the 1990s, has driven the need for national assessment (testing) and standards. This trend has become an issue and has created debate throughout education, including physical education. Proponents on both sides have valid points to make. Those who oppose national testing point out the need for people to enjoy physical activity. They believe that testing does not foster the desire for lifelong participation. In contrast, proponents of testing think it would parallel work completed in other disciplines, such as math and science, while helping students gauge their progress towards a national standard for fitness and/or skill competence.

The National Association for Sport and Physical Education has provided guidelines in the form of grade-level benchmarks, as well as an operational definition of the *physically educated person.* Such a person is skillful in a variety

of physical activities, physically fit, participates regularly in physical activity, knows the benefits of physical activity, values physical activity and its contributions to a healthy lifestyle, respects diversity, and acts in a socially responsible manner. The question remains, however, of how much direction and specificity in the form of standards and assessment are needed.

In many school programmes and business settings, the term *wellness* has replaced *fitness* and *health.* In general, this term refers to optimal health and well-being, but it has been broadened to include the dimensions of emotional, mental, spiritual, social, and environmental well-being. There are many issues that are of interest to all educators, issues that pose a challenge to all of those who seek to teach children. These include discipline problems, student drug abuse, violence, insufficient resources, lack of parental support for education, large classes, teacher burnout, and perhaps most importantly, a concern for the health and well-being of all children.

By far the greatest issue facing physical education in K–12 institutions is the reduction of time in the curriculum allotted to this important subject.

The need for daily physical education is obviously important for the well-being of students, but it presents a dilemma for those who must balance academics, accountability, and what is best for the child's overall education. Given the support for the physical and psychological contributions of exercise, along with the health risks associated with inactivity, it is clear that daily physical education plays a crucial and unique role in each child's cognitive, psychological, and physical development.

FOCUS ON SCIENCE IN SPORTS

The science of sports sociology, a field that is often viewed as an art. Coakley discusses the concepts of the art and science of sports sociology and indicates that not all who study this field see things similarly. Sports sociology is both an art and a science, and critical questions are asked by researchers from both perspectives.

However, before posing questions regarding how sports can be made better, it is important to understand what currently exists. Both qualitative and quantitative research have a role in answering specific research questions posed within sports sociology, and it is important to have a clear understanding of their purposes and potential within the field.

SOCIAL THEORIES AND SPORTS

The value of theories is that they give us grounding, or a foundation, on which to build our positions and arguments. Theories offer a starting point from which we can address a particular issue within sports sociology. Although there are a number of theories from which sports sociologists draw, the most common are structural functionalism, conflict theory, critical theory, and symbolic interactionism.

STRUCTURAL FUNCTIONALISM

Structural functionalism maintains that sports are an inspiration in our society and that a systems approach (studying individual parts of society) is the best way to study society. Those who use this approach assume that society is composed of interrelated parts that are bound together by individuals who have the same values and processes, which produce consensus. Social order is maintained (balanced and functional) by individuals with shared values who work together towards consensus. When the balance is upset, dysfunction within the society occurs.

The system needs of society included in this theory are pattern maintenance and tension management, integration, goal attainment, and adaptation. It is the functionalist's contention that sports contribute to maintaining balance in society, because it requires that individuals work together to set goals and attain them. The functionalist notes that, because values and rules are taught within society, tension can occur and it is important to have a way to release it. Sports provide this catharsis. This theory contends that sports serve as a mechanism to bring individuals from different backgrounds together to work towards a common goal.

One of the limitations raised regarding this viewpoint is that it overstates positive comments regarding sports. Remember, to the structural functionalist, only that which is functional for society or is seen to contribute to order and efficiency is good. Therefore, if sports were dysfunctional they would not have lasted this long. Another limitation is that functionalists see the needs of all groups in society as similar.

CONFLICT THEORY

Conflict theory envisions sports as an opiate of society, meaning that it deadens our awareness to social issues. Within this theory, society is not viewed as a stable system held together by common beliefs and values. Rather, society is a constantly changing set of relationships based on economics. Because some groups of individuals have resources or access to resources-and thus have a high economic class or status-they can manipulate and coerce others to accept their viewpoint. Class relationships are centred on economic power, the individuals who have attained it, and the manner in which they use it. Therefore, the process of change is based on these premises, which produces social inequality.

Categories of concern for the conflict theorists include the following:

- *Alienation:* How the elite athlete in high-level sports becomes alienated from his or her body, as if the body became separate from the self; includes the use of performance enhancing methods to achieve better execution, higher profit, and heightened entertainment.
- *Coercion and social control:* Those with resources and power focus the attention of society on the outcome of sports rather than on the important social, economic, and political issues of the society.

- *Commercialism:* Promoting economic gain by encouraging individuals that consumption is a measure of self-worth and prestige; results in social injustice because those without means are excluded from high status.
- *Nationalism and militarism:* The extent to which sports promote a false sense of nationalistic pride and promote violence.
- *Racism and sexism:* Reveals existing inequities; e.g., minorities do not have equal opportunity in sports administration (coaching and managing).

Conflict theory also has some limitations. The economic basis is the theory's strongest argument but is also its weakness. This theory assumes that social life is driven only by economic factors and that people with resources are the ones who own and drive the market; people who are on the low end of the economic scale are victims of injustice and exclusion.

Economic power certainly exists in society, but the conflict theory tends to focus on only individuals who lack or have such power. The theory does not address the fact that sports can be empowering for some individuals and groups. Economic forces are not the only relationships between groups of individuals, so to base arguments about sports solely on this premise is misleading.

UNDERSTAND OF CRITICAL THEORY

To understand the realities of sports and how they affect different groups and individuals in society, critical theories are employed. Not limited to one approach, but encompassing several, critical theories focus on the concepts of power, social action, and political involvement. It is important to understand that, when seeking answers to issues, critical theorists examine the sources from which power originates and how power changes and affects individuals. In an attempt to seek what is fair, equal, and inclusive, political action must be a part of this effort. Critical theorists do not believe there is one broad explanation for the problems of society, but rather they believe a combination of history, social, and material conditions make up social life. As such, the issues and problems for which critical theorists are concerned involve "economic struggles over labour law, rights of workers, property ownership, and power structures in organizations... family violence, child and spousal abuse, and women's control over their own bodies". Other inquiries regarding sports are addressed: Are certain individuals or groups privileged because of their sports excellence? What activities are regarded as sports? Why violence in sports is supported and considered part of the game?

If it is important to explore sports within specific contexts, i.e., that sports is more than a reflection of society and that it is a socially constructed phenomenon, then critical theorists offer an excellent approach for such exploration. However, although the approaches to critical theory appear strong in their own right, one limit is that there are no clear guidelines for each approach. In addition, it is not certain at what point sports reproduce significant social relations and when they are or become a site for change.

SYMBOLIC INTERACTIONISM IN SPORTS

Interactionist theories offer another approach to the exploration of sports. These theories assume that our behaviour involves choices that are based on the way we define our interactions in certain situations, allowing us to explore our identity. It is assumed that we behave according to the manner in which we envision the effect of our behaviour on ourselves and others and thus develop a sense of which we are.

Thus identity is paramount in the explanation of who we are in relation to sports or in a specific sports setting. Our identity is in a state of constant change, because each situation is different and the individual(s) with whom we interact can be different from setting to setting. Identity then influences how we behave or our choices of how to behave. The interactionist studies actual occurrences or situations as they are created by individuals interacting with one another; An example of this type of study in sports is to examine how individuals develop meaning and identity associated with sports, such as what it is like for a child to participate on a Little League team. Other studies using interactionist theories have explored the meaning of pain in an athlete's life.

As with the other theories presented here, interactionist theory also has limitations. Personal definitions of the individual(s) and setting(s) are exclusive and do hot seem to be related to the social structure of society as a whole. Although this is a valid criticism, the strength of this theory lies in the fact that individual meaning, identity, and interaction can be discovered, thus allowing the researcher greater insight into individual revelations and learning.

Explanations of social life have been pursued by numerous sociologists. These social scientists have collected data, challenged theories, and revealed findings regarding the social world.

This pursuit to establish a general theory or foundation for the relationships and structures that enable individuals to live in cultures, subcultures, and societies has resulted in a number of truths rather than.one general truth or theory. It is necessary, therefore, to consider the many diverse and complex factors that affect social life and consider the issues within sports sociology from various perspectives or theories.

Although researchers may argue over which theory is best, it is important to examine the strengths and weaknesses of each, considering, of course, the research questions to be explored and the perspective to be used. Each theory offers a different dynamic and potential for discovery. Further and extensive reading and study are needed within each theoretical framework to pursue questions regarding sports.

BREATH CONTROL TECHNIQUES

The use of breathing routines has a long tradition and history in the East, particularly as part of yoga, meditation, and other related disciplines. In the western world, breathing techniques are often used in conjunction with other

relaxation techniques, such as PMR. According to Payne (2004) some of the more prominent breathing techniques include slow breathing, deep breathing, diaphragmatic breathing, breathing meditation, and breathing with imagery. When applied to sport injury rehabilitation, breath control techniques are seen as suitable for alleviating and controlling pain as well as dealing with increased levels of somatic and/or cognitive anxiety. Currently very few studies investigating the effects of breathing techniques on rehabilitation has been conducted. For example, slow breathing technique has been acknowledged as having stress-relieving properties, but the underlying mechanisms as to why this is the case are unclear (Payne, 2004), however the extent to which slow breathing techniques are employed in sport injury rehabilitation is currently unknown.

In contrast, deep breathing has been proposed as being one of the simplest and effective way to control pain and anxiety during rehabilitation. First, deep breathing is proposed to relax the muscles, subsequently relieving muscle tension and any other physiological symptoms related to increased muscle tension. Second, it facilitates the transportation of oxygen to the injured area which in turns facilitates the healing process. Deep breathing is also suitable to use as a means of redirecting the injured athletes focus away from the experienced pain and discomfort during rehabilitation. Deep breathing enables a reduction in athletes' levels of anxiety, thus allowing the athletes to gain greater levels of control over their bodies, which in turn can have positive effects on the athlete's self-efficacy, self-confidence, and motivation. Yet despite the apparent physical and psychological benefits, when it comes to relieving pain, deep breathing appears to be the most neglected and least used relaxation technique. Similar to research on slow breathing, research on the effectiveness of diaphragmatic (i.e., abdominal) breathing routines during sport injury rehabilitation is sparse. In fact, according to Payne (2004) one of the only studies investigating the effectiveness of breathing techniques was conducted by Bell and Saltikov. Their comparative study with 45 male participants compared the effectiveness of a combination of Mitchell method6 and diaphragmatic breathing with diaphragmatic breathing alone. Based on the changes in participants' heart rates no significant differences in the results for the two forms of intervention were found. However as research on breathing techniques is limited, no definite conclusion on their effectiveness can be drawn.

PROGRESSIVE MUSCULAR RELAXATION

Progressive muscular relaxation (PMR) is the most commonly used and taught relaxation technique in sport (Flint, 1998b). Based on the early work by Jacobson (1938), PMR refers to the combination of deep breathing and systematic tensing and releasing of specific major muscle groups. The intention of PMR is to relax the skeletal musculature, which, once successful will often be followed by the relaxation of the mind, and over has been since revised and modified to make it simpler and more effective by Bernstein and Borkovec (1973).

The process of PMR is relatively simple. Anxious and tense athletes may find it difficult to "just shake their muscles out and get them to relax". Therefore, instead of attempting to relax the muscles, the PMR requires the athletes to first tighten the muscle, and then relax them.

This procedure will cause the muscles to rebound from a previous state of muscle tension down to a lower level of tension. Often PMR is used with either four major muscle groups (i.e., face and neck, arms and shoulders, chest and back, and legs and buttocks), or more localised to a specific set of muscles which appear to be the main cause of the tension.

This systematic process is accompanied by controlled deep breathing, which, when combined with tensing and releasing can also assist the athletes to become more aware of the different muscle groups in their bodies. As a result, PMR has been proposed as best suited for athletes who are unaware of the level of tension in their bodies, and where that tension is seen as facilitator for pain and general physical discomfort. Rotella (1982) believes that PMR is most suitable for athletes who exhibit the tendency to be overly anxious about their injuries, and who suffer from insomnia, tension headaches, or general tightness. In his opinion, PMR should not be imposed with athletes who, over the years have learned effective means of coping with stress independently and have been coping well for years.

PASSIVE RELAXATION

In contrast to the above, passive relaxation has been proposed as most suited to athletes with low or moderate levels of muscle tension that are using relaxation to achieve an overall sense of calm and physical relaxation (Taylor & Taylor, 1997). Passive relaxation was developed by Taylor (1996), and rather than tensing and releasing major muscle groups (PMR), passive relaxation involves the use of imagery. During the process, athletes are required to imagine their tension (or pain) as a liquid which is filling their muscles. Aided by deep breathing, athletes are then required to imagine the process of draining this liquid away from their bodies through the drain plugs on the bottom of their feet. The purpose of deep breathing is to act as a facilitator in pushing the tension away (Taylor, 1996).

Most of the research on relaxation techniques to date has been conducted collectively with imagery. A study by Johnson (2000) investigated the effects of relaxation in conjunction with guided imagery. The injured athletes ($N = 14$) were taught relaxation and breathing techniques; however the type of relaxation taught was not elaborated further. The only significant differences ($p < .05$) between the intervention group and the control group were found for relaxation/guided imagery condition, thus suggesting a combination of the two interventions as being effective in enhancing mood. Cupal and Brewer (2001) used a similar research design when investigating the effects of relaxation and guided imagery combination on knee strength, re-injury anxiety, and perceptions on pain. Thirty injured athletes receiving physiotherapy treatment to their anterior cruciate

ligament injuries took part in a randomised controlled trial (placebo, control, and treatment group). In the treatment condition, the relaxation element of the intervention consisted of several minutes of breath-assisted relaxation. As a result of the intervention, the most considerable benefits were found for increased knee strength, decreased re-injury anxiety, and lowered levels of pain.

Conversely Handegard et al. (2006) used a case study approach when investigating the effects of relaxation and guided imagery intervention with a soccer player and a baseball player in the US. From the article, it is evident that relaxation was introduced to the athletes by the researcher; however, when describing the implemented intervention, the authors fail to describe the particulars of the type of relaxation used. Nevertheless, the results revealed that both athletes attributed 30- 40% of their recovery to their MST programme (including the use of both imagery and relaxation) and the athletes themselves reported increases in their levels of self-confidence.

In contrast to the above, Christakou and Zervas (2007) used a combination of relaxation and a combination of pain-management and treatment imagery (i.e., rehabilitation-process imagery). In their study, 18 injured athletes (age range 18-30) with grade II ankle sprain were randomly allocated into control and intervention group. The participants in the intervention group underwent 12 individual 45 minute sessions of imagery, each of which began with systematic relaxation of the muscle groups (relaxing all the muscle groups starting with their feet and progressing up to their face). The findings from the analyses revealed some improvement on pain, edema, and ROM after the relaxation and imagery intervention; however none of the findings were statistically significant. This could be a result of small participant numbers, and by increasing the participant numbers for each condition might have produced different results.

The most recent study in this area investigated the effects of cognitive and relaxation interventions on injured athletes' mood and pain during rehabilitation (Naoi & Ostrow, 2008). Three male and two female US University level athletes representing track, baseball, soccer, and basketball took part in an intervention study consisting of two intervention periods (cognitive intervention and relaxation intervention) and two baseline periods (before and after the interventions). The relaxation interventions were aimed to relax both the muscles and the mind, and consisted of both breathing exercises and autogenic training.

The participants were required to listen to a pre-recorded relaxation audio CD at least once a day during the intervention session, and were give an opportunity for and encouraged to listen to the CD at home as often as they felt necessary. The results revealed that three of the five participants displayed improvements in mood and/or levels of pain during the relaxation intervention period.

Four of the participants also felt that relaxation had facilitated their physical and psychological recovery. The authors conclude by stating that all the athletes responded differently to the interventions, therefore suggesting that for successful implementation of psychological interventions during rehabilitation, the interventions should be tailored to meet the individual athletes' needs.

PERSONAL, SOCIAL AND HEALTH EDUCATION

Personal, social, health and economic (PSHE) education has in various forms been part of the national curriculum for schools in England since 2000. Some aspects, but not all, have been compulsory. PSHE is defined by the schools inspectorate Of sted as a planned programme to help children and young people develop fully as individuals and as members of families and social and economic communities.

Its goal is to equip young people with the knowledge, understanding, attitudes and practical skills to live healthily, safely, productively and responsibly. In Wales, the comparable element of the state school curriculum topic is Personal and Social Education (PSE). In Ireland, it is Social, Personal and Health education (SPHE).

It is also known as PSHEE (Personal, Social, Health and Economic Education), PSED (Personal, Social and Emotional Development) and PSHCE (Personal, Social, Health and Citizenship Education).

RECENT DEVELOPMENTS

Recent research at the University of Southampton and the University of Bristol has resulted in a thrust towards changing this. The UK government published in May 2005 the "SEAL" pack (Social and Emotional Aspects of Learning) for primary schools to teach emotional literacy and personal growth overtly through PSHE and the curriculum.

This is to be supported also in secondary schools in England and Wales with a similar pack, still in development, called "SEBS" or Social, Emotional and Behavioural Skills. It is also sometimes referred to as variants of PSHEE (Personal Social Health Economic Education). More recently, the largest ever study of PSHE education in primary and secondary schools in England was completed by the Centre for Education and Inclusion Research (CEIR) at Sheffield Hallam University (Formby *et al.*, 2011). This research was based on a nationally representative survey and in-depth case studies to map and assess the delivery and effectiveness of current provision in English primary and secondary schools.

In July 2011, the Department for Education launched an internal review of personal, social, health and economic education to look at the content and quality of teaching of PSHE in schools. Closing date for the responses to the review was Wednesday 30 November 2011.

WORLDWIDE USE OF PHYSICAL EDUCATION

In South Korea, it is mandatory for pupils to take 3 hours of PE through primary and secondary schools.

In Portugal, pupils from primary school could optionally join PE as an extra-curricular activity. From middle school to secondary school pupils must participate in PE classes 2 hours per week.

In Singapore, pupils from primary school through junior colleges are required to have 2 hours of PE every week, except during examination seasons. Pupils are able to play games like football, badminton, captain's ball, and basketball during most sessions. Unorthodox sports such as touchball, fencing, and skateboarding are occasionally played. In more prestigious secondary schools and in junior colleges, sports such as golf, tennis, shooting, and squash are played. A compulsory fitness exam, NAPFA, is conducted in every school once every year to assess the physical fitness of the pupils. Pupils are given a series of fitness tests (Pull-ups/Inclined pull-ups for girls, standing broad jump, sit-ups, sit-and-reach and 1.6 km for primary [10-12 year-olds]/2.4 km for secondary and junior college levels [13-18 year-olds]). Students are graded by gold, silver, bronze or fail. NAPFA for pre-enlistees serves as an indicator for an additional 2 months in the country's compulsory national service if they attain bronze or fail.

In Malaysia, pupils from primary schools to secondary schools are expected to do 2 periods or 1 hour of PE throughout the year except a week before examination. In most secondary schools, games like badminton, sepak takraw, football, basketball and tennis are available. Pupils are allowed to bring their own sports equipment to the school with the authorization of the teacher. In most secondary schools, physical exams are rarely done, schools record pupils' heights, weights and how many push-ups they can do.

In Scotland, pupils are expected to do at least two periods of PE in first, second, third and fourth year. In fifth and sixth year, PE is voluntary.

In Indonesia, students ranging from Kindergarten to High School have PE integrated with their curriculum. Kindergarten until Grade 3 of Elementary students have gymnastics, starting from Grade 4 of Elementary School, students will be introduced into traditional martial arts Pencak Silat and some team games such as badminton, tennis, soccer, futsal, rounders, basketball, etc. Starting from Junior High School, Both gender are separated during PE class. PE find its place in extracurricular forms, where students can specialize them self in one kind of sports they choose. Sport Festival can be held during vacuum period, usually after examination. At this time students can compete each other by bringing own class' flag. Some universities such as ITB include PE in curriculum for freshmen. In the Philippines, some schools have integrated martial arts training into their Physical Education curriculum. In England, pupils are expected to do two hours of PE a week in Year 7, 8 and 9 and at least 1 in year 10 and 11. In Wales, pupils are expected to do only one hour of PE per fortnight. In Poland, pupils are expected to do at least three hours of PE a week during primary and secondary education. Universities must also organise at least 60 hours of physical education classes at undergraduate courses.

In India, Physical Education is an important subject in schools. Many students chose Physical Education as a subject against Language Subject Like English, French, some time official language Hindi and some time local languages like Punjabi, because it is very scoring subject and very interesting.

Assignments on Physical education increase the interest in Sports. Educational Bodies in India like Central Board of Secondary Education and Punjab School Education Board are in those which conduct examination on Physical Education in affiliated schools and collages.

ADAPTED PHYSICAL EDUCATION

Adapted Physical Education or APE, is a sub-discipline and self control of physical education, focusing on inclusion and students with special needs.

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Personality and Sport

Despite popular opinion, no distinguishable "athletic personality" has been shown to exist. That is, no consistent research findings show that athletes possess a general personality type distinct from the personality of nonathletes. Also, no research has shown consistent personality differences between athletic subgroups (*e.g.*, team athletes vs. individual sport athletes, contact sport athletes vs. non-contact sport athletes).

Research has identified several differences in personality characteristics between successful and unsuccessful athletes. These differences, however, are not based on innate, deeply ingrained personality traits but rather result from more effective thinking and responding in relation to sport challenges as well as higher levels of motivation.

Specifically, successful athletes, compared with less successful athletes, are:

- More self-confident,
- Better able to cope well with stress and distractions,
- Better able to control emotions and remain appropriately activated,
- Better at attention focusing and refocusing,
- Better able to view anxiety as beneficial, and
- More highly determined and committed to excellence in their sport.

Olympic and World champion athletes have defined mental toughness as the natural or developed psychological edge that enables you to cope with competitive demands and remain determined, focused, confident, and in control under pressure.

These athletes identify the following as critical personality responses that represent mental toughness: loving the pressure of competition, adapting to

and coping with distractions and sudden changes, channeling anxiety, not being fazed by mistakes in the process, being acutely aware of any inappropriate thoughts and feelings and changing them immediately to perform optimally when needed, using failure to drive yourself, learning from failure, and knowing how to rationally handle success—an impressive list of qualities that we all would like to have as part of a mentally tough personality. Although most sport personality research has focused on the influence of personality on sport behaviour, research has also examined the effects of sport participation on personality development and change.

A belief commonly held in American society is that sport builds character or that sport participation may develop socially valued personality attributes. Research shows, however, that competition reduces prosocial behaviours such as helping and sharing and that losing magnifies this effect. Sport participation has been shown to increase rivalrous, antisocial behaviour and aggression and has been linked to lower levels of moral reasoning. Nevertheless, the sport story has a positive side. Research in a variety of field settings has demonstrated that children's moral development and prosocial behaviours (cooperation, acceptance, sharing) can be enhanced in sport settings when adult leaders structure situations to foster these positive behaviours. Interventions with children were successful in building character when naturally occurring conflicts arose and were discussed with the children to enhance their reasoning and values about sport and life events. The moral of the story is this: Sport doesn't build character, people do.

PERSONALITY WITHIN SPORTS

The mind is one of the most important things to an athlete, as it is one of the greatest strengths they have and it can dramatically affect their performance; this is why personality is one of the biggest influences in sport.

Your personality is your attitude, feelings and how you react to various situations within life; this gives you your unique perception of the world around you, what you do and how you react to this. Your personality is build up of your psychological core, which gives you your basic and simple aspects of personality, so your likes and dislike; these cannot be rewritten, but through life it does grow.

You then have your typical response which is partially rewritable and evolves; this is your attitude, so how you generally react based upon your beliefs and opinions concentrated within your psychological core. Finally there is the role related behaviour which is your specified behaviour based on your suited role; this means it is the controlled and restricted personality of the individual based upon the role they are taking. It is these three factors which make up the personality of a person.

There are two main personality types which roughly defines everyone, this affects various aspects of their personality, but this is especially within athletes. The two extremes are introverts and extroverts.

Introverts are commonly the people who rely on themselves and do individual sports, or have a position which reflects this personality type. Introverts are generally independent, more intelligent, timid, practical, self-assured and serious as they are self dependent.

Extroverts are typically more relaxed, trusting, group dependent and less intelligent; this is because they rely on others during their sport, or in their everyday life.

Although these are two extremes of the types of personalities, the majority of people have aspects of both types, but will generally sway one way. An example of this is that introverts can also take part in some team games; however, they will almost always be put in a position that suits this personality *i.e.,* a position that does not involve as much team work. As personality is important within sport to aid the motivation and ability of the athlete, it is important to understand not just what a personality is, but also how it is developed. Personalities are believed to be developed in various ways as there are many theories. However, there are three theories which stand out from the others, and most of these other theories are derived from these three.

One of these theories is the Trait theory. The Trait theory predicts that the personality of one's self is not influenced by their surroundings, but instead by the inherited personality of both parents, within the passing on of genes. The theory states that someone's personality cannot be changed and that people are fixed in their ways; this means that our personalities are determined simply by what your parents have each inherited from their parents (etc.).

According to this theory it means that experience will not change our personalities; this means that someone will repeat their behaviour in the same situation. Due to this it means that someone's behaviour/attitude and personality becomes predictable as the role-related behaviour, typical behaviour and psychological core stay the same throughout a person's life. The problem with this theory is that people do in fact adapt to their surroundings and situations, as we make mistakes and learn from them; however, some people do find it harder or near impossible to change or adapt their personality. The theory also suggests that we merely inherit the personalities of our parents; although this still makes us unique it makes our humanity very limited as we are not as adaptable as people think. The theory is also criticised as children are taught to behave and they adapt to that as it is what they are taught, similar to how athletes are trained through discipline, etc.

Another theory discussing the origin of our personalities is the Social Learning theory; this theory hypothesises that we learn through interacting with the people around us by analysing their personality at a subconscious level then seeing how they react to stimulus's/situations and copying them to develop our own unique personality. According to this theory it means that the psychological core develops and that then affects the typical and role-related behaviour as they are constantly adapting to develop their personality to their situations. By having the personality adaptable, the person is therefore able to adapt to the same situation or something new by using previous experiences to help them make a personally rational decision.

Although this theory seems more accurate, as we can learn from our mistakes, people sometimes do appear to inherit some traits or how their mind analysis and interprets things from their parents, as they have a similar understanding of things. However this could be said that it is because of the upbringing and the duplication of aspects of the parent's personalities through socially learning, but it could also be through inheritance of the genes as genes do play a part.

The final theory of personality development is the Interactional Approach theory; this theory is a concoction of the previous theories. The mixture states that you inherit characteristics and then your personality develops over time through socialisation; this means that people's personality will change and develop depending on how they have lived, for example they will learn from their mistakes. However, they are still influenced by the mixture of their parent's genes, hence inheriting parts of their personality. Although this theory has the strengths of the other two theories, it also has its weaknesses. Despite being proved that we do inherit our parent's genes and that we do learn from our mistakes/situations, it contradicts the social learning theory that says that we have a blank canvas when we are born; which some people believe is true.

From these theories and from reading various articles on the subject I have developed my own theory. Despite being similar to the Interactional Approach Theory, it is more in depth and its development is better explained.

My theory states that there is a blank canvas for the personality, this canvas is then developed by socially learning. The learning that we take part in is natural as our brain absorbs information detailing and acknowledging our surroundings and the behaviour of others, most of which will come from the people you see the most or have the most influence over you (*i.e.,* your parents, and then in later years, your role models). However, this is defined by a primitive/animalistic core which causes curiosity and a very minor behavioural personality; this is the blank canvas, as the canvas has to be made of something which will then affect the final portrait.

The basic core gives an infant something that resembles a personality, but a very basic one as they do not know any better; it is simply our brains trying to interpret the data it is taking in while the natural instinct within this core controls its main functions. As the infant grows and the brain develops, it becomes more and more influenced by the people surrounding them, this means they then socially learn which causes the individual to develop their psychological core, and then, as they grow, the rest of the layers of their personality.

As much as socially learning is the main source of developing a personality, the various genes which influence the primitive behavioural instincts do vary; this is because these are passed on genetically as they are the basic and most simple instructions given by the brain *i.e.,* to eat, drink. excrete and to interact to survive. Although the parents mixed genes will create a unique individual, this is only a temporary core and simple instinct (a demonstration and basis for them to create their own); this is before their minds start to develop their own psychological core.

So this primitive core is not their personality per say, it is just a natural reaction based upon the basic instructions of the brain of how to react to stimulus's, taken from the genes of their parents. However, this primitive core does not completely disappear, after all they are the building blocks and the centre of their entire consciousness. As the brain develops these genes make their brain more susceptible to certain areas when analysing their experiences and developing their own personality, so they are more likely to notice, remember or copy specific behaviour as they have already had that in the example from their parents.

According to this theory, it means that a person's personality is developed due to their socialisation, but that personality is aided and defined further, especially at first, as they start to create the psychological core. Due to the development of this new core it will overlap the primitive core and move them further away from their natural origins/primitive behaviour, as this is then a much stronger influence to their decisions and reactions to stimulus's/situations throughout their life.

Although having these genes do mean that some people may be more susceptible to develop certain traits within their personality, this is a very minor factor and would not cause a great change, as the person's experiences affect them more due to the natural ability for humans to analyse and adapt. These theories, along with everything psychology related, can all be applied to sport. For example the decisions made within sports by their coaches *i.e.,* positions played, how to communicate with the athlete and how to work efficiently with them. However, this is dependent upon which theory the coach or player most likely favours/believes in.

If a coach was selecting a team from a group of players, if they believed in the trait theory then that would affect their decision as the coach may know the players parents so they would judge their personalities as they would think that the player would inherit those traits or not progress any further than they have already. However, if the coach believed in either the social learning theory or the interactional approach theory, then they would look at the individual players and judge them as they can teach them how to behave appropriately (etc.) and see who has the most potential and who he/she can manage.

Although the individuals personality does matter, due to the need for respect and honouring the rules, personality also matters when choosing a position or the sport they want to participate in. When the coach chooses a position in a sport, they will place somebody in that position based not only on their performance and skill, but their personality as well *i.e.,* whether they are an introvert or an extrovert.

As described previously, an introvert is more independent and adapted to relying on themselves. Although introverts are commonly known to do solo sports, they can do team sports as well. In the cases where they do team sports they are more likely to play a position that is reliant upon themselves, or where they do not have to work with others as much. For example, an introvert would

be placed in goal, as they are away from the main game and the responsibility is solely on them; this means that it suits their personality and they will feel more comfortable playing in that position.

An introvert is unlike an extrovert as the extrovert would rather rely on others and work with people more; this means that they would be part of the team, so they would be strikers in football, or part of the pack in rugby during the scrum.

THE RIDDLE OF PERSONALITY AND SPORT

Most of us at one point or another have played or participated in a sport, whether it is volleyball, tennis, karate or pole-vaulting. Have you ever sat back and wondered why you chose that particular sport to play besides the simple fact that you love participating in it? Recent studies have shown that the complex of multiple personality traits that composes each individual may be a significant factor in which sport you prefer to play. Traits can be described as people's characteristic behaviours and conscious motives. The broadest category of personality traits involves extraversion and introversion. People reflecting traits of extraversion tend to be excitable, outgoing, lively, sociable and impulsive.

They love the lime-light, work well in groups, and tend to dislike being alone for long periods of time. People reflecting traits of introversion tend to be reserved, reclusive, thoughtful, calm, and rational. They are more interested in their own mental self, work better alone, and are controlled in social situations, preferring closer, more personal relationship. Although traits of introversion and extroversion are reflective of personality, that doesn't mean that everyone is classified as one or the other, many people have traits associated with both extraversion and introversion.

In a study done by Urska Dobersek and Cart Bartling (2007), athletes from four different sports, three individual sports and one team sport, and non-athletes were given standard personality tests including the Eysenck Personality Questionnaire which measured emotionality and tough-mindedness and the Global 5 survey, which measured extraversion, introversion, emotional stability, orderliness, accommodations and intellect. Each subject's personality traits were viewed in association with the sport they preferred and conclusions were drawn between personality traits and were linked to the type of sport preferred.

The study showed significant differences in individuals who played team sports, like volleyball, and people who played individual sports, like tennis, track and golf. Participants on the volleyball team, a team sport, tended to display more traits associated with introversion such as being reliable and thoughtful. Learning to cooperate with other players and sharing the recognition for a win with other people tend to require being less bold and outgoing, and instead, being calmer, rational, and aware of surroundings. Participants of individual sports, where the pressure is all on you to perform reflected traits of extraversion such as being outgoing, energetic, spontaneous and to some extent egotistical.

These findings were interesting because many researchers and scientists would say the opposite is true. Many would agree that individual sports athletes

would show traits of introversion versus team sports participants who would display traits of extraversion. They argue this view because individual sports require a high level of thinking and being aware of self, which are characteristic traits of introversion, and team sports require sociability, and therefore openness, skills which are characteristic traits of extroversion. In a study using the Eysenck Personality Inventory done by Eagleton and his colleagues (2007), the researchers studied 90 undergraduate team sport participants, individual sport participants and non-participants. They found that team sport participants scored higher on traits associated with extraversion, like liveliness, responsiveness and being outgoing, compared to individual sport participants and non-participants, who displayed traits of introversion, such as being reserved, passive and controlled.

The book "Sport Psychology," by Matt Jarvis (1999), he upholds this view that team sport players are more extroverted than individual sport players who exert telic dominance, a motivational mode where individuals become cautious and serious-minded and form well thought out plans which are characteristics of introverts. A study does by Schurr and her colleagues studied team and individual sport athletes versus non-athletes. It revealed that team players were more anxious, aggressive and excitable, all traits of extraversion, as compared to individual sports athletes, who were more submissive and controlled. The book "Angles on Applied Psychology," by Julia Russell (2003), also agrees with this theory. Her book mentions one study that compared the personalities of Irish female students who participated on the university hockey club to students who were on the tennis team using the Eysenck personality Questionnaire. Participants on the hockey team reflected more traits of extroversion than did the participants on the tennis team.

These studies reveal some of the difficulties in predicting behaviours based on personality traits. There is no one perfect personality mold that fits each individual sport, but it is possible that research on links between personality traits and sport preference in the future could reveal the secret as to why one person chooses soccer over badminton and possibly determine success rates of individuals in certain sports.

PERSONALITY AND EXERCISE

As in sport, researchers have found no "exercise personality" or set of personality characteristics that predict exercise adherence. Exercisers cannot be differentiated from non- exercisers based on an overall personality type. Two personality characteristics, however, are strong predictors of exercise behaviour. Individuals who are more confident in their physical abilities tend to exercise more than those who are less physically confident. A second important predictor of exercise behaviour, obviously, is self-motivation, with self-motivated individuals beginning and continuing exercise programmes and less motivated individuals dropping out or never starting at all.

A personality type termed "obligatory exercisers" describes individuals who participate in exercise at excessive and even harmful levels. For these individuals,

exercise becomes the central focus of life, and their behaviour becomes pathological in terms of their need to control themselves and their environment. Clinical evidence demonstrates a similar link between anorexia nervosa, a psychopathological eating disorder, and compulsive exercise. Specialists in exercise psychology attempt to help individuals plan and engage in exercise behaviour that is healthy and non-controlling to enhance total well-being.

Echoing the idea that sport builds character, exercise or fitness training has also popularly been associated with positive personality change and mental health.

The personality characteristic that researchers have most frequently examined in this area is self-esteem. Self-esteem is our perception of personal worthiness and the emotions associated with that perception. Think of self-esteem as how much we like ourselves. Research has generally confirmed that fitness training improves self-esteem in children, adolescents, and adults. Research has also shown that exercise positively influences perceptions of physical capabilities, or self-confidence. Interestingly, the research indicates that these changes in self-esteem and self-confidence may result from perceived, as opposed to actual, changes in physical fitness. In addition, many aspects of intellectual performance have been related to physical activity, suggesting that cognitive functions respond positively to increased levels of physical activity.

Many people also associate exercise with changes in mood and anxiety. Most individuals say that they "feel better" or "feel good" after vigorous exercise, which emphasizes the important link between physical activity and psychological well-being. In addition, research documents that anxiety and tension decline following acute physical activity. The greatest reductions in anxiety occur in exercise programmes that continue for more than 15 weeks. Much research has been conducted to determine whether exercise or fitness reduces people's susceptibility to stress, and the generally accepted conclusion is that aerobically fit individuals demonstrate a reduced psychosocial stress response. A tentative explanation for this finding is that exercise either acts as a coping strategy that reduces the physiological response to stress or serves as an "inoculator" to foster a more effective response to psychosocial stress.

Prolonged physical activity is also associated with decreases in depression and a lessening of depressive symptoms in individuals who are clinically depressed at the outset of the exercise treatment. Explanations for these changes range from the distraction hypothesis, which maintains that exercise distracts attention from stress, to other explanations that focus on the physiological and biochemical changes in the body after exercise.

PERSONALITY TRAITS

There are many different personality types, and it is sometimes difficult to classify a person into a single type as there are many different personality traits you can possess.

Personality traits are simply:

- Actions,
- Attitudes,
- Behaviours you possess.

POSITIVE PERSONALITY TRAITS

Some personality traits are positive:

- Being honest no matter what the consequences are is one personality trait people should aspire to.
- Having responsibility for all of your actions and being a little bit of a perfectionism are also personality traits.
- Adaptability and compatibility are great and can help you get along with others.
- Having the drive to keep going, and having compassion and understanding are positive personality traits.
- Patience is a virtue and also another trait.
- Getting up the courage to do what's right in those tough situations and loyalty to your friends and loved ones are laso personality traits.

Here's a few more to consider:

- Adventurous,
- Affable,
- Conscientious,
- Cultured,
- Dependable,
- Discreet,
- Fair,
- Fearless,
- Observant,
- Impartial,
- Independent,
- Optimistic,
- Intelligent,
- Keen,
- Gragarious,
- Persistent,
- Capable,
- Charming,
- Precise,
- Confident,
- Dutiful,
- Encouraging,
- Reliable,
- Exuberant,

- Helpful,
- Humble,
- Suave,
- Imaginative,
- Meticulous,
- Obedient,
- Trusting,
- Valiant.

NEGATIVE PERSONALITY TRAITS

O*ther personality traits are negative. For example:*

- Laziness,
- Picky,
- Sullen,
- Pompous,
- Dishonesty,
- Finicky,
- Sarcastic,
- Arrogant,
- Cowardly,
- Sneaky,
- Rude,
- Quarrelsome,
- Impulsive,
- Slovenly,
- Self-centered,
- Boorish,
- Surly,
- Unfriendly,
- Unruly,
- Thoughtless,
- Stingy,
- Bossy,
- Vulgar,
- Malicious,
- Conceited,
- Obnoxious.

A whole host of other bad characteristics can also be considered personality traits if you practice these things habitually.

DETERMINING PERSONALITY TYPES

Your personality type can be determined by many factors. You can approach it the scientific way, by testing yourself and having a psychologist analysis you. A personality test is rather simple. By answering a few questions

about your likes and dislikes and where you would like to go in life, a professional can give you a report detailing the type of personality you have.

In psychology, there are five factors that determine different personality types. *The big five factors are:*

- *Openness* is appreciation for a variety of experience.
- *Conscientiousness* is planning ahead rather than being spontaneous.
- *Extraversion* involves going out with friends and being energetic.
- *Agreeableness* is, as it says, being agreeable.
- *Neuroticism* refers to worrying or being vulnerable.

Your personality test assesses how much of each of these five factors you possess.

Another way of determining your personality type is to just take a long and deep look at yourself. Asking questions is a great way of discovering who you are and what you are. Ask things like: "If a child is hurt and alone, what would you do?" The main thing you want to know is if you are a good person.

HOW DO I CREATE MY PERSONALITY?

Your personality is entirely up to you. It is in the actions you take and the decisions you make. Either you are a patient person, or not; a responsible person or not. The only way to change your personality is to take active steps to become the person you want to be. Taking up a hobby is a great way to become well rounded and improve your personality. Sports can make you stronger, arts and crafts can make you patient, volunteering can make you caring. Even just reading a book can push you to be better.

How can my Personality Affect Others?

Being positive and upbeat can influence everyone around you, and so can negativity. For example, a friendly smile to a stranger can brighten up their day, as a glare can frighten them and cause their mood to drop. Like the famous quote, "Do unto others as you would have them do to you". While you may not be able to help it if you are having a bad day or if you don't like doing a particular thing, changing your attitude changes everything. Complaining and sulking will only make time drag on when doing an unpleasant task. Singing a song in your head or even humming makes it just a little easier to deal with. Being a pleasant person helps every day. Understanding examples of personality traits is a great way to start the journey into self discovery. Remember, if you're up for the challenge, you can make positive changes to your personality type.

IMPORTANCE OF PROFILING IN SPORT

PROFILING BRIDGES THE GAP BETWEEN 'GOOD' PERFORMANCES AND 'GREAT' ONES

Over the past two decades, sport has become much more scientific. Our understanding of biomechanics, technique and technology has seen previous

performance barriers broken time and time again. While our advanced physiological and technical knowledge has produced huge advances and previously unattainable physical performances, there is a significant 'knowledge gap' developing in another area that is also critical to creating results. This is the coaches' and athletes' 'emotional intelligence'. Emotional intelligence is about understanding the role that your personality and behaviour play in your performance, and being able to analyse and deliberately adapt your behaviour in order to improve your performance.

Emotional intelligence, or 'mental talent', is one of the least understood and most underemployed aspects of sport today. Athlete Assessments was founded to help coaches, athletes and sports professionals develop their 'mental talent', so that they may realize their full potential. This awareness is achieved through sports profiling.

What is Sports Profiling?

Sports profiling is the key to developing the self-awareness you need, as a coach, an athlete or sports professional, to develop your emotional intelligence and understand how your behaviour and personality impacts on your performance and results. No matter what level you are, you can use sports profiling to take your performance to a new level.

Athlete Assessments has developed three unique, sports specific behavioural profiling products - AthleteDISC for athletes, CoachDISC for coaches and Manager DISC for team managers, sports administrators and other sports professionals. These leading edge products are the only specific behavioural profiling products for athletes, coaches and sports professionals available in the world today.

The Danger of Acting Out of Habit

Often people act out of habit. A habit is a well-rehearsed pattern of behaviour. Behaving habitually is like operating on autopilot. Autopilot works well in certain situations, but not all situations.

For example, what would happen if you operated on autopilot in an important competition where your well-rehearsed strategies were no longer working? To create a successful result in this situation, you would need to be aware of what behaviours you were currently doing and then be able to make changes or adjustments.

When we look at the most successful coaches and athletes, one defining quality is their ability to produce winning results in all types of situations and environments. We suggest if you want different results, you need to be aware of and able to change your behaviour. It makes sense then, that if you do not know how you currently behave (understanding your 'autopilot'), then you cannot make changes. As an individual you simply repeat your behaviours, as you do not know why or how you do them. No change in behaviour will lead to no change in your results. No change in behaviour will lead to no change in your results.

PROFILING GIVES YOU SELF-AWARENESS (BEHAVIOURAL AWARENESS)

Profiling your behaviour gives you information about yourself that you may not be consciously aware of. As you become more conscious of your behaviour, you are more able to control it, thereby gaining more control over your results. Athlete Assessments' AthleteDISC, CoachDISC and ManagerDISC are behaviour profiling tools. They have been developed specifically for athletes, coaches and sports professionals, in a language you understand, with highly relevant information that will change the way you think about your training coaching/work, and change the way you train/coach/perform your role. These profiling tools are based on decades of behavioural research, and many years of sporting experience.

After completing a questionnaire, which takes approximately twelve minutes, a detailed 44-page personalized report is produced on your preferred behaviours. It contains a large amount of insight, analysis and prescriptive advice specific to your behaviour, personality and habits.

As a coach, understanding your behaviour has particular importance. A recent study of sports coaching, conducted by Empire Research Group, found traditional sports coaching methods had the potential to damage the chances of athlete success.

Traditional coaching is the type of coaching that focuses on the physical and technical aspect of sport. The relationship between the athlete and the coach is not considered as an important aspect of sporting success. However, it is now widely accepted that communication and the relationship between coach and athlete plays a critical role in performance and results.

- A study published in the Sociology of Sport Journal (1993) interviewed high-level teenage athletes who had suffered from 'burnout'. 'Poor communication' was the leading factor of burnout, which created a perceived low level of personal control over the situation in which they trained. Poor communication left them feeling stressed and unable to cope.
- The 2007-2008 Barriers NCAA study found that 42 per cent of the 9000 student athletes surveyed would not consider a future in college athletics because of the poor relationship with their college sports coach or their coach just prior to college.
- Most sporting programmes suffer a large number of athletes who drop out altogether because of poor coach-athlete relationships. Poor relationships are the result of coaches and athletes not understanding themselves or each other.
- In the survey of sports coaches at the Evolution of the Athlete Conference, the top challenges for coaches were identified.
  - 50 per cent rated "Understanding individual athlete's personality and how to best motivate them".
  - 46 per cent rated "Personal life balance - managing sport, career, home and social etc".

  - 31 per cent rated "Team/squad dynamics and managing relationships within the team/squad".
- *"No matter how much you know as a coach, the info is only half of the story. Communicating effectively - getting your message across - is the key to getting the most out of your athletes. To be an effective coach, you need to know your athletes well - which can be difficult and it can take time. You need to find out the best way to communicate with your athletes - what's most likely to work and what will get the results we all want."*

Coach Gary Lynagh, Olympian and 3-time World Champion

Despite the above evidence (and there is plenty more like this from all corners of the sporting world)... ...few resources are devoted to helping coaches become better communicators and to support better coach-athlete understanding.

In the past, coaches haven't been provided with the opportunity to further develop their communication skills and tangible ways to improve relationships with their athletes. Most coach training remains skills and technique focused.

The problem with this is it leaves little time and energy to focus on critical issues including:

- Understanding the individual athletes and team dynamics.
- Developing stronger relationships.
- Improving communication.
- Meeting needs and understanding limitations.

"Exceptional coaching relies on having the information to enable you to tailor your coaching style for each athlete and the benefit of the team"

Bo Hanson, four-time Olympian and founder of Athlete Assessments: All coaches have a preferred way of coaching that either may or may not suit their athletes. If the coach's style does not suit the athlete, the relationship does not develop and the athlete is not coached in the way they most require. This leads to lesser performances from both coach and athlete and eventually dissatisfaction. The athlete or the coach may leave the programme or sport in time as frustration increases.

The Best Coaches

In the 2008 Evolution of the Athlete Conference survey, coaches were asked 'What characterises a phenomenal coach?' The results showed how important the athlete coach relationship is.

- 61 per cent said phenomenal coaches focus not only on the technical and physical aspect of the athlete, but see the athlete as a 'whole person' with a life outside of the sporting environment.
- 55 per cent of coaches also stated the importance of being able to teach and having strong communication skills.
- 33 per cent suggested coaches must always be looking for ways to improve themselves, their understanding and be innovative in their approach to creating better outcomes for their athletes.

How to Become a Phenomenal Coach

Becoming self-aware, by undertaking sports specific behavioural profiling, is the surest way for coaches to develop a comprehensive understanding of both themselves and each of their athletes. Coaches become self-aware through learning about their own coaching style, communication style, strengths and limitations. When athletes also complete a behavioural profile, coaches know with certainty their athletes' individual personalities, motivators, preferred communication style, most effective training environments and much more. Self-awareness is the cornerstone of success. With this knowledge coaches are enabled to adapt their behaviours to become vastly more effective, with excellent communication and relationships with their athletes. From here, both coach and athlete will start seeing improved performance, consistently. The door to realizing their true potential will be wide open.

"My coach prepares me to be great. You can have all of the talent in the world, but underachieve because you don't have that person to nurture your talent. You will never find a great athlete who coaches himself to greatness."

-Michael Frater, member of the gold medal Jamaican 4x100m relay team, talks about his coach Stephen Francis

WHY USE PROFILING FOR SPORTS PROFESSIONALS

Many of the reasons and benefits coaches and athletes use profiling, also directly apply to those working in the sports industry. On-going professional development is vital to team managers, sports administrators and all professionals working in the sports industry.

Profiling is extremely useful in further developing your self-awareness of work behaviours, preferences and style – effectively, how you perform your role.

With this information you can be more effective with your communication and build stronger relationships with staff, peers, bosses, coaches and athletes. You will have a deeper understanding of your motivation, strengths and areas for development relating to your professional role. Using this valuable information and guidance you can consciously apply your personal strengths, and identify specific issues to focus on, to realize your full potential as a valuable and contributing member of your sports organisation.

No matter what level in the organisation you are, leadership development starts from the same foundation – self awareness.

Each profile produces a 44-page personalized report giving insight into the individual's unique motivators, strengths, limitations, preferred communication style, best training/working environments and much more, as well as strategies to maximize personal performance.

The key benefits of these products, as they apply to coaches, athletes, sports professionals and performance consultants (including sport psychologists, counselors etc).

HUMANISTIC PSYCHOLOGY USED IN SPORT

Humanism originated as a psychological framework in the 1950's as a response to the negative outlook on humankind by Behaviourism and Psychoanalysis, the dominating frameworks at the time. Humanism became known as the "Third Force" among the psychological frameworks. In contrast to the teachings of Behaviourism and Psychoanalysis, the founders of Humanism, Carl Rogers, Abraham Maslow, and Rollo May, explored the positive aspects of humankind such as love, individuality, creativity, hope and actualisation. Their primary focus was on the innate goodness of human beings, the drive and potential of humans to achieve personal growth, human responsibility, and the actual lived experience of the human person.

Humanists argue above all that each human is a unique being, who has the ability to choose and change themselves and the way they live their life, also known as free will.

Abraham Maslow, one of the fathers of Humanism, is best known for his "Hierarchy of Needs" which is a model used to explain his theory of human motivation. This model was constructed to satisfy the theoretical demands of the world and at the same time conform to what Maslow believed as known facts. In the original model, there are five basic needs that determine humans' motivation; physiological needs, safety needs, belongingness needs, esteem needs, and the self-actualisation need. The physiological needs consist of the basic things that humans must have in order to survive such as food, water, and shelter.

The safety needs are slightly more abstract but still physical. They include things such as security and protection as well as freedom from fear and anxiety.

The belongingness needs involve the giving and receiving of love, and also the need to feel accepted and part of something such as a family or group. Next are the esteem needs, which are the desire for not only self-respect and self-esteem but also for the respect and esteem of others.

Finally, the self-actualisation need refers to the human desire to be self-fulfilled, doing what you are meant to be doing and everything you are capable of. It is a hierarchy in that in order to the meet the needs at the top, those at the bottom must first be satisfied. For example, someone who does not have a home and is forced to sleep on the street will not have the need for love or acceptance until they find some shelter.

Maslow's Hierarchy of Needs is still used today in a number of ways. There have also been several modifications and additions to the hierarchy.

One of the most notable changes to the model was made in the 1990's with the addition of transcendence. That is, once self-actualisation has been achieved, humans have a need to help others also reach that state of actualisation too. This reinforces the idea that humans are inherently good and not only want to be the best they can be, but also want those around them to reach their full potential as well.

THERAPEUTIC METHODS OF HUMANISM

Humanistic therapy techniques are designed to guide a client to make alternative choices about their life or personal ideals. The therapeutic approach that is most fundamental to Humanistic psychology was developed by Carl Rogers (1951) as he pioneered the Humanistic principles in what is known as client-centered therapy.

This approach focuses on the client's self-concept and how they can achieve ultimate fulfilment (self-actualisation). Central to client-centered therapy is a strong, trusting relationship between the client and therapist.

There are several characteristics that a therapist using client-centered therapy must possess; congruence, acceptance, active listening, empathy. In order for client-centered therapy to work, it is of vital importance that the therapist shows the upmost respect for their client as an individual.

This means the therapist does not dominate with their own views and respects the client's right to self-direction. Rogers argues that it is important for the therapist to look at each client with an individual hypothesis and not with a purpose to try to change them.

The role of the counsellor using this approach is to accept the client for who they are, and encourage the individual to view their choices objectively without imposing their own views and ideals on the client which they then simply follow.

Another key aspect to the client-therapist relationship is empathy. The self-concept can best be expressed with a therapist who demonstrates accurate empathetic understanding. Empathy also creates a learning environment that allows clients to relate to themselves in new ways.

Along with empathy, Rogers emphasises the importance of being an active listener. As an active listener, it is the role of the therapist to clarify and objectify the client's feelings. This is often done by the therapist repeating or rewording what the client has just said to them. This allows the client to hear back what they have said and can give them a better understanding and clarification of their own thoughts and emotions. It also gives them the reassurance that the therapist is really listening and what they have to say is important.

Gestalt psychology is a subset of humanism, and uses some similar techniques in the therapy setting. One of the therapeutic techniques more unique to Gestalt is psychodrama (the empty chair), which is where the client engages in a dialogue with different aspects of themselves. It is common for the client to switch seats as they take on the two different components of the self. This technique has also been used to deal with anger directed towards someone else, in which case the client takes on the role of that other person.

HUMANISM IN SPORT

Sport psychologists and coaches adopting a humanistic approach should allow the athlete to be an active participant in the process. It should be athlete-centred and focus on the athlete developing self-awareness, growth, and development. According to Lombardo's humanistic model of coaching (1999), the goals of

the athlete should always take precedence over those of the coach. The coach, who should merely serve as a guide and not an authoritative figure, should demonstrate empathy, understanding, and remember what it was like to be an athlete. At the same time, it is also the coach's responsibility to challenge their athletes by asking them "meaningful questions" and figure out strategy on their own. As a result of humanistic coaching, athletes remain more enthusiastic and passionate about their sport, which can also reduce the chance of burnout at a young age. Gestalt therapy has also been used in coaching athletes in several ways, but particularly through the development of self-awareness.

Csikszentmihalyi (2002) concept of flow has also been related humanistic sport psychology. Flow is a state of consciousness where one becomes totally absorbed in what they are doing, so that all other thoughts and emotions are excluded. Flow has been associated with peak performances where the body and mind work effortlessly as one.

There are nine dimensions of flow in sport; clear goals, concentrating, loss of feeling of self-consciousness, distorted sense of time, feedback, balance between ability level and challenge, control, activity is intrinsically rewarding, and being absorbed in the activity. A swimmer who had just won a big race and was clearly in a state of flow, described it as being one with the water and her stroke.

She felt in complete control of the situation and knew exactly what her body needed to do to pass up the competition and win. In order to achieve flow, it is also important to have a balance between skill and challenge. That is, the task set cannot be too challenging but can also not be too easy. Finding the perfect balance is difficult but necessary (Jackson and Csikszentmihalyi, 1999). The feeling of being in control of the situation is one of the things that stands out the most to athletes who experience flow, and is a key aspect of humanism as well as it emphasises humans' ability to make their own choices and take responsibility for those choices.

HUMANISTIC INTERVENTION IN PSYCHOSIS

Sometimes people understand psychosis or schizophrenia to be unrelenting, even with the intervention of psychotherapy. It is contended herein that therapy, and humanistic therapy in particular, can be helpful to the psychotic individual, but, perhaps, the therapist may have difficulty understanding how this approach can be applied to the problems of psychosis. Although it is a prevalent opinion in our society that schizophrenics are not responsive to psychotherapy, it is asserted herein that any therapist can relate in a psychotic individual, and, if therapy is unsuccessful, this failure may stem from the therapist's qualities instead of those of the psychotic individual.

Carl Rogers created a theory and therapy indicated by the terms "humanistic theory" and "person-centered therapy." This theoretical perspective postulates many important ideas, and several of these ideas are pertinent to this discussion. The first of these is the idea of "conditions of worth", and the idea of "the

actualising tendency." Rogers asserts that our society applies to us "conditions of worth." This means that we must behave in certain ways in order to receive rewards, and receipt of these rewards imply that we are worthy if we behave in ways that are acceptable. As an example, in our society, we are rewarded with money when we do work that is represented by employment.

In terms of the life of a schizophrenic, these conditions of worth are that from which stigmatization proceeds. The psychotic individuals in our society, without intentionality, do not behave in ways that produce rewards. Perhaps some people believe that schizophrenics are parasites in relation to our society. This estimation of the worth or the lack of it regarding these individuals serves only to compound their suffering. The mentally ill and psychotic individuals, in particular, are destitute in social, personal and financial spheres.

Carl Roger's disapproved of conditions of worth, and, in fact, he believed that human beings and other organisms strive to fulfill their potential. This striving represents what Roger's termed "the actualising tendency" and the "force of life." This growth enhancing aspect of life motivates all life forms to develop fully their own potential. Rogers believed that mental illness reflects distortions of the actualising tendency, based upon faulty conditions of worth. It is clear that psychotic people deal with negatively skewed conditions of worth. It is an evident reality that the mentally ill could more successfully exist in the world if stigmas were not applied to them. The mentally ill engage in self-denigration and self-laceration and these culminate in the destruction of selfhood. This psychological violence of the mentally ill towards their selves is supported by non-mentally ill others. The type of self-abuse by psychotic individuals would certainly abate if the normative dismissal of the mentally ill as worthless was not perpetuated.

In spite of a prevalent view that psychotic individuals are unsuccessful in the context of psychotherapy, Roger's theory and therapy of compassion cannot be assumed to be unhelpful to the mentally ill. The key components of Rogers' approach to psychotherapy include unconditional positive regard, accurate empathy and genuineness. Unconditional positive regard, accurate empathy and genuineness are considered to be qualities of the therapist enacted in relation to the client in terms of humanistic therapy. These qualities are essential to the process of humanistic therapy.

In terms of these qualities, unconditional positive regard is a view of a person or client that is accepting and warm, no matter what that person in therapy reveals in terms of his or her emotional problems or experiences. This means that an individual in the context of humanistic psychotherapy, or in therapy with a humanistic psychologist or therapist, should expect the therapist to be accepting of whatever that individual reveals to the therapist. In this context, the therapist will be accepting and understanding regardless of what one tells the therapist. Accurate empathy is represented as understanding a client from that person's own perspective. This means that the humanistic psychologist or therapist will be able to perceive you as you perceive yourself, and that he will

feel sympathy for you on the basis of the knowledge of your reality. He will know you in terms of knowing your thoughts and feelings towards yourself, and he will feel empathy and compassion for you based on that fact.

As another quality enacted by the humanistic therapist, genuineness is truthfulness in one's presentation towards the client; it is integrity or a self-representation that is real. To be genuine with a client reflects qualities in a therapist that entail more than simply being a therapist. It has to do with being an authentic person with one's client. Carl Rogers believed that, as a therapist, one could be authentic and deliberate simultaneously. This means that the therapist can be a "real" person, even while he is intentionally saying and doing what is required to help the client.

The goal of therapy from the humanistic orientation is to allow the client to achieve congruence in term of his real self and his ideal self. This means that what a person is and what he wants to be should become the same as therapy progresses. Self-esteem that is achieved in therapy will allow the client to elevate his sense of what he is, and self-esteem will also lessen his need to be better than what he is. Essentially, as the real self is more accepted by the client, his raised self-esteem will allow him to be less than some kind of "ideal" self that he feels he is compelled to be. It is the qualities of unconditional positive regard, accurate empathy and genuineness in the humanistic therapist that allow the therapist to assist the client in cultivating congruence between the real self and the ideal self from that client's perspective.

What the schizophrenic experiences can be confusing. It is clear that most therapists, psychiatrists and clinicians cannot understand the perspectives of the chronically mentally ill. Perhaps if they could understand what it is to feel oneself to be in a solitary prison of one's skin and a visceral isolation within one's mind, with hallucinations clamoring, then the clinicians who treat mental illness would be able to better empathize with the mentally ill. The problem with clinicians' empathy for the mentally ill is that the views of mentally ill people are remote and unthinkable to them. Perhaps the solitariness within the minds of schizophrenics is the most painful aspect of being schizophrenics, even while auditory hallucinations can form what seems to be a mental populace.

Based upon standards that make them feel inadequate, the mentally ill respond to stigma by internalizing it. If the mentally ill person can achieve the goal of congruence between the real self and the ideal self, their expectations regarding "what they should be" may be reconciled with an acceptance of "what they are." As they lower their high standards regarding who they should be, their acceptance of their real selves may follow naturally.

Carl Rogers said, "As I accept myself as I am, only then can I change." In humanistic therapy, the therapist can help even a schizophrenic accept who they are by reflecting acceptance of the psychotic individual. This may culminate in curativeness, although perhaps not a complete cure. However, when the schizophrenic becomes more able to accept who they are, they can then change. Social acceptance is crucial for coping with schizophrenia, and social acceptance

leads to self-acceptance by the schizophrenic. The accepting therapist can be a key component in reducing the negative consequences of stigma as it has affected the mental ill client.

This, then, relates to conditions of worth and the actualizing tendency. "Conditions of worth" affect the mentally ill more severely than other people. Simple acceptance and empathy by a clinician may be curative to some extent, even for the chronically mentally ill. If the schizophrenic individual is released from conditions of worth that are entailed by stigmatization, then perhaps the actualizing tendency would assert itself in them in a positive way, lacking distortion.

In the tradition of person-centered therapy, the client is allowed to lead the conversation or the dialogue of the therapy sessions. This is ideal for the psychotic individual, provided he believes he is being heard by his therapist. Clearly, the therapist's mind will have to stretch as they seek to understand the client's subjective perspective. In terms of humanistic therapy, this theory would applies to all individuals, as it is based upon the psychology of all human beings, each uniquely able to benefit from this approach through the growth potential that is inherent in them. In terms of the amelioration of psychosis by means of this therapy, Rogers offers hope.

SOCIAL COGNITIVE THEORY

Social cognitive theory (SCT) refers to a psychological model of behaviour that emerged primarily from the work of Albert Bandura. Initially developed with an emphasis on the acquisition of social behaviours, SCT continues to emphasize that learning occurs in a social context and that much of what is learned is gained through observation. SCT has been applied broadly to such diverse areas of human functioning as career choice, organisational behaviour, athletics, and mental and physical health. SCT also has been applied extensively by those interested in understanding classroom motivation, learning, and achievement.

SCT rests on several basic assumptions about learning and behaviour. One assumption concerns triadic reciprocality, or the view that personal, behavioural, and environmental factors influence one another in a bidirectional, reciprocal fashion.

That is, a person's on-going functioning is a product of a continuous interaction between cognitive, behavioural, and contextual factors. For instance, classroom learning is shaped by factors within the academic environment, especially the reinforcements experienced by oneself and by others. At the same time, learning is affected by students' own thoughts and self-beliefs and their interpretation of the classroom context.

A closely related assumption within SCT is that people have an agency or ability to influence their own behaviour and the environment in a purposeful, goal-directed fashion. This belief conflicts with earlier forms of behaviourism that advocated a more rigorous form of environmental determinism.

SCT does not deny the importance of the environment in determining behaviour, but it does argue that people can also, through forethought, self-reflection, and self-regulatory processes, exert substantial influence over their own outcomes and the environment more broadly.

A third assumption within SCT is that learning can occur without an immediate change in behaviour or more broadly that learning and the demonstration of what has been learned are distinct processes. One reason for this separation is that SCT also assumes that learning involves not just the acquisition of new behaviours, but also of knowledge, cognitive skills, concepts, abstract rules, values, and other cognitive constructs. This division of learning and behaviour is a shift from the position advocated by behavioural theories that defined learning stridently as a change in the form or frequency of behaviour. It also means that students can learn but not demonstrate that learning until motivated to do so.

HISTORICAL ORIGINS OF SCT

Born in 1925, Albert Bandura was trained and began his career in the mid-twentieth century when explanations of human functioning, including classroom learning, were dominated by behavioural models advocated by researchers such as B. F. Skinner, Clark Hull, Kenneth Spence, and Edward Tolman. In this context, Bandura, along with his students and colleagues, initiated a series of studies designed to examine social explanations for why and when children displayed aggressive behaviours.

These studies demonstrated the value of modeling for acquiring novel behaviours and provided initial evidence for the separation of learning and performance. They also indicated the importance of the learner's perceptions of the environment generally, of the person modeling a behaviour specifically, and of the learner's expectations regarding the consequences of behaviour.

In doing so, findings from this systematic research contradicted assumptions within behavioural models that learning was the result of trial and error learning or that changes in behaviour were due primarily to the consequences of one's own actions.

By the mid 1970s these studies helped form the foundation for what Bandura initially called observational learning theory and then later social learning theory. This precursor to SCT established a viable model for understanding how people learned through observation of models. Additional work during this time expanded aspects of the theory dealing with abstract modeling, language, and conceptual learning. In the years that followed, SCT continued to evolve, spurred by the work of Bandura and his colleagues stressing the processes of goal setting, self-efficacy, and self-regulation. The evolution of SCT also drew ideas from information processing models of psychological functioning to describe the cognitive processes that mediate learning. Ultimately, Bandura noted in the preface to his 1986 treatise, *Social Foundations of Thought and Action: A Social-Cognitive Theory,* that, in an effort to be inclusive of these more motivational

and cognitive processes, he was using the label "social cognitive theory" rather than social learning to describe his framework. Throughout this book, Bandura describes the philosophical and conceptual foundation for SCT and reviews empirical evidence for its main components. Hence, it provides a concrete milestone for the birth of contemporary SCT. Since that time, SCT has continued to grow and expand especially with regard to the work on self-efficacy, self-regulation, and agency.

CORE CONCEPTS WITHIN SCT

SCT integrates a large number of discrete ideas, concepts, and sub-processes into an overall framework for understanding human functioning. Five of the central concepts. For a more complete explanation of SCT, readers are directed to works by Bandura and to the relevant chapters within textbooks on learning.

Observational Learning/Modeling. From its inception one core premise within SCT has been that people learn through observation. This process is also described as vicarious learning or modeling because learning is a result of watching the behaviour and consequences of models in the environment. Although observational learning is dependent upon the availability of models, who or what can serve this role is defined broadly. Live demonstrations of a behaviour or skill by a teacher or classmate, of course, typify the notion of modeling.

Verbal or written descriptions, video or audio recordings, and other less direct forms of performance are also considered forms of modeling. There also distinctions among different types of models. Mastery models are proficient when demonstrating a skills, whereas coping models struggle, make mistakes, and only eventually show proficiency. Abstract modeling occurs when the skill or knowledge being learned is conveyed only indirectly, and cognitive modeling occurs when a model verbalizes her thoughts while demonstrating a cognitive process or skill.

According to SCT, observational learning of novel behaviours or skills is dependent on four inter-related processes involving attention, retention, production, and motivation. Attentional processes are critical because students must attend to a model and the relevant aspects of behaviour in order to learn. Retention refers to the processes necessary for reducing and transforming what is observed into a symbolic form that can be stored for later use. Production processes are necessary when students draw on their stored codes and make an effort to perform what they have observed. Finally, motivational processes are key for understanding why students engage in the prior sub-processes, including whether they ever attempt to use or recreate the new skills they have observed. Each of these processes, furthermore, are affected by factors such as the developmental level of the learner and characteristics of the model and modeled behaviour.

Beyond new learning, modeling is also important for understanding when or why previously learned behaviours are exhibited. Students' may inhibit their

engagement in behaviour if they observe a model suffer consequences they would prefer to avoid. For instance, if a teacher glares at one student who is talking out of turn, other students may suppress this behaviour to avoid a similar reaction. In a related fashion, students may disinhibit or engage in a behaviour they had initially suppressed when they fail to see any negative consequences accrue to a model. For example, students may refrain from shouting out answers unless they are called upon only until they see others do so without repercussions. Finally, through a process labeled response facilitation, models can simply prompt others to behave in known ways.

Outcome Expectations. Outcome expectations reflect individuals' beliefs about what consequences are most likely to ensue if particular behaviours are performed. For instance, children may believe that if they get a hit during a baseball game the crowd will cheer, they will feel good and will be admired by their teammates. These beliefs are formed enactively through students' own past experiences and vicariously through the observation of others. Outcome expectations are important in SCT because they shape the decisions people make about what actions to take and which behaviours to suppress. The frequency of behaviour should increase when the outcomes expected are valued, whereas behaviours associated with unfavourable or irrelevant outcomes will be avoided.

Perceived Self-efficacy. Self-efficacy also has emerged as a prominent and influential concept within SCT. Self-efficacy reflects individuals' beliefs about whether they can achieve a given level of successful at a particular task. Students with greater self-efficacy are more confident in their abilities to be successful when compared to their peers with lower self-efficacy. Self-efficacy has proven useful for understanding students' motivation and achievement in academic contexts. Higher levels of perceived self-efficacy have been associated with greater choice, persistence, and with more effective strategy use.

Consistent with the tenets of SCT, self-efficacy is viewed as a product of individuals' own past performances, the observation and verbal persuasion of others in the environment, and individuals' on-going physiological state. Rather than directly affecting their self-efficacy, however, these sources of information are weighed and filtered through a process known as cognitive appraisal. For instance, a prior failure may not be detrimental to self-efficacy if students believe there was some no-longer relevant reason for the poor performance (*e.g.*, prior sickness). Interventions based on SCT and designed to increase self-efficacy in school-aged children have proven effective. Goal Setting. Goal setting is another central process within SCT. Goals reflect cognitive representations of anticipated, desired, or preferred outcomes. Hence, goals exemplify the agency view within SCT that people not only learn, they use forethought to envision the future, identify desired outcomes, and generate plans of action. Goals are also closely related to other important processes within SCT.

For instance, models can provide goals in the form of specific behavioural outcomes or more general standards for acceptable levels of performance. Goals also are intricately related to students' outcome expectations and their perceived

self-efficacy. Goals are a function of the outcomes students expect from engaging in particular behaviours and the confidence they have for completing those behaviours successfully. Finally, goals are an important prerequisite for self-regulation because they provide objectives that students are trying to achieve and benchmarks against which to judge progress.

Self-regulation. Research on self-regulation or, when applied to academic contexts, self-regulated learning, blossomed in the 1980s and continued into the early 2000s to expand. Explanations for students' management or control of their own learning behaviours have arisen from within many distinct theoretical perspectives. Many of the most common models, however, have strong roots in SCT.

SCT models of self-regulation assume that self-regulation is dependent on goal setting, in that students are thought to manage their thoughts and actions in order to reach particular outcomes. SCT views of self-regulation initially emphasized three sub-processes.

Self-observation reflects students' ability to monitor or keep track of their own behaviours and outcomes. Self-judgement is the process through which students' evaluate whether their actions are effective and allow them to make progress towards their goals. Finally, self-reaction occurs when students' respond to the evaluations they have made by modifying their behaviour, rewarding it, or discontinuing it.

Self-regulation is a prominent and increasing aspect of SCT that exemplifies the underlying assumptions regarding agency and the influence of personal factors on behaviour and the environment. The self-regulation is also dependent on other processes within SCT, including goal setting and self-efficacy. Unless students have goals and feel efficacious about reaching them, they may not activate the processes needed for self-regulation. Modeling can also affect students' self-regulated learning. The skills needed to manage one's behaviour, as well the beliefs and attitudes that serve to motivate self-regulation, can be obtained through modeling.

3

Physical Education and Sports: An Integrated Approach

AN IMPORTANT INFLUENCE ON ACTIVITY LEVELS

A child's teacher, coach, and physical educator play an important influence on activity levels. Perceived expectations of the teacher and interactions of the teacher with students can positively or negatively influence students' attitudes towards participation in physical activity. DeMarco and Sidney (1989) go on to state that one of the reasons teachers have such an influence on students throughout the years is due to the number of years (amount of time) students spend in school.

There is a strong connection between the physical educator and the students' attitudes. "Teacher behaviour and the content of the curriculum have a profound impact on students' attitudes. The influence teachers have on students tend to be greater with girls. Increased opportunities with good teachers and coaches have helped change the system so that fewer girls lack confidence today than in previous decades. This leads to students gaining confidence in physical activity and feeling as though they can accomplish the task.

A middle school programme should include exciting and challenging physical fitness routines that allow students to explore and experience many types of exercise. Fun must be a primary component of any physical activity programme for children to create the best possible scenario for them to maintain an active lifestyle throughout adolescence and the teenage years.

STUDENT ATTITUDES, PERCEPTIONS, AND PERSPECTIVES

Wittrock (1986b) highlighted the value of studying students' attitudes with the following argument: Perhaps teaching can directly influence achievement, just as learning can sometimes occur without awareness. But research on students' cognitive processes examines and tests the utility of assuming otherwise, that teaching can be better understood and improved, by knowing its effects upon the learners' thoughts and mediate achievement.

Having a positive attitude towards physical education may affect a young persons involvement in physical activity. Steinhardt (1992) stated that a majority of children generally have a positive attitude towards physical education, regardless of school level. Yet, other researchers have argued that younger age children show more favourable attitudes towards PE compared to older children.

Numerous researchers' indicate that students' attitudes towards physical education vary from positive to negative. Shepard and Godin (1986) found that as students move from grades 7 to 9, they are less likely to perceive exercise as being fun. And, students who hold negative attitudes towards physical education are more likely to avoid participation (Carlson, 1994).

Students' perceptions of physical education are important because young people are the ones educators are generally trying to reach. However, researchers seldom acknowledge or consider students even though they are the centre of the learning process (Dyson, 1995). Graham (1995) stated, " The fact is that as a profession we just do not know how students feel about physical education programmes-what they like, do not like, value, would like to have included or excluded in their programmes" (p.364). Only recently, researchers have recognized that students provide valuable answers to many interesting questions regarding physical education programmes. Studies that have investigated students' attitudes provide us with a significant amount of information on how they feel and think about physical education (Graham, 1995).

Tannehill et al., (1994) conducted a study regarding students' attitudes towards PE by using a 42-item questionnaire as well as open-ended questions. Results indicated that over 50% of students' grades 10 and 11 ranked physical education as the least important subject in the curriculum. This may stem from PE not being overly supported by administrators and other teachers (Math, Science, English) and often overlooked as an important content area compared to other subjects.

The dislike or lack of interest in PE may stem from a lack of variety within the lesson content. Carlson (1995) reported that, "the content of the curriculum was a major contributing factor for students' lack of interest in the subject matter." Over the years students may get "bored" with the same mundane repetitious lessons that have been used year after year (i.e., basketball, dribbiling). Middle school students' perceive a lack of meaning and feel isolated, and alienated in the gymnasium. Negative attitudes can stem from students perceiving physical education as meaningless, discouraging, or even afraid of failure. Carlson's (1995) study illustrated one students' sense of feeling unsuccessful saying: I

got really frustrated. It seemed like everyone else knew how to play the game, and I didn't….I don't have the skills and techniques that the people who have played sports have….I would try, but not very hard. If I was better at the sport I would participate more, because I wouldn't be afraid to do it. [I'm afraid] that if I screw up, people are going to get on my case.

In addition, they have reported that there are many reasons why they share the sentiment "we hate gym" (Carlson, 1995). Students need to engage in challenging but varied tasks to maintain interest in PE (Blumenfeld, 1992). Corbin (2002) noted that it is important to set different goals for students depending on their unique needs. "Learning motor skills and learning to value and enjoy activity seem to be worthy goals for young children. Gallahue (1996) stated that unless students enjoy and have a general interest in a physical education programme, more specifically in the physical education content, there is a small chance they will remain physically active during their post high school years. In addition to understanding what students want in a PE programme, another area that has been discussed is what students' think about coeducational verses same-sex classes.

There have been many studies in the past regarding students' perceptions of coeducational physical education verses same-sex physical education classes. Osborne, Bauer, & Sutliff, (2002) study looked at students perceptions regarding participating in co-ed verses non-coed classes. Some students felt concerned with their privacy of personal issues around the opposite sex. Others felt certain sports (football, wrestling) were suited for males and gymnastics and volleyball were better suited for females. The researchers belief was that students preferred non-coed verses coed classes and the physical educators should take into consideration both programmes to determine what would better suit their students. Yet, the physical educators felt "coed physical education may be more beneficial to all students because they are exposed to a variety of diverse ideas from both genders".

Treanor, Graber, Housner, & Weigand (1998) conducted a yearlong study with 466 middle school students in order to gain insight of their perceptions of co-ed and same sex PE. They reported that male and female 6th, 7th, and 8th grade students indicated that they liked same sex PE because they received more practice opportunities, cooperated better, and played team and individual sports better in same sex PE classes. Males were shown to compete at a higher intensity in same sex PE whereas females were shown to compete harder in co-ed PE classes. Both male and female students reported that they behaved better, received more practice opportunities, played team sports more efficiently, and were less fearful of injury in same sex PE classes. Future research is needed to find whether students' perspectives of same sex verses coed physical education are influenced by student abilities so the teachers can make informed decisions based on this knowledge.

Dyson (in press) reported students' comments regarding a PE lesson: "I thought is was kind of boring we didn't do anything fun," "I don't like the drills

and we don't get to play," and "We would rather have more games." They concluded that students may have found PE boring because the lessons were not designed to meet the needs of individual students.

Students perspectives can assist educators in choosing the best teaching strategy by understanding the developmental characteristics of the children they teach, and developing the appropriate student centered-curricula that addresses these characteristics (Sanders & Graham 1995). Hopple and Grahams' (1995) study addressed whether or not students had a clear understanding of why they had to participate in the mile and how they felt about the mile run. Results indicated that students were unsure of why they had to participate in the mile run/physical fitness test. The findings indicated that most students had little to no understanding of why they took the mile run/physical fitness test. Some students believed that the teachers used it to "get you exercising most of the time" or to "see who was going to be in the track meet" along with "I don't know". Students would make the mile run "fun," (without having to finish in a set amount of time and making it easier) if given the chance.

Placek and collagues (2001) investigated what middle school students' thought of health – related fitness and whether they felt exercise was important. The study involved 39 sixth grade students in an urban middle school. The researchers used open-ended and application questions to interviews the students. Results indicated that students did not make the connection between health benefits and strength, but equated strength with appearance. Both boys and girls conveyed a strong message that being thin and looking good meant you were in good shape. Students also thought that fat is sweated out and permanently gone. All students were aware that working out is good for you and most believed that everyone should participate. Yet, they did not understand the purpose of certain activities, such as jogging, and the benefits of jogging.

Exploring students' thoughts and feelings can provide educators with an understanding of how to develop positive experiences in physical education that will in turn lead to a greater appreciation for the benefits of participating in physical activities and the importance of maintaining an active lifestyle.

EFFECTS OF CLASS SIZE

Examining the schools' contextual factors (i.e., class size) will help readers understand the teachers' work environment and how teachers interpret their roles, which in turn affects students and what they learn or do not learn (Tyson, 1996). Class size can have a great effect on students' learning and a teacher's ability to teach. It can either enhance or restrict students' learning.

Throughout the country, physical educators are dealing with overcrowding in the gymnasium. With large classes, the physical educator's role becomes that of monitor rather than teacher (Tyson, 1996). At different grade levels teachers express concern by saying that class size creates a hindrance to quality instruction. McKenzie and his colleagues (2000) reported larger classes had a negative affect on students being physically active and could limit students

ability to learn important PE objectives. Crowded classroom conditions not only make it difficult for students to concentrate on their lessons, but inevitably limit the amount of time teachers can spend on innovative teaching methods such as cooperative learning and group work or, indeed on teaching anything beyond the barest minimum of required material (Burnett, 1995). Tyson (1996) mentions that students have reduced individual teacher contact (i.e, teacher and student interaction and opportunities to provide feedback) as well as more complex marginal problems in the design of effective instruction.

One study regarding middle school physical education (Dyson, in press) made mention that the gymnasium was routinely overcrowded having two and three classes combined with one instructor teaching approximately 60 to 90 students. Due to overcrowding in the gym it is no wonder that waiting, management, and organization consume a major portion of class time. Larger classes often result in fewer opportunities for students to participate due to having less equipment and space per student and the increase in wait time. Having large classes directly effects students' opportunities to interact with the teacher and their peers as well as learn in their physical education classes. Grant (1994) mentioned that large classes may impede the development of students' sense of belonging and being known.

Cothran & Ennis (1999) shared one teacher's frustration with large classes in PE, Well, the way the gym class is you don't get to know them. By the time you take roll, deal with their slips of paper, get them organized into teams, then you miss a lot of things that you should be focusing on. You just try to run them through like a big faucet that you try to get everything through in 30 minutes Ms. Goetz.

Large class sizes are likely to contribute to the low amount of (moderate to vigorous physical activity) MVPA and higher negative student attitudes towards the PE programme (Dyson, in press). Smaller classes are crucial to students' learning in PE. Smaller classes (i.e., in general education) can shrink the achievement gap and lead to reduced grade retention, fewer disciplinary actions, and less dropping out especially for minority students or students attending inner-city schools (AERA, 2003).

RESEARCH REGARDING URBAN SCHOOLS/PHYSICAL EDUCATION

Most research regarding urban schools has come from academic class settings and after-school (alternative) programmes geared towards at-risk or underserved youth. There has been a paucity of research regarding "in-school" urban PE programmes. And most research conducted in the gymnasium has been done at the high school level. This portion of the paper will be devoted to discussing the realizations and hardships teachers and students are confronted with in urban schools.

Teachers and students are dealing with an increased level of violence among students and teachers who attend and work in urban schools including students

fighting, outside intruders, and weapons in schools. Shen (1997) indicated that physical conflicts among students, robbery and theft, vandalism of school property, student use of alcohol, student drug abuse, student possession of weapons, and verbal abuse of teachers were all issues urban teachers are faced with.

Principals are having a difficult time hiring teachers and often employ teachers who do not hold certifications in the subjects they have been contracted to teach. In addition, these teachers experience difficulty in organizing and conveying the content and in their ability to maintain order and discipline in the classroom, leading to teachers become policing agents who constantly search for control. Administrators become judges who make daily decisions that easily may affect a students' entire life (Kallusky, 2000). Ennis and Chen (1995) have described the challenges of teaching in large urban schools:

In large, urban schools, constraints occur in the form of students who may not value the educational process, facilities and equipment that are outdated or in need of repair, and administrators and teachers who may have difficulty focusing on educational goals because they are distracted by threats of violence and student teacher confrontations.

Educators need to realize that drugs, gangs, and violence are what many underserved youth deal with on a day-to-day basis. Due to the many factors that affect students outside of school, promoting physical activity in "at-risk" youth is a major task. At-risk students are defined as " students who are turned off by traditional school, they are often pre-delinquent, troubled, and hostile with few goals. Often these students possess low self concept, exhibiting an alienation to society with rules and regulations".

Urban youth deal with several complex limitations embedded in their economically disadvantaged lives. Knop, Tannehill, & O'Sullivan (2001) highlighted how the negative impact poverty has on healthy behaviours may partly explain urban adolescents' lack of interest in PE. If youth do not have the opportunity to practice good nutritional habits, use safe fitness and play facilities, or participate in directed fitness activities, they may find it difficult to see the relevance of physical education (Collingwood, 1997).

Physical activity can have a major impact on this type of student. According to Hellison, "positive student-teacher relationships become essential in assisting at-risk students to grow and change behaviour to become more successful in the schools".

One student in an inner-city school provided this negative descriptions of teachers:

" Teachers come to make money, They don't care what you do. Teachers don't like me. They say, 'Why do you bother to come, you can't pass anyway?' They yell at us and give us detention for no reason. They give up on you. Schools don't care!" It may be that many students around the country share these sentiments.

Urban students' often have difficulty engaging in the learning process and affiliating with others. This may be in part because many students living in

underserved areas change schools frequently throughout their school careers, limiting opportunities to master content and connect with peers. This may lead to a feeling of not belonging. Researchers have indicated that a key component that influences a student's decision to engage in school is the student's sense of membership. They also imply that engagement is more likely to happen when a student believes that there is a personal connection to the school. If students believe that the activities provided by the school are valuable, they are more likely to be involved in those activities and consequently see the school as valuable.

Ennis and her colleagues described physical education urban school context providing limited educational experiences for students who wanted to learn. Consistent problematic areas include limited facilities, equipment and instructional time; disruptive and disengaged students; and unsupportive administrators. Students' want teachers and programme leaders "who take an interest in them, and get to know them, who don't judge them too harshly before finding out what they can really do…" (Jordan, 1995). This kind of thing is happening all over the country especially with programmes in underserved areas. They tend to "blame the victim" by treating the kids as if they are the cause of the problem, rather than placing the blame where it belongs, on the community and societal, economic, social, and political factors.

Physical educators need to give students' a chance to express themselves without taking away their individuality and creativity. They need to teach them responsibility, respect, and leadership so they can be part of successful programmes as they all work towards the goal of making a difference.

DEVELOPING FUNCTIONAL SKILLS THROUGH PHYSICAL EDUCATION

The FUN Pack provides task cards for pupils and the lesson rotation plan for teachers to switch teams through the different subject areas for the next lesson. Teams of pupils rotate on a weekly basis and take on the roles identified above. Within the lesson, pupils take part as performers within a structured game either as players or officials. Other pupils act as scorers, timekeepers, coaches or match analysts recording the number of passes or shots. Using video and still cameras other pupils record the game and download the footage or visual images whilst another group provides recorded match commentary and match reports all of which can contribute to the production of a newsletter or added to the school's website. The West Kent e-learning group has provided eight schools with the essential ICT equipment including camcorders, MP3 voice recorders and digital cameras to enable them to develop the lessons. The FUN resources are also available for use with Rugby and with new curriculum links for year eight.

GAMES CONSOLES IN SCHOOLS

Games consoles are being used in schools to encourage disaffected pupils in physical education lessons in order to increase fitness levels. Some schools are

using the consoles to simulate actions of certain activities to improve pupils' behaviour and teamwork skills through tennis, baseball, snowboarding and skiing for example. Whilst some may think that the use of virtual reality games is contradictory in raising activity levels and attainment there is anecdotal evidence to suggest that, with rigid structures in place using specific games, pupils can be physically active without releasing the console. In one case study project teachers identified pupils between the ages of fourteen and sixteen who had often missed physical education lessons.

NINTENDO WII FIT AND VIDEO GAME

The Wii Fit is a video game that has been designed by Nintendo for the Wii console. The game focuses on exercise which involves an individual using a Wii balance board. The board is a wireless accessory and contains multiple pressure sensors used to measure an individual's centre of balance. This can be applied to activity games such as skiing, for example. The 'Wii Fit' package includes a 'Wii Fit' game disk for the Nintendo Wii console containing fitness training related games and activities. The balance board measures a user's mass and centre of balance.

The software can then calculate the user's body mass index when told of his or her height. The game consists of different sub-games and activitie – some of which are not available until being unlocked by building up credits in the 'Fit Bank', including yoga poses, strength training, aerobics, balance games and other exercises.

MULTI-PLAYER WIRELESS AND DANCE MAT SYSTEMS

There a number of multi-player wireless dance mat systems where pupils can activate panels on a dance platform in sequence with four arrows on a screen and the beat of music. DanceMachine offer a twenty mat system for schools. It has been developed to improve fitness levels through hi-tech sound and visual equipment and is suitable for all key stages. This interactive range of equipment is designed to improve fitness through a large video screen and the latest hi-tech sound equipment. This system tests both mental and physical activity through the many games and music to choose from and offers unlimited hours of physical activity. Interactive fitness equipment offers many benefits to the growing concerns of pupil's participation in physical activity. Amongst the many benefits to pupils is that they will burn off energy, boost their overall fitness, improve coordination and cardiovascular health. Dance steps are projected on to a wall or screen; users follow the steps displayed by arrows on their individual dance mat. At the end of song or session, users and instructors can see instant feedback on how well they performed, along with a leadership board for motivational competitiveness. Physical activity can therefore be more enjoyable and fitness and coordination is improved. Each dance mat is easily transported to different location by a storage cart that can hold up to sixteen dance mats.

GENERATION PEDOMETERS

The FitLinxx ActiPed is a next generation pedometer that clips to a shoe and records the wearer's walking, running or jumping as well as measures the distance travelled, calories burnt and total time of active minutes. This data can be stored and sent wirelessly and securely to an ActiPed account for the wearer to view their achievement and compare with their peer group.

Other innovative developments using ICT in physical education is the Nike Plus programme. This programme allows pupils to monitor their progress with regards to their levels of exercise in a similar way to other pedometers. This requires an iPod or Nike Plus sport band, sensor for shoes, sensor case to attach to shoe and a receiver for an iPod Nano. As pupils run, an iPod indicates their time, distance, pace and calories burned. And it gives you feedback at the halfway point and in the final lead-up to your goal. You can also see the details of your workout on your iPod. On selected workouts when using it with a Nano/iPod sporting legends such as Lance Armstrong and Venus Williams give periodic motivational help.

Pupils can download all the run information on to the Nike Plus website where they can see a timescale indicating all the information about their run and review their workout. Pupils can store all the runs completed so they can compare them and gain advice and help with training/coaching for any distances. The website also has a whole interactive community all over the world. This allows a person to challenge people, view other racing times and interact with other runners. The Nike Plus website motivates pupils to access learning outside school; increases their running and fitness; improves ICT skills; motivates their learning through self-pacing calculations and estimating distances; undertake courses appropriate to their levels of skill and fitness; set targets to challenge themselves; assess their learning; supports the teaching of appropriate techniques.

DESIGNED OF PUPIL RESPONSE SYSTEMS

Interactive pupil response systems are designed to engage and motivate pupils whilst giving the teacher the tools to monitor and record pupil progress. They are sometimes referred to as classroom voting systems, utilising advanced radio frequency technology and integrating with curriculum software. Pupil response systems add increased interactivity into classrooms through interactive writing tablets or wireless slates which presents a cost effective alternative to interactive whiteboard technology. Pupil response systems are essentially a series of handsets that interact with additional software for Windows PowerPoint which allows pupils to interact with the teacher's presentation. This could be in the form of a quiz or formal assessment. Each pupil has access to a handset and if required can remain anonymous throughout the activity, or it can relate to each pupil individually. The results from each question can be highlighted to the group, via a graph or table, and pupils can compete against one another with a marking system, or a time limit, that can be adopted by the teacher.

Qwizdom is one interactive pupil response system. At Seaford Head Community College in East Sussex, Qwizdom has been used to develop material from both the GCSE and BTEC syllabi. It has also captivated pupils' interest, particularly in areas that may be more academic or literature based. It has been used with all Key Stage 4 pupils to evaluate the BTEC physical education course. This has allowed physical education staff to make changes to the curriculum throughout the year in order to enhance the learning environment for each pupil. In addition, Qwizdom has been used within an orienteering unit of work. The lessons were designed to include a strong theme of numeracy and literacy and included clues that pupils could answer using the handsets. The teacher was able to collate and save results, as well as observe the progress of the pupils as the handsets interact with the laptop used on-site by the member of staff.

ARCHOS: MP4 MASS STORAGE

Archos is an MP4 mass storage unit that has the capability of accessing the web, transmitting video, still images and music through an external source such as a speaker system or interactive whiteboard. The main function within physical education lessons is its ability to record video footage. The player has a small camera attachment that can film any type of activity, such as a dance performance, and it can be instantly played back on the Archos's 4-inch screen. The screen size allows for students to observe theirs or others' technique and make comment, or watch the performance. During the playback mode there is also the opportunity to slow the action down to several variable speeds, as well as pause the footage. This is ideal when illustrating areas for improvement, or highlighting good technique and also incredibly visual for the pupils observing. Playback can instantly be transferred to a PC or laptop, and therefore be viewed on the 'big screen', or even edited to make into a video. It is a reliable back up for pupils' written assignments and can make the course content far more interesting and challenging. At Seaford Head Community College, pupils have created videos of good technique during outdoor and adventurous activities whilst using the climbing wall using the Archos to capture the footage. They have then used the school's ICT suite to edit their footage together to make a short film. The physical education department has also used the Archos equipment to film evidence of completion of BTEC National Diploma work with the Year 12 pupils. It has provided a reliable back up for the pupils' written assignments and has made the course content far more interesting and challenging.

Archos can save video footage which can be used for starter material at the beginning of a lesson. For example, footage taken from the previous lesson, or information from the internet, or digital television. Clips can be related to the lesson focus, or learning objectives. Information can be stored on the device that will relate to the lesson planned such as a good technique or performance. This could be observed at any stage throughout the lesson by pupils in order for them to enhance and compare their own work against the work of others. Music

can be used at any stage and can play whilst the Archos is performing another feature. For example, it would be possible for the Archos to be plugged into speakers for a dance or gymnastics performance as well as film the performance itself.

Wireless internet (wifi) is also a feature as pupils can access the web in wifi areas to aid their research within accredited courses at key stage four and beyond by searching for items related to the work being covered. This does require a licence from Archos and involves a fee. Filming is easy with the 'Head camera'. Pupils can gain instant feedback on what they have performed and develop work as a result. They can use the slow motion tool on the device to illustrate an action or to evaluate their own and others performance. This information can then be stored on any computer system that has the software installed (this will take three minutes to install). Footage is stored via USB and takes moments to save minutes of work. This can then be used in various ways. For example, it can be added to Movie Maker and edited into a movie. It can also be added to presentations (PowerPoint). To view the footage on a larger scale it takes moments to plug the device in and illustrate the work on the interactive whiteboard. This works via USB again (similar to a memory stick) and can be watched and paused a number of times. Slow motion is not available at a larger scale as the footage is being played through the computer, rather than the Archos unit itself.

Other recordings can be taken from digital TV, terrestrial, video and DVD by linking the device up to a DVR station (also a charger). Using a DVR station alongside the wifi allows the teacher to set a timer on the Archos to record programmes. Data is stored directly onto the device and can be played back. Alternatively, highlights of programmes can be recorded by hand once plugged in using the record and pause functions.

THE USE OF IPODS

An iPod is a brand of portable media players designed and marketed by Apple Inc. The products includes the hard drive based iPod Classic, the touchscreen iPod Touch, the video-capable iPod Nano and the compact iPod Shuffle. The iPhone can function as an iPod but is generally treated as a separate product. iPod Classic models store media on an internal hard drive, while all other models use flash memory to enable their smaller size. As with many other digital music players, iPods, excluding the iPod Touch, can also serve as external data storage devices. Storage capacity varies by model.

The iTunes software can be used to transfer music to the devices from computers using certain versions of Apple Macintosh and Microsoft Windows operating systems. The use of iTunes and its alternatives may also transfer photographs, videos, games, contact information, e-mail settings, Web bookmarks and calendars to iPod models supporting those features. There are a number of potential benefits of using gadgets such as iPods which can engage and motivate pupils through analysis of performance. Pupils can rip and upload

videos to their own. A dictaphone can allow pupils to provide commentary to moving images. For teachers it allows practical forms of assessment to take place and provide immediate results and feedback. Clips can be stored in pupil files allowing for reduced marking and paperwork for both teachers and pupils. The iPod shuffle is a digital audio player that uses flash memory which can provide teachers with quick and easy access to music playlists for dance lessons and can be played through a docking station using speakers. Other applications include the iPhone which is an internet and multimedia enabled 'Smartphone' designed and marketed by Apple Inc. Functions include a camera phone, portable media player similar to a video iPod and full internet access including web browsing.

PODCASTING: SERIES OF AUDIO OR VIDEO DIGITAL MEDIA

A podcast is a series of audio or video digital media files which are distributed over the internet by download, through web feeds, to portable media players and personal computers. A podcast is distinguished from most other digital media formats by its ability to be syndicated, subscribed to and downloaded automatically when new content is added. Like the term *broadcast*, *podcast* refers either to the series of content itself or to the method by which it is syndicated; the latter is also called podcasting. The host or author of a podcast is often called a podcaster. Podcasting is becoming increasingly popular in education and is currently being used at Hayesbrook Specialist Sports College, which has enabled pupils and teachers to share information at any time. An absent pupil can download the podcast of the recorded lesson and it is being used as a tool for teachers or administrators to communicate curriculum, assignments and other information with parents and the community. Teachers can record trampolining and gymnastic routines, dance performances, swimming techniques, post-match interviews and pupil debates for example. Podcasting can be a publishing tool for pupil oral presentations within accredited physical education courses at Key Stage 4 and beyond.

THE VIRTUAL LEARNING ENVIRONMENT (VLE)

The virtual learning environment (VLE) has transformed the way in which pupils learn and teachers teach. The virtual learning environment is a global website that allows pupils to access their work and their curriculum from anywhere in the world. It is rights-protected and therefore only parents, students and staff will be able to log in. Pupils work can be set, collected and marked via the VLE, saving on a great deal of paperwork and collection and deadline dates. This, in turn, can empower pupils and inform their own learning. Pupils are able to make more decisions, as tasks will be completed at their own pace and potentially in their own time.

There are many ways in which physical education teachers can optimise pupil's knowledge and understanding through the use of this technology, which has significant advantages.

For example, pupils are able to join subjects (known as courses) and from there they will see the tasks, homework, quizzes and forums linked to the teacher, from home and school. As a teacher you are able to post work for your pupils that will be available around the clock. Your pupils will be able to submit work online and you can feedback to them from anywhere in the world. This allows teachers, parents and pupils to monitor their work and current attainment in physical education.

Using the VLE pupils are able to post their work for others to see and comment on; parents will be able to participate more fully in their children's learning; learning can continue outside the school day; pupils will be able to participate in collaborative work involving other schools locally and internationally involving external experts; and learning can be more personalised to suit pupil needs. As many pupils make use of interactive online services (such as blogs, messaging and virtual worlds) at home, the VLE allows them to make use of these services in a controlled and safe on line environment.

At Hailsham Specialist Sports College in East Sussex, the VLE is being piloted to enhance collaboration with feeder primary schools by having online mentoring of Year 6 pupils by current Year 7 pupils, helping to ease the transition to secondary school. Cross-curricular learning is also facilitated through use of the VLE. Current examples of this working are the science and physical education project run in Year 7 by physical education teachers. Pupils are able interact online with teachers and each other to discuss and formulate answers to questions relating to learning objectives from lessons 'out of school time'.

This type of learning environment and this specific cross-curricular work has been recognised as a model of good practice and is growing rapidly. With many schools moving towards a more interactive way of teaching and learning it is likely that these types of practices will be commonplace in many schools by the start of the next decade.

VIDEO CONFERENCING IN SCHOOL

In schools video conferencing can be used for formal teaching, using guest teachers, multi-school projects and community events. Once connected, pupils can see the other person on a TV screen and ask questions. The equipment required includes a TV monitor, camera, microphone, speaker and a compressed video system which can be transmitted through an Integrated Services Digital Network (ISDN). Video conferencing can provide pupils with the opportunity to learn in different ways, which might include a focus on a particular topic being covered in physical education at examination level. This could be arranged with another physical education department where teachers can offer particular expertise within an examination syllabus allowing for the sharing of information. This may be particularly useful for post-sixteen courses in physical education that have an international dimension and allow pupils to research a particular topic unique to one country. Equally, teachers could make use of video conferencing for cross-moderation of pupils' practical and theoretical work in

physical education in post-fourteen and post-sixteen accredited courses. This interactive approach to teaching can be highly motivating for pupils and improve their communication and presentation skills. In addition, memory retention can potentially be improved and a range of different learning styles can be catered for and can provide a much broader forum where learning can take place.

THE USE OF YOUTUBE WITHIN SCHOOLS

YouTube is a video-sharing website where users can upload, view and share video clips. It uses Adobe flash video technology to display a wide variety of user-generated video content, including movie clips, television clips and music videos, as well as amateur content such as video blogging and short original videos. Most of the content on YouTube has been uploaded by individuals, although media corporations including the BBC offer some of their material via the site. The wide range of topics covered by YouTube has turned video sharing into one of the most important parts of internet culture. YouTube is fast becoming an effective medium for gaining and presenting images in schools.

This has many advantages for a physical education teacher wishing to visually describe a sport, an action, a skill or technique to a class. For example, if you are introducing a new invasion game to pupils such as Kabbadi, video clips taken from YouTube can be shown to highlight the main principles and purpose of the game. Ofsted (2009) cited one school where this was very effective in which the inspector observed the following.

Video clips from YouTube on the boxing match between Mike Tyson and Oliver McCall were used to discuss somatic and cognitive impact on physiological arousal when participating in sport and its effects on performance, following the breakdown of McCall in the ring. This led to discussion of the importance of temperament under pressure, drawing on examples such as an England versus Germany penalty shoot-out and the missing of an easy conversion which would have won the rugby league challenge cup. The teacher then led a session expertly on the impact of confidence, peaking in performance and self-talk, comparing performances of Usain Bolt and Asafa Powell. The use of visual cues, contemporary examples and discussion combined with the teacher's excellent subject knowledge helped to consolidate students' understanding of a complex topic very well.

Most schools now have facilities for internet access to be shown and the use of large spaces such as the school hall for assemblies to present images from YouTube can be hugely effective. YouTube is beneficial because it is fast. Teachers and pupils can type in the sport wanted and a whole variety of differing images are displayed. There is also software to download videos from YouTube and save them onto a computer which would cut out the need for the internet when showing the class. However, it requires knowledge of the internet and in some cases an internet connection is needed. There also needs to be clear guidance on its use by teachers and pupils which in some cases requires forms of governance in terms of access. The website at Seaford Head Community

College currently utilises YouTube for publicity, promotional and marketing purposes as well highlighting pupil achievements and experiences including performing arts and physical education.

PHYSICAL EDUCATION AND SPORTS

According to Collins English Dictionary, self-actualization is a psychological "process of establishing oneself as a whole person, able to develop one's abilities and to understand oneself". Physical education is "an educational based subject that aims at total or wholesome development of the learner through use of movement and well selected activities. The overall goal of physical education is to influence and educate learners through physical means, which in turn results in outcomes that go beyond the physical fitness". Given this definition of physical education, its value in the lives of all persons cannot be over emphasized.

Participation in physical education, which includes various physical and sports activities, leads to a total physical fitness both among persons with and without disabilities and hence to self-actualization. When persons with disabilities participate in physical education and sports, they are adapted to their levels of bodily conditions in order for them to benefit fully and attain total physical fitness, enhancing their cognitive, psychomotor and affective development. In other words, when one develops mental fitness, physical strength, and psychosocial well being through sports, one is thus adequately prepared for meaningful undertaking in other activities to the best of his/her capacities. It has variously been shown in a number of studies that, persons with disabilities who participate in sports improve in strength, coordination, and flexibility. Both parents and teachers have always conceded that individuals with disabilities who participate in sports activities are less depressed, perform better academically, are more stable in behaviour as well as in their overall social interactions. The overall impact of this participation was further emphasized by Nelson Mandela when opening the first annual South African Junior Wheelchair Sports Camp held in Johannesburg in December 1995 saying:

Disabled children are equally entitled to an exciting and brilliant future. We must see to it that we remove the obstacles... whether they stem from poor access to facilities; poor education; lack of transport; lack of funding; or unavailability of equipment such as children's wheelchairs. Only then will the rights of the disabled to equal opportunities become a reality.

According to the Olympic Solidarity Manual, 2005 edition, the revival of Modern Olympics by the 19th to 20th Centuries French reformer and aristocrat, Pierre de Coubertin, was basically an educational endeavor. de Coubertin developed this idea out of the challenge that was posed by a humiliating defeat of France in the Franco-Prussian War of 1871 and attributed the defeat to apparent poor physical condition of the then French population. The athletic programmes at the British boys' schools also greatly inspired him. Thus he borrowed heavily from Greek and Latin, which he made to be core subjects in schools, through which he aspired to improve upon the youth's health and athletic talents as well

as their international diplomacy. This is the noble foundation upon which the universally renowned Paralympics games are also based as attested by the following quote.

The fundamental principal guiding the Paralympics movement is that, elite level athletes with physical disabilities should have opportunities and experiences equivalent to those afforded elite athletes without disabilities. … Competitive sports have proven to be an effective vehicle to promote equality, inclusion, accessibility and awareness about the capabilities of those with physical disability. … and dispel the stigma surrounding disability and illuminate the realm of possibility. … The first Paralympics Games were created in 1948 by Sir Ludwig Guttman, a neurosurgeon … when he organized the International wheelchair Games to coincide with the 1948 London Olympics. The first deliberate attempt to connect the Olympics with the Paralympics was made in 1960 when the first Paralympics games were held in Rome, just a few weeks after the Rome Olympics. In the first year of the games, 400 athletes from 23 nations competed in wheelchair events.

In 2001, an agreement was signed between the International Olympic Committee (IOC) and the International Paralympics Committee (IPC) which says that, the Paralympics would always come immediately after the Olympics and both shall use the same venue and facilities.

Thus, as the Olympic athletes leave the venue, the Paralympics athletes get in; hence both categories use the same village and the same facilities and systems. This ensures equity. It also signifies that both programmes are perceived similarly in terms of their benefits to the society and to the participants. In other words, they are both an instrumental vehicle towards self-actualization for the participants irrespective of their physical conditions. Indeed, the Paralympics may be perceived as more significant considering the level and magnitude of effort made both by the officials as well as the participants with disabilities to get that far.

ACTUALIZATION OF PERSONS WITH DISABILITY

The World Summit on education for all in 1990 committed all nations to work towards provision of education as a key to social-economic growth and a means to self-empowerment. Thus, learners with special needs must be given an attention that is commensurate to their conditions in educational institutions. According to available literature, the majority of persons living with disabilities lead a sedentary lifestyle because their caregivers are either overprotective or they do not know how to handle them and thus their physical participation are tremendously hampered. Consequently, individuals with disabilities are often sidelined at the peripheries of physical activities venues and are thus forced to remain permanently as passive participants. This is a form of discrimination based on physical conditions of the learners and should be discouraged at all costs.

The effort has been made in Kenya towards offering a viable solution to the aforementioned situation. For instance, a report on the Presidential Working Party on Education and Manpower Training for the Next Decade and Beyond (Government of Kenya, 1988) recommended integration or mainstreaming of learners with disabilities within the Kenyan education system. Similarly, according to the Kenyan Ministry of Education's 2006-2011 Strategic Plan, the Government of Kenya supports the training of teachers in special education at various institutions such as Kenya Institute of Special Education (K.I.S.E.) which was established in 1986, and Kenyatta University. This is a highlight of Kenya government's commitment towards improving the destiny of persons with disabilities. The Kenya Institute of Special Education trains special education teachers at a Diploma level. These are teachers who have specially been trained to understand, cope and teach persons with disabilities with the view to ensuring they too benefit fully from education programmes offered in the country. Kenyatta University's Department of Special Education trains teachers for the said purpose at Bachelor's, Master's and PhD degree levels. Similarly, the Department of Exercise, Recreation and Sports Science offers courses in Adapted Physical Education at the undergraduate and postgraduate levels to students who desire to work with individuals with disabilities. These institutions and others that have later on proliferated have been significant pillars in the development of special education programmes and their respective human and physical resources in the country. Indeed, the development and expansion of special education programmes as well as their respective disability sports programmes in Kenya is a clear indication that the Government of Kenya is determined to extend the achievement of the Millennium Development Goals (MDGs) among the entire population including the persons with disabilities as vital key players. The eight MDGs which were declared by the United Nations for achievement by 2015 are listed below and their attainment therefore becomes very possible with expansion of special education/special physical education and sports programmes within the country.

These are:

a. Eradication of poverty and hunger,
b. Achievement of universal primary education,
c. Promotion of gender equity and women empowerment,
d. Reduction of child mortality,
e. improvement of maternal health,
f. Combating of HIV/AIDS, malaria and other diseases,
g. Environmental sustainability,
h. Establishment of global partnerships for development.

Indeed, through accessible facilities and training programmes, Kenyatta University has attracted the highest number of students with disabilities into various degree programmes compared to any other university in Kenya. At Kenyatta University, Kenya Institute for Special Education and all teacher training colleges, teacher-trainees take Adapted Physical Education courses

where they are inducted into the necessary methodological approaches required to enhance full participation of learners with disabilities. The aim here is to promote self actualization of these individuals through sports just as the case has been amongst those without disabilities. One of the best organized and most vibrant levels of sports competitions in Kenya, namely Teachers' Training Colleges Sports Competitions, effective 2007, included sports for persons with disabilities for teacher trainees who are mainstreamed into sports competitions in various disciplines. This is a breakthrough in nurturing of persons with impairments through sports at the educational institutions in Kenya. This approach is expected to unearth the hidden sports potentials of individuals with disabilities. The participants' fitness and self-esteem will also be improved. Individuals with disabilities now participate in a variety of sporting programmes around the country. These sports are managed under the umbrella of disability organizations that are run by voluntary organizations.

SPECIAL OLYMPICS PROGRAMME

The organization runs year round sports activities for individuals with intellectual disabilities. This organization is affiliated to the Special Olympics International which is run under the Eunice Kennedy Shriver Foundation. Through a process of divisioning, individuals whose abilities range from mild to severe are provided with opportunities to participate in such activities as football, handball, swimming and athletics at recreational and competitive levels. Kenya has been an active participant in international Special Olympics competitions that are held the year preceding the Olympic Games. Many of the coaches used in Special Olympics programmes work with athletes on a voluntary basis. The Special Olympics has been able to do this through volunteer training programmes. The Department of Exercise, Recreation and Sports Science at Kenyatta University has been at the forefront in training students as volunteers to serve athletes with intellectual disabilities.

KENYA PARALYMPICS SPORTS

This is the organization that runs sports for persons with physical and visual disabilities. They participate in a variety of sports both recreationally and competitively. These include athletics, wheelchair tennis, basketball, swimming and cycling among others. The Kenya Paralympics programme is very expansive as it involves a variety of individuals with different disabilities. These include those with visual and physical disabilities, including amputees, as well as albinism. The categorization of the disabilities and their extent ensures that all levels are catered for in the competitions. In addition, there are a variety of adaptations used in these sports. For example, use of wheelchair ensures persons with disabilities can move on their own and play like others. In other cases the use of teacher aides increases the support the athlete has to participate. The teacher aide also serves as the assistant to the instructor so that the teacher can have time to attend to others. Modification of rules and equipment on the other

hand allows the individual with disability to utilize the abilities he/she has to perform. For example, the tennis player is allowed two bounces to enable him/her to reach the ball.

SPORTS FOR THE DEAF

Those with hearing impairments have an opportunity to participate in inclusive and separate sports in Kenya. Where the sport requires communication, the referee has to use signs. Many individuals with hearing impairments however, continue to actively participate in integrated sports with limited support. There is need for more attention towards deaf sports to attract more into sports.

There is a new impetus to involve the ever increasing number of students with disabilities at the University. During the 2008/2009 academic year, the number of these students rose to 110. These include students with visual and physical disabilities. The Kenyatta University Disability Sports Association (KUDSA) aims at empowering students with disabilities to participate in sports at both recreational and competitive levels. Through the association, students with disabilities participate competitively in athletics, tandem cycling, goal ball, swimming and weight training. It is expected that with the interest created, more students with disabilities in other universities will be encouraged to participate in sports. The students and lecturers of the Department of Exercise, Recreation and Sports Science have initiated this effort with a view to ensuring that the students with disabilities benefit from the abundantly available sports programmes at Kenyatta University However, the challenge the disability sports continue to have is limited adapted facilities, equipment and trained personnel in the area of adapted sports.

The right to education for every individual, as enshrined in the 1948 Universal Declaration of Human Rights, coupled with the pledge made by the world community at the 1990 World Conference on Education for All, has helped to increase the involvement of governments and other organizations in catering for persons with disabilities. This applies both in Kenya and else where in the world. As a result, many individuals with disabilities are now accessing public sport facilities to train and compete at national and international levels. Kenya disability sports are now running shoulder to shoulder with other regular sports with government support.

PARTICIPATION IN PHYSICAL EDUCATION AND PHYSICAL ACTIVITY

This should be more of a reason for an increase in physical activity and student participation. Unfortunately, this is not the case. As students' progress into their teen years the enrollment in physical education and physical activity drop. Studies in middle school PE have shown that as little as 16% of class time is spent in Moderate to vigorous physical activity (MVPA). MVPA includes behaviours that are equivalent to or more active than a brisk walk or high intensity activities.

AGE OF STUDENTS: PHYSICAL, SOCIAL AND EMOTIONAL CHANGES

Middle school is a unique period for students' where they are undergoing rapid physical, social, and emotional changes (AAHPERD, 2001). Along with the many changes that take place during adolescence, lack of physical activity is included. Researchers are finding that even in school where PE classes are offered, activities in these classes often are judged inappropriate and of insufficient intensity to develop cardiorespiratory fitness. Sallis & Patrick (1994) reported that expert panel's recommend that adolescent youth participate in at least 30 minutes of moderate-intensity physical activity daily or complete at least (three) sessions of continuous moderate-to-vigorous exercise weekly. Unfortunately, adolescents are failing to meet this minimal goal.

Opportunities for middle schoolers to receive PE is extremely important because participation in high school PE is declining in both terms of overall enrollment and the number of classes students receive per week (McKenzie, 2001). McKenzie (2001) noted that there is a sharp decline in physical activity for students during adolescence. And, more specific to age, several studies from Europe suggest that habitual activity levels decline dramatically from age 6 to 18. The decline in physical activity among adolescents is so great that Rowland (1999) referred to adolescence as a risk factor for physical activity.

Numerous descriptive and correlational studies have been conducted, and almost all show a decrease in physical activity levels as children age. In contrast, one study assessing students' health related physical activity during PE noted that moderate-to-vigorous physical activity (MVPA) in middle schools were higher than in the elementary schools but only during roughly 20% of the lesson; unfortunately it was still far below the 50% standards of Healthy People 2010.

PHYSICAL ACTIVITY: GENDER OF STUDENTS

In addition to the decrease in physical activity, researchers have begun to uncover that along with physical activity declining with age, it also differs by gender. The decrease seems to be more prevalent in females than males. Girls participation in physical education starts to decrease at the junior high level and they tend to participate in less strenuous exercise as they advance from grades seven to nine. A 1994 study indicated that as many as 51% of boys and 76% of girls were failing to meet the goal of being engaged in 30 minutes of moderate to vigorous physical activity daily. The 1999 Youth Risk Behaviour Survey conveyed the percentage of girls reporting vigorous activity on three or more days per week declined from 68% in 9^{th} grade to 52% in 12^{th} grade (CDC, 1999). Sallis (1993) estimated adolescent girls reduced their physical activity by 7.4% and adolescent boys by 2.7%. Another study conducted in 2000 (McKenzie, et.al) revealed that boys (46.4%) were more active than girls (39.5%) both in energy expended and the amount of time engaged in MVPA during a lesson.

4

The Environmental and Theories of Motivation in Sports

Athletes participate in sports for various reasons, from a hunger for physical activity and competition to the joy of belonging to a team. Coaches can improve the team's performance by finding the right motivation for each situation and player. Specific motivational theories exist that apply psychological concepts to sports for increased drive and performance.

EXTRINSIC MOTIVATION

Extrinsic motivation is motivation that comes from an outside source. Some of it is tangible, such as financial or other material rewards, including trophies or medals.

Tangible extrinsic motivation is not necessarily ideal for athletes who become too focused on materialism at the expense of other aspects of sports. Intangible extrinsic motivation includes praise, recognition and achievement, which can often be enough to motivate athletes.

INTRINSIC MOTIVATION

Intrinsic motivation comes from within the athlete or player. It includes a natural desire to overcome challenges and enjoyment in the repetition of a skill. These factors can remind athletes why they participate in a certain sport—especially during grueling practices. Intrinsic motivation is often best supported by a series of goals, whether they're enhanced skill sets or victories in competition.

THEORY OF VITALITY

The theory of vitality dictates that vitality influences the future capacity for performance. An athlete has a baseline vitality with which to work and won't stray far from that point. Actions or effects affect that vitality and either thwart or satisfy the player's needs. For example, if a player is extrinsically motivated and praise isn't forthcoming, the player's vitality sinks and he loses motivation. Similarly, if a player loves a game and keeps winning at it, her intrinsic enjoyment is satisfied, her vitality rises and she is motivated to continue.

SANDWICH THEORY

The sandwich theory motivates athletes to correct or improve without destroying their sense of enjoyment, pride or inclusion as an equal team member. You can use this theory on yourself by noticing your positive contributions to your team, too. When crafting criticism, sandwich the need between positive reinforcement. Doing so motivates athletes to put forth the necessary effort for improvement because their larger extrinsic or intrinsic needs are being met.

A MOTIVATION

A motivation occurs when players lack motivation, which happens for a few reasons. Sometimes, the player has no sense of capacity and truly doesn't believe he is capable of performing the way that's required. Other times, the player doesn't understand the connection between the actions required and the desired outcome.

In these instances, coaches and trainers can build self-esteem by carefully building skill sets. Another solution is conditioning athletes to understand how their improvements in technique can benefit their overall performance or their team.

CONCEPT OF ENVIRONMENT

In our society sport fulfils important functions and is indeed indispensable. It offers opportunities for physical activity in a world where physical activity is increasingly diminishing; it promotes good health and well-being; and it provides a means of social contact and ample opportunity for intensive experiences.

At the same time, however, sport can be a considerable cause of damage to nature and the environment. Damage can occur directly as a result of the pursuit of sports activities or the building and operation of the requisite infrastructure, or it can be caused by indirect factors such as the use of cars to travel to and from sports activities.

The causes of the conflict between sport and the environment are inherent in sport itself and are also a consequence of deep-rooted social changes; they may be understood only from this perspective. Since the 1970s, higher income, more leisure, greater mobility and increasing individualisation have formed the basis for major and continuing changes in sport.

These changes include the following:

- A rise in the number of people who pursue sports activities
- A higher degree of differentiation between types of sport and sports equipment as well as motives and reasons
- The use of areas hitherto unused or seldom used and areas already in use being opened up for new purposes
- Spread of activities to periods previously not or seldom made use of
- Fewer ties with sports clubs and their traditions
- Increase in individual, spontaneous activities without proper training
- Increase in activities offered commercially and to a certain extent associated with aggressive advertising

Consequently, these developments have led to wider and more intensive use of particularly attractive but, by nature, vulnerable areas. Sport is claiming more territory, and this is continually putting numerous animal and plant species under threat and causing the loss of natural landscapes. Sport can not only affect nature and landscapes, but can also give rise to other environmental damage. With regard to this problem, the use of non-renewable resources, the emission of harmful substances during the building and operation of sports facilities, journeys to and from these facilities, and the production and disposal of sports equipment all play a key role.

Sports activities can cause critical damage to and endanger precious and vulnerable locations. However, in terms of overall damage, sport tends to play a lesser role compared to other causes such as agriculture, forestry, industry and transport. In the analysis of conflicts between sport and the environment, areas of overlap with other forms of land use must be taken into account.

At the same time, sport is also affected by general damage to the environment caused by other sources. Such damage includes, for example, a large number of devaluated watercourses, *e.g.*, as a result of hydraulic engineering, pollution of soil and water and air. Thus, while sport can be an obstacle to issues of nature conservation and environmental protection, the two conflicting areas also have common interests. New approaches are required for resolving existing conflicts between sport and the environment in the long term. This means orienting conservation and utilisation concepts to the principle of sustainability in line with the agreements reached at the Conference on Environment and Development in Rio de Janeiro in 1992. Sport must be included in the on-going debate on implementation of Agenda 21, which was adopted at the conference. The aim should be for representatives of sport and those promoting the cause of nature conservation and environmental protection to join forces and draw up guidelines for sustain-able development in sport.

CRITERIA FOR THE SUSTAINABLE DEVELOPMENT OF SPORT

The model of sustainable development consists in reconciling the improvement of economic and social living conditions with the long-term protection of the

natural basis of life in order to also give future generations the opportunity to unfold. It not only addresses governments, but also business and industry, all social groups and, indeed, each individual citizen.

When applied to sport, it becomes necessary to:

- Promote and further develop forms of sport which are compatible with nature and the environment;
- Make sports-related infrastructure more environmentally compatible;
- Reduce damage to vulnerable areas;
- Secure and improve opportunities for sport and physical activity outside vulnerable areas;
- Preserve and increase the recreational quality of countryside and its enjoyment value for those doing sport.

AREAS OF ACTION

This paper limits itself to outlining central areas of action. The areas of action are linked to one another in a variety of different ways; considering them in isolation fails to do justice to the complexity of the relationships. Therefore, occasional overlaps in content are unavoidable.

Sports Activities in Nature and the Countryside

Sport and nature conservation can be reconciled almost everywhere. Thus conflicts arising from sports activities in nature and the countryside are not a general problem. They seldom arise on a large scale, but tend to be concentrated in specific locations, which are characterised by their special attractiveness for sport, as well as by a particular vulnerability and the need for nature protection.

Critical factors with respect to the effect of sports activities on nature are the extent, intensity and type of sport being pursued as well as the resilience of the natural area being used. In principle, the use of nature for the purposes of sport should stop at the point where the type of activity concerned considerably affects or damages nature or the rural landscape. Thus sports activities should take into due account the degree of ecological resilience of the area concerned.

In order to reduce the damage to vulnerable areas early on and at the same time fulfil the task of providing for recreation, nature conservation bodies and representatives of sport should be more involved in the planning of opportunities in resilient landscapes. A positive impact on the recreational value of countryside is generated as a side effect of the various nature conservation programmes on species and biotope conservation.

In the past, some countries have developed promising approaches all in the planning and management of sports and leisure activities. These are essentially aimed at ruling out, or avoiding as far as possible, potential conflicts and lessening existing conflicts. Numerous regulations that have been put into practice and proved successful show that they can meet the demands of both sport and nature conservation.

For example, leisure activities and facilities that are not tied to a particular natural environment or geographical features should be removed from vulnerable areas and transferred to less vulnerable areas of manmade landscapes or situated near residential areas.

A wide range of measures such as signposting, shifting car-parks, banning traffic from certain roads, information boards, route marking, maintaining desirable routes and closing down undesirable routes, setting up obstacles such as water-filled ditches or bushes all make it possible to transfer activities from vulnerable to more resilient areas without this being noticed by the people concerned. Supplementary measures towards the restriction of activities to certain periods of time could be planned.

In many cases problems only arise when the same areas are used excessively at the same time. Before the use of such areas is banned altogether, the possibility of restricting numbers of visitors to these areas should be examined, while taking into account social fairness.

In order to avoid inadequate enforcement, planning possibilities involving the restriction of infrastructure should be considered. In cases where the pursuit of sports activities causes harm only at particular times, restrictions during these specific periods should be considered. In this way, nature conservation requirements during the breeding or moulting season of birds or vital periods for other animals can be respected without banning access to areas at other times.

It is also possible to reconcile sport with nature conservation by defining maximum permissible group sizes, restricting activities to those which do not pose any threat in the specific situation, declaring certain areas of countryside off-limits, stipulating specific routes, defining maximum permissible boat lengths or permissible type of power source or imposing the requirement of producing specific qualifications.

Voluntary commitments should be given priority for achieving conservation aims as they provide greater clarity for those involved. If this is not possible or proves unsuccessful, a wide variety of different solutions should be implemented. It is the duty of sports organisations and commercial operators to encourage a considerite attitude to nature and the environment by providing information about ecological aspects.

However, environmental education processes will only be effective it all those involved are willing to respect the restrictions and acquire knowledge of nature conservation issues.

Restrictive measures intended to protect vulnerable or over-used natural areas are successful particularly when attractive alternatives are offered. These should involve upgrading the land concerned in terms of the aesthetic appeal of the landscape, ecological and recreational aspects, as well as selecting locations which avoid the generation of high traffic volumes. Artificial facilities for types of outdoor sport which take place in nature or the countryside provide only

partial relief. They do not provide a substitute for the experience of nature and may in the long term even serve to increase the use of and thus the pressure on nature.

The measures suitable for avoiding and resolving conflicts arising in connection with types of activities pursued in the countryside can be summarised as follows:

- Developing binding, uniform and effective regulations in areas which, for the sake of nature conservation, must be kept free of any use or certain uses
- Developing and testing effective measures, *i.e.*, measures which can be conveyed and controlled, below the level of a ban
- Shifting activities and facilities to less vulnerable areas
- Concentrating and managing activities (in terms of location and time)
- Targeted expansion of supply-oriented planning in resilient areas where the countryside should possibly be enhanced
- Creating artificial alternative and substitute facilities
- Obliging all sports operators to organise their events and programmes such that they are compatible with nature and the environment
- Systematically informing and educating people practising sport and multipliers about the possibilities for pursuing activities without affecting nature or the environment.

CHARACTERISTICS OF TRAINING IN SPORTS

Training is a complex behaviour, mainly because it is performed in a time frame that ranges from seconds to years. Sports people use numerous terms to describe the characteristics of this temporal dimension of training. Single human movements, which occur in a second or two, are combined and repeated to make a training bout or workout, a period of more-or-less uninterrupted physical activity.

Workouts may occupy a few minutes or hours, and may be continuous exercise, a set of reps or repeated movements, or a set of sets. A complete training session usually lasts an hour or two and consists of one or more workouts.

The nature of each session may vary, but after a week or so a repeated pattern of sessions known as a microcycle usually emerges. A series of microcycles may constitute a phase of training, for example a build-up or speciality phase. A repeated pattern of phases or microcycles makes up a mesocycle, and a season or macrocycle of training may consist of a repeated set of mesocycles. Finally, over a period of years a training history develops.

Studies involving quantification of training focus invariably on only a small part of the training time frame. In some biomechanical applications, the focus of interest is a single movement or limited set of movements, such as a high jump or a javelin throw.

In most other applications, particularly those involving investigation of the physiological effects of training, the fundamental unit of training is the workout. Even in studies of injury and illness that focus on a season or history of training, data on typical workouts during one or more phases of training usually provide the key training variables.

Workouts vary between sports, but most can be classified as eitherendurance, interval, strength or skill. For example, in competitive track running a workout of continuous running is classified as endurance; repetition running (short periods of high-speed running separated by rests or slow-speed running) is an example of an interval workout; short sprints with a weight in tow qualifies as a strength workout; and practicing of starts is a skill workout. This classification reflects common usage by sportspeople, but it also has an underlying theoretical basis: in general, endurance workouts train the aerobic power system, interval workouts train the anaerobic glycolytic system, strength workouts train the phosphagen system, and skill workouts train the central nervous system.

Duration and intensity are important characteristics of a training workout, because they contribute to the short- and long-term effects of the workout on the health and fitness of the athlete.

In the case of an endurance workout performed at a reasonably steady pace, only one estimate of duration and intensity may be required. Interval and strength workouts involve multiple periods of work and rest, each of which may need an estimate of intensity and duration. The intensity and duration of skill workouts also need to be characterised, especially if the movements are practiced at sufficiently high intensity and for a sufficient duration to produce a training effect on the body's power systems.

The aims of a study will dictate whether other aspects of training workouts need to be assayed. For example, it may be important to determine details of clothing, equipment, training surface or medium, venue, time of day, weather, consumption of food or drink, psychological state, supervision, or perhaps even the number and calibre of training companions.

METHODS OF QUANTIFICATION

There are three groups of methods:: observational (taking measurements in real time or from video recordings), physiological (monitoring heart rate, blood lactate concentration or oxygen consumption), and subjective (use of questionnaires or diaries). The methods in each group are similar in their suitability for assaying training, but there are substantial differences between groups.

The suitability of each method for assaying training in different time frames. Training in the shortest periods of time can be assayed only with observational methods, whereas the longest time frames require subjective methods. All methods, including those in the physiological group, can quantify training at the level of a workout, but the physiological methods are useful only for assaying the intensity of training of steady-state workouts.

Table. Suitability of methods for quantifying training behaviour in different time frames.

	Time frame of training behaviour				
	seconds	minutes	minutes-hours	days-weeks	months-years
	single movement	repetitions, intervals	workout, bout session	microcycle, phase, mesocycle	macrocycle, season, history
Observational					
real time	++	+++	+++	+	-
video	+++	+++	++	-	-
physiological[a]					
oxygen uptake	-	-	+	-	-
heart rate	-	-	++	+	-
blood lactate	-	-	+	+	-
Subjective					
questionnaire	-	++	++	++	++
diary	-	+	++	+++	++

Suitability: +++ high, ++ moderate, + limited, - unsuitable.[a]Suitable for intensity of steady-state workouts only.

OBSERVATIONAL METHODS

Quantification of periods of training from a few seconds to a few weeks can be achieved simply by observing the training either in real time or on video. Practical considerations set the upper limit of the time frame: it is time-consuming for the coach or scientist to be present at every training session, and expensive if observers or video operators are employed.

Observation may also cause the athletes to train more intensely or closer to their prescription than they would otherwise do, but in general the measures obtained by observation are probably more valid than those obtained by physiological or subjective means.

Real-Time Observation

The measures usually recorded in real time are the type and duration of the workout, along with relevant split times, distances, weights or workloads that produce measures of intensity. Special stopwatches facilitate recording of multiple times if the workout is a set of intervals. Information on other dimensions such as weather and equipment is also recorded if relevant. It is worth making a recording form with coded columns for all the necessary data. Such forms reduce the rates of error and loss of data and can be sent directly to a data-capture service.

Measures of intensity derived from observation can be expressed either inabsolute terms (e.g., pace in minutes per mile) or in relative terms (e.g., pace as a percent of the athlete's personal best pace for the distance). For athletes doing

resistance training with weights, an important measure of relative intensity is the repetitions maximum (RM); for example, 80% of 1 RM is 80% of the weight that an athlete can only just lift once. The use of relative intensity simplifies description or prescription of intensity for athletes who differ in ability.

Video

Video is a tool primarily for the coach or biomechanist interested in improving the athlete's skill. It is ideal for the analysis of single movements or intervals of exercise lasting up to a minute or two. The most cost-effective method is qualitative analysis, in which the athlete, coach or sport scientist simply view the video together and decide immediately how technique could be improved. The athlete can then attempt any recommended changes and be filmed for a further round of analysis.

Quantitative analysis involves digitisation of the video images to permit calculation of spatial and temporal relationships in the movement. Several proprietary hardware-software packages are available for the purpose. Simple but effective digitizing is also possible with minimal extra hardware and software. The procedure is time-consuming and loses the benefit of immediate feedback to the athlete, but it allows detailed comparisons of one athlete with another or of one athlete before and after an intervention.

Video has also been used for time-motion or notational analysis, in which the times spent in various modes of activity or in moving at various speeds are estimated from time and distance measurements taken from the video. As yet the method has been employed only for quantification of the energy demands of competition rather than of training.

PHYSIOLOGICAL METHODS

Training produces many effects on the body, ranging from acute responses (e.g., increase in breathing frequency during exercise) to chronic adaptations (e.g., increase in blood volume and maximum oxygen consumption after a few weeks of endurance training). Some chronic adaptations find application in studies of the training of non-athletes, where they can provide objective evidence of an increase in physical activity.

With athletes, only the acute responses are used to quantify training, and of these responses only three have any practical significance: oxygen consumption, heart rate, and blood lactate concentration. All three provide information only on the intensity of steady-state exercise.

The need for special apparatus to monitor physiological responses sets the upper limits on the useful time frame for these methods. Devices are now available that will allow athletes to monitor their own heart rates indefinitely, but if the data are to be collected by a researcher, several months of monitoring is difficult to achieve. Measurement of lactate concentration is also difficult to sustain for more than a few months, while oxygen consumption requires equipment that can be used realistically only for a few training sessions.

The shortest duration of training that can be monitored is set by the response time of the physiological variables to changes in exercise intensity. Oxygen consumption and heart rate take 3-4 min to reach a steady state, and blood lactate concentration takes even longer, so these variables are unable to provide readily interpretable information on the intensity of reps/intervals.

Oxygen Consumption

In theory this is a good measure of the intensity of steady-state exercise, for a number of reasons. First, training that can be sustained at a constant pace for more than a few minutes is performed with energy supplied almost entirely from consumption of oxygen. Secondly, the relationship between steady-state oxygen consumption and power output or speed is linear over the range of intensity from rest to maximum steady state. Thirdly, oxygen consumption drifts upwards by only a few percent in prolonged exercise performed at a constant high workload. Finally, oxygen consumption at a given workload is stable over a period of months of training, in part because exercise efficiency changes little in trained athletes.

In practice, measurement of oxygen consumption requires athletes to breathe into special apparatus to allow expired gas to be collected or analysed. This requirement limits the monitoring of training activities in the field, although several portable devices weighing only a few kilograms are now available. It is more convenient (but less representative of real training) if the activity can be performed in a laboratory on a sport-specific ergometer. Analysis of oxygen consumption is possible in real time with one of a range of available metabolic carts or with a similar computerized system of analysers of gas volume and composition; alternatively, Douglas bags can be used to store the gas for later analysis. If analysing or collecting gas is too difficult during the training activity, it is possible to analyse or collect gas for several minutes immediately after the activity, then to calculate the oxygen consumption that occurred during the activity by back-extrapolation.

Several measures of intensity can be derived from oxygen consumption. Of the absolute measures, milliliters of oxygen per minute per kilogram of body mass ($ml.min^{-1}.kg^{-1}$) is appropriate for comparing training that involves continual changes in direction or speed, or continuous work against gravity (examples: running, off-road cycling, most team sports). Liters of oxygen per minute ($L.min^{-1}$) is better for sports like road cycling and swimming. A relative measure that is rarely, if ever, used with athletes is the met (multiple of the resting metabolic rate). The most common relative measure is oxygen consumption expressed as a percent of maximum oxygen consumption, which is usually determined in an incremental test to maximum effort with the same mode of exercise as the training activity. The relative oxygen consumption allows more meaningful comparison of the training intensities of athletes who differ in body mass, performing ability, and exercise efficiency.

For reasons already stated, it is not possible to measure the intensity of short intervals of high-intensity training directly as an oxygen consumption. It is

nevertheless possible to exploit the linear relationship between workload (or pace) and oxygen consumption to express the intensity of such workouts as a percent of maximum oxygen consumption. For this purpose the oxygen consumption of several steady-state workouts is determined and plotted against workload, the line through the points is extrapolated to the higher workloads of the interval training, and the "corresponding" oxygen consumption is read off the graph.

Heart rate

This variable shows a response to exercise similar to that of oxygen consumption, so it can be used in a similar fashion to measure intensity when work load is maintained reasonably constant for more than a few minutes. Heart rate is higher if the same exercise is performed in a hotter environment. It also drifts upward more than oxygen consumption as the athlete heats up in prolonged exercise. It has the advantage over oxygen consumption of being far easier to assay.

In the laboratory heart rates are usually measured with an electrocardiograph, but for field work a range of miniaturized cardiotachometer is available. The most reliable of these detect the electrical activity of the heart and use it to calculate heart rate. Models that store the heart rate allow the coach and sport scientist to make use of the data, which are either replayed on the watch or downloaded into a computer or special portable analysing unit. Waterproof versions can be used to monitor steady-state aquatic training. The athlete can also measure heart rate directly by palpation of an artery in the wrist or neck, but exercise has to be stopped briefly to perform the measurement and the resulting estimate is not accurate.

Heart rate can be used to express intensity in several ways. The absolute heart rate is useful for the individual athlete monitoring intensity on a day-to-day basis. Heart rate expressed as a percent of maximum controls for differences in the maximum heart rate between athletes. Differences in the resting heart rate can be taken into account if intensity is expressed as a percent of heart-rate reserve: 100(training heart rate - resting heart rate)/(maximum heart rate - resting heart rate). A practical method of specifying intensity is to express training heart rates as a percent of race-pace heart rate. Heart rate recorded in the field can also be converted to oxygen consumption or other measure of training pace or power using relationships between heart rate and pace derived for each athlete from a series of steady-state exercise tests.

Lactate Concentration

During intense exercise lactate produced in muscle by the anaerobic glycolytic pathway diffuses into the blood and causes the blood lactate concentration to rise above the resting value 1-2 $mmol.L^{-1}$. If the intensity is not too high, blood lactate reaches a steady level after 10-20 min of steady exercise. The relationship between the steady level of lactate and workload is curvilinear but reproducible,

which means that lactate can be used to define training intensity. The range of intensities over which this method works is narrow: moderate intensities do not evoke increases in blood lactate, and at high intensities lactate does not reach a steady value before the athlete fatigues.

The highest intensity at which lactate stabilizes is one definition of the anaerobic threshold, and it corresponds to a blood lactate concentration of about 4 $mmol.L^{-1}$. Exercise at this intensity can be sustained for 30-60 min before fatigue occurs. Blood lactates are measured during training mostly for determination of the anaerobic threshold, then for prescription of intensity of training relative to the threshold. The peak value of lactate concentration reached during or following short high-intensity workouts is sometimes measured by enthusiastic sportspeople, but this practice is not useful.

Compact lactate analysers are available for determination of blood lactate concentration in a droplet of blood taken from a finger or earlobe. A portable instrument, suitable for use in the field, is also available. The analysis is rapid (1-2 min) and reliable, although technically demanding for the non-scientist. Problems with the technique arise not from the lactate analysis itself but from variability between athletes: the intensity corresponding to a blood lactate concentration of 4 $mmol.L^{-1}$ is perceived as moderate by some athletes and too hard to sustain by others. Even within the same athlete, variations in muscle glycogen content caused by recent training or diet can alter the lactate concentration corresponding to the anaerobic threshold. Care should therefore be taken to standardize training and diet for the few days before blood lactate is monitored.

SUBJECTIVE METHODS

Questionnaires and diaries are closely related instruments: a diary is effectively a series of self-administered questionnaires. Both instruments obtain data recalled from memory, and both can be used to assay training over all but the shortest time frames.

Questionnaires

In most respects, questionnaires are the best method for assaying training. They are quick and inexpensive to administer and they can provide data on most dimensions of training. Unfortunately no compendium of athlete questionnaires is available, few studies provide useful detail about the wording of their questionnaires, and few studies have reported on the precision of measurement of the items in a questionnaire. The researcher may therefore have to spend a considerable amount of time devising and trialing a questionnaire before using it in a study.

Questions about duration of training can be asked in terms of time spent or distance covered, depending on the sport. Duration of strength and interval training may be better defined in terms of the numbers of reps and sets rather than time spent, because the duration of the work and rest intervals is usually

hard to remember or estimate. Intensity can be assayed as estimated pace or workload and expressed subsequently as relative intensity, if the athlete's personal best performance is also recorded. For some workouts it may be preferable or necessary to assay intensity as perceived effort, usually in several broad categories. A two-point scale of intensity or effort could be simply *high* and *moderate-low;* a four-point scale could be *race-pace, hard, moderate* and *easy*).

For construction of a training questionnaire, it is important to get the help of a few good coaches or athletes who know how training sessions are organised and what terminology is used in their sport. Their advice will help make the decisions on how best to ask about duration and intensity, and whether other dimensions of training are important for the study.

The main drawback with questionnaires is errors in the responses of athletes, who may misinterpret the questions, exaggerate their training, or be unable to remember details. Measures of training derived from questionnaires are therefore usually less precise than those derived from observation or physiological monitoring. Lack of precision results in weakening of the apparent relationship between training and outcomes such as performance or injury, so it is important to estimate the precision of measures derived from questionnaires.

The precision of a measure is expressed formally as reliability and validity. Reliability of a training measure is the consistency of the measure obtained from repeated measurement of training in a sample of athletes. In the case of questionnaires, reliability is obtained simply by administering the questionnaire on two occasions. Validity describes the relationship between true training and the training obtained concurrently from the questionnaire or other instrument.

True training can never be measured perfectly, so in practice validation is a matter of comparing your measure with something better that is more difficult or costly to obtain.

For example, direct observation or physiological monitoring can validate a diary. In one study a phone interview was considered to give better measures of training for validating a self-administered questionnaire.

Validation of training over a season is difficult, because it is usually unrealistic to observe or monitor athletes for more than a few training sessions. One approach is to use a retrospective questionnaire, but to validate the questionnaire against measures from a diary, then to validate a short period of diary data against objective measures taken concurrently.

The quality of data obtained from a questionnaire is determined partly by the method of administration. The worst data are obtained from self-administered questionnaires, especially those sent by mail: misinterpretation or complete omission of questions is frequent, and an acceptable compliance (rate of return, preferably at least 70%) may not be achieved even after repeated reminder notices have been sent. Better data can be obtained if the athlete completes the questionnaire in the presence of an interviewer, who can answer queries and check the completed questionnaire immediately.

This technique can also be extended to a small group of athletes. The best data are obtained when one person, preferably one of the principal researchers, administers the questionnaire to each athlete, in person or by phone. In large-scale studies with several interviewers, it is important standardize procedures for recording each item. Misinterpretations and transcription errors by the interviewers will be further minimized if the questionnaire is constructed as if it were to be self-administered.

Draft versions of the questionnaire should be trialed initially on colleagues and, after revision, on a small sample of the athletes for whom it is intended. Analyse the data from this sample, because some problems become apparent only when you extract data from the questionnaires. After further revision give serious consideration to a reliability or validity study: it will make your main study more publishable. Make any minor revisions thereafter without further pilot work, but if major revision of key questions is indicated, further investigation of reliability or validity may be necessary. Now at last you are ready to use the questionnaire!

Diaries

Data from diaries are likely to be more valid than data from questionnaires, because diary entries are recorded soon after the training sessions, and an uninterrupted record of training over an extended period can be achieved. In other respects diaries present more problems than questionnaires. The greatest difficulty is with compliance, which may be acceptable at the start of a study but which may drop to an unacceptable rate as athletes lose interest. Regular collection of diary forms or regular encouragement will lessen the drop-out rate, as will keeping the diaries short and simple. The problem of coding a large amount of diary data can be avoided if athletes are provided with a diary sheet designed to permit direct recording of responses into numbered columns ready for data capture.

Pilot studies are as necessary for a newly-devised diary as they are for a questionnaire. Reliability is not worth determining for a daily diary, because the necessary close proximity of the test and retest will make high correlations inevitable. On the other hand, investigation of validity is much more feasible for a diary than for a questionnaire, because the short time interval represented by a diary entry can be observed or monitored relatively easily.

MOTIVATIONAL TECHNIQUES FOR COACHES AND ATHLETES

Goal Setting

- Athletes should be encouraged to set a few ambitious but achievable long-term goals; perhaps to represent their country in a major championship in three or four years. Through empowering athletes to set their own goals, they are more likely to accept the challenges that lie ahead and pursue the goals with enthusiasm;

- To keep athletes on track with their long-term goals, they should also set appropriate medium-term goals. For example, following a bronze medal-winning performance at the 2004 Athens Olympics, UK heptathlete Kelly Sotherton set herself the medium-term goal of winning the 2006 Commonwealth title in Melbourne en route to pursuing her long-term goal to be crowned Olympic champion at the 2008 Beijing Games;
- By far the most important goals in practical terms are those for the short-term, as it is these that keep athletes focused on the checkmarks which are seminal to achieving superior performance. Therefore, short-term goals should be predominantly process-oriented. For example, when Manchester United's Wayne Rooney injured a metatarsal six weeks before the start of the soccer World Cup, he set a series of process goals in his race to regain full fitness. These included daily physiotherapy sessions, remedial exercises in an oxygen chamber, non weight-bearing aerobic activities, monitoring of nutritional intake and so on;
- Goals need to be monitored and revised on a regular basis. One of the biggest mistakes that coaches make in setting goals is that they are often too rigid in their approach. The goal setting process works best when there is some flexibility and the individual athlete or team take ownership of each goal. Thus, coaches and managers are better off exercising some democracy when setting goals, particularly if working with more experienced athletes.

Using Extrinsic Rewards

SDT, the key aspect in using extrinsic rewards effectively is that they reinforce an athlete's sense of competence and self-worth. Thus, a reward should be informational in nature rather than controlling. If a reward comes to be controlling, it can significantly undermine intrinsic motivation. For a reward to be informational, it is advisable that it has relatively little monetary worth such as a 'woman of the match' or 'athlete of the tour' title. Also, the reward should be presented to an athlete in front of all potential recipients with some emphasis placed on the prestige associated with it. Other popular ways of using token rewards include etching athletes' names on annual honours boards for their contributions, or awarding a special item of clothing.

Motivational Music

A particularly good way to motivate athletes in training and prior to competition is through the use of music they perceive to be inspirational. Sydney Olympics rowing gold medallist, Tim Foster, now a respected coach, uses music to punctuate all of the indoor training sessions that he leads. Specifically, during circuit training or rowing ergometre intervals, he puts on loud/fast music, while during *recovery* periods he plays soft/slow music. Therefore, work and recovery

times are regulated by music. Research from Brunel University indicates that this approach increases work output, reduces perceived exertion and improves in-task affect – the pleasure experienced during the activity.

SPORTS PSYCHOLOGICAL CHARACTERISTICS OF PROFESSIONAL GOLFERS

Golf is an activity that has consistently been studied by sports psychologists. This popularity might come from the specificity of this sport: players spend a very short time at hitting the ball whereas moving across the course and waiting represent the majority of the duration of a game. The golfer must therefore develop emotional management skills (i.e., emotional control) and "adjust" his/her level of physiological and psychological activation. An efficient use of this time, which is mainly based on psychological competencies, is probably critical for golf performance. Therefore, golf clearly represents an ideal activity to be studied by sport psychologists.

In arrange to investigate the determinants of golf performance, a lot of studies have been conducted. Technical aspects interested some. For example, Davidson and Templin demonstrated the critical importance of acquired skills in golf performance. In a study of 119 professional golfers, they showed that driving and putting abilities as well as hitting green in regulation predicted 86 % of the variance of professional scoring average of the 1983 pro tour. Other researchers mainly focused on psychological factors related to golf performance. The studies can be classified into three categories depending on the variables examined: emotional factors, coping or performance strategies, and integrative studies. In the first part of the investigative rationale, we therefore present the golf-related studies. In the second part, we present studies examining psychological profiles of elite athletes in other activities.

PSYCHOLOGICAL FACTORS RELATED TO GOLF PERFORMANCE

Among the three categories identified, the majority of the studies concerned the emotional aspects related to the performance, the most popular factor seeming to be state anxiety. Results concerning this line of research are rather inconsistent. In a majority of studies, the relationships among the subscales of the Competitive State Anxiety Inventory-2 – namely cognitive anxiety, somatic anxiety and self-confidence – and golf performance were examined.

Cross-sectional and nomothetic research designs often revealed non-significant findings. For example, McAuley used the CSAI-2 to examine the reciprocal effects between pre-competitive state anxiety and self-confidence on the one hand, and golf performance on the other hand, among collegiate golfers. The results showed that pre-competitive measures did not predict golf performance but that golf performance was a significant predictor of post-round cognitive state anxiety and self-confidence. Similar results were found with

elite golfers. In a study of eight male golfers of the Swedish National Team, Hassmén et al. did not find a consistent relationship between pre-competitive mood states and performance. McKay et al. examined self-reported state anxiety measured by the CSAI-2 and physiological responses in 15 male professional golfers prior to, during and on completion of a tournament and practice round. If an increase in the anxiety variables and a lower self-confidence during competition compared to practice were observed, there was no significant correlation between psychophysiological variables and golf performance.

The results are a little bit more consistent in studies where experimental and/or idiographic approaches were used. For example, among a sample of eight male golfers of the Swedish National Team, Hassmén et al. showed that variability in somatic anxiety was significantly related to variability in golf performance. Using an experimental design and within-subjects comparisons with a sample of 12 experienced male golfers, Chamberlain and Hale brought partial support for the predictions of the Multidimensional Anxiety Hypotheses. More precisely, a negative linear relationship, a curvilinear relationship and a positive linear relationship were found respectively between cognitive anxiety, somatic anxiety and self-confidence on the one hand, and performance on the other hand. They also confirmed the impact of the directional aspect of competitive state anxiety-facilitative vs. debilitative-on performance.

Finally, testing the "catastrophe model" of anxiety and performance, few works proposed that cognitive anxiety, physiological arousal and self-confidence affect performance in an interactive fashion. In their study, Hardy et al. investigated eight male golfers participating in a golf tournament who reported their cognitive anxiety, somatic anxiety, and self-confidence prior to their tee shot on each hole. The results showed a complex relationship between these three variables. In a low self-confidence condition, cognitive anxiety was positively related to performance when somatic anxiety was low but negatively related to performance when somatic anxiety was high. By contrast, under condition of high self-confidence, cognitive anxiety was more positively related to performance when somatic anxiety was high than when it was low. The conclusion of such research is that cognitive anxiety is not as detrimental for performance as hypothesized in MAH. It could have a beneficial effect upon performance when competitors have low levels of physiological arousal and interpret their anxiety symptoms as being beneficial to performance.

One more line of research concerned the coping and performance strategies likely to moderate the effect of anxiety on performance and/or to reinforce self-confidence. Certain studies have investigated imagery direction and its subsequent effects on golf putting performance. They generally demonstrated improved performance following positive imagery such as seeing the path of the ball until the hole, and impaired performance following negative imagery such as missing the putt or through suppressive imagery, such as do not image hitting the ball "pass the target" or do not image an obstacle (a bunker) to avoid. In the same vein, one study examined the effect of various imagery

modalities (i.e., self-modeling via video intervention, audio intervention, written-script intervention) on golf putting performance. It appeared that the video and audio groups performed significantly better than the written script and control groups.

Others study were carried out especially to examine the role played by coping strategies. Nicholls's studies were qualitative and implicated adolescent elite golfers. The existence of efficient (e.g., positive self-talk, breathing exercise, following a routine) and inefficient (e.g., negative thoughts, trying too hard, speeding up) coping strategies was emphasized. Gaudreau et al. demonstrated that the coping strategies used differ throughout the pre-competitive, competitive and post-competitive phases of a golf competition. However, this piece of research does not concern the possible effect of coping strategies on golf performance.

In conclusion, integrative studies used one or two of the above factors in a context of a golf performance. Two studies can be distinguished because of their use of an experimental design. Beauchamp et al. examined the effect of a 14-week golf-teaching programme on the motivation, preparation, and putting performance of novice golfers. Three groups were compared: participants in the first group followed a cognitive behavioural programme, those in the second group used a physical skill-training programme and the third group was a control group. The results indicated that the cognitive-behavioural group presented higher levels of intrinsic motivation, a more consistent use of pre-putt routines and better putting performance as compared to the 2 other groups. Thill and Cury used a similar design with recreational golfers and found that a motivational context of one-on-one competition leads to anxiety and distraction, whereas a task-involving context excludes intrusive thoughts and is negatively related with self-handicapping. Using a correlational design with a sample of recreational golfers, Catley and Duda studied the psychological antecedents of flow and found that pre-round measure readiness variables (calm, positive focus, confident readiness and pessimism) as well as golf skill level were significantly related to the frequency and intensity of flow.

The rest of this set of studies has focused mainly on the role and the importance of coping strategies in golf performance and emotional reactions. Studies conducted by Gaudreau and his colleagues investigated the mediating role of coping strategies between (1) emotional reactions and performance and (2) pessimism/optimism and emotional reactions. These studies conducted with male amateur golfers confirm the great importance of coping strategies for emotional adjustment and performance in golf.

For example, using a sample of regional male golfers, Gaudreau et al. investigated the mediating role of coping in the relationship between Performance Goal Discrepancy (PGD) and affect. Multivariate path analyses revealed that active coping and behavioural disengagement mediated the relationship between PGD and positive affect during competition, whereas only behavioural disengagement mediated the relation between PGD and negative affect, during the competition.

ELITE ATHLETES' PSYCHOLOGICAL PROFILES

Only a few studies carried out in golf concerned "elite" participants and this statement is also true for other sports. Only a limited amount of articles report empirical data on psychological profiles of elite athletes. Most of them stress the importance of psychological skills (or performance strategies) used by high performers. Early research in this domain aimed at discriminating successful and less successful athletes in gymnastics, racquetball and wrestling. Overall, this set of studies revealed that the best athletes involved in these investigations (a) presented higher levels of self-confidence, (b) were closer to achieving their maximum potential, (c) focused less their attention on negative thoughts before competition and (d) used more self-talk.

More recent qualitative and quantitative researches confirmed and supplemented the elites' athletes profile showing that Olympic/World championship competitors were characterized among others by: imagery skills, pre-competition and competition game plans, strong self-beliefs, high personal drive, with high ego and high task orientation as well as high intrinsic and extrinsic motivation, abilities to focus and to block distracters, to set goals and to cope with and control anxiety. Results regarding anxiety are not congruent in that some studies reported lower levels for the best achievers whereas other found no differences.

THE PRESENT STUDY

The amount of studies concerning recreational or amateur golfers is significant, only few studies included a sample of professional golfers. This is unfortunate because psychological training for peak performance interests high-level competitors. Hence research is needed on that population. Several sets of factors have been distinguished in the literature: motivational factors, emotional factors and coping strategies. However, even the integrative studies fail to combine these three categories of factors to better understand psychological functioning and to predict golf performance.

This study has three purposes: (1) to provide descriptive data on a population poorly explored: professional golfers; (2) to study differences between players who competed for the whole tournament and players who were excluded after two days of competition; and (3) to investigate possible psychological predictors of golf performance. We conducted a study on 41 male professional golfers. Based on previous studies, several motivational variables (achievement goals, perceived competence), emotional reactions (pre-competitive state anxiety) and coping strategies (relaxation, imagery, emotional control, attentional control, negative thoughts and self-talk) were assessed the day before an important competition. The relationships of these variables with two performance indicators (cut success, final ranking) were subsequently examined.

The motivational factors, we expected that the best golfers would present higher mastery-approach and performance-approach goal, higher perceived competence and would present higher use of coping strategies, in particular

attentional control, self-talk and imagery. Eventually we anticipated that the best golfers would display lower somatic and cognitive anxiety and higher self-confidence.

METHOD AND PARTICIPANTS OF GOLFERS

Forty-one male professional golfers (M_{age} = 28.8, ± 5.75) volunteered for this study. These players had been professionals for 3.68 years (± 3.42) and practiced 30.9 hours (± 14.1) a week.

SEVERAL PSYCHOLOGICAL FACTORS OF GOLF PERFORMANCE

This study was part of a larger project in collaboration with the French Golf Federation. As the goal of the study was the examination of several psychological factors of golf performance and their consequences for professional golfers, we chose to focus on an important event: the Open of Bordeaux, which is the first stage of the French professional tour. This competition opened the season 2004 and lasted 4 days (i.e., 72 holes stroke play, 18 holes a day, cut after the second round). As it is the case for professional tournaments, the cut after two days of competition, which is a selection procedure, enabled the first 50 placed competitors to stay in the tournament, excluding the rest of them. In the present study we labelled "successful golfers" the players who made the cut and hence competed for the entire competition whereas the adjective "unsuccessful" was used for players eliminated after two days of competition. All the golfers were informed prior to the competition that they would be presented with a questionnaire on their attitudes during competition. Players were contacted the day prior the competition to fill out the questionnaire. They were informed that the questionnaire was not anonymous so that the data concerning their subsequent performance could be collected and that this information would only be accessible to the researchers of the study and treated consistently within the ethical guidelines of the university of the second author.

MEASURES

Achievement goals. A French version of the Achievement Goals Questionnaire for Sport, the "Approach and Avoidance Questionnaire in Sport and Physical Education" was used to assess situational achievement goals. Grounded on the 2 ´ 2 achievement goal framework, the scale consists of 12 items divided into 4 sub-scales: 3 items assessed mastery-approach goal (e.g., "It is important to me to perform as well as I possibly can"), mastery-avoidance goal (e.g., "I worry that I may not perform as well as I possibly can"), performance-approach goal (e.g., "It is important to me to do well compared to others"), performance-avoidance goal (e.g., "I just want to avoid performing worse than others"). Responses were indicated on a 7-point Likert-type scale ranging from (1) "not at all like me" to (7) "completely like me". Construct validity and reliability of this scale were supported in previous research using French or English samples.

Perceived competence. To assess perceived golfing ability, a questionnaire similar to the one developed by Nicholls and colleagues was used. Due to the length of the questionnaire, only two items of the scale were used in this study. ("When you are golfing and you compare yourself to most of the other golfers, you consider yourself..."; "I feel that my level in golf is…"). Responses were indicated on an 8-point scale ranging from (1) "very bad" to (8) "very good". This scale has already been used with French samples and has demonstrated good construct validity, internal consistency and predictive validity. The correlation between the two items was high (r =.68, p <.001), and the answers of the participants to these two items were averaged.

Performance strategies. The French version carried out by Debois, Quillet, Sylvestre, and Calmels of the Test of Performance Strategies was used. This 64-item questionnaire assesses 16 psychological skills and strategies used either in competition or during practice. In this study we retained only 6 dimensions of the competition setting. This selection was made in line with previous studies, which also chose to focus on the most commonly cited psychological strategies. Three items per variable were used to assess relaxation (e.g., "I am able to relax if I get too nervous at competition"), imagery (e.g., "I visualize successful past performances"), emotional control (e.g., "In competition my emotions prevent me from playing my best", inversed form), attentional control (e.g., "In competition, I am able to control my negative thoughts"), negative thoughts (e.g., "In competition, I have negative thoughts") and self-talk (e.g., "I talk positively to myself to get the most out of competition") strategies. Responses were indicated on a 7-point Likert-type scale ranging from (1) "never" to (7) "always".

This scale has been consistently used in the past and has demonstrated good psychometric properties. Thomas et al. reported Cronbach alpha coefficients ranging from.73 (attentional control) to.80 (self-talk) for the six dimensions used in the present study.

Emotional reactions. The French version of the "Competitive State Anxiety Inventory-2" was used. This 27-item scale is a self-report instrument designed to measure cognitive (9 items) and somatic (9 items) states of anxiety, as well as self-confidence (9 items). In this study 10 items were selected to assess the three dimensions: 3 items for cognitive state anxiety (e.g., "I am concerned about performing poorly"), 4 items for somatic state anxiety (e.g., ''I feel tense in my stomach'') and 3 items for state self-confidence (e.g., "I am confident about performing well"). This scale has been used with French samples and has demonstrated good construct validity, internal consistency and predictive validity.

Performance. The player's success/failure at the cut procedure served as the first performance indicator. His ranking at the end of the tournament was used as a second indication of his performance.

DESCRIPTIVE STATISTICS AND DATA ANALYSIS

Descriptive statistics were first performed. Analysis of variance was then used to investigate the differences between players who made the cut and players

who did not. Since there is no necessary relationship between the results of univariate and multivariate tests of the same hypothesis and since univariate *F* tests alone do not reflect the discriminating power that the variables may share, a discriminant analysis was also used as a means to see which variable(s) could discriminate the same two groups. Eventually, multiple regression analysis was used to predict players' ranking at the end of the tournament.

DESCRIPTIVE STATISTICS

Means, standard deviations and Cronbach alphas of all the variables assessed in this study. Alpha coefficients were in general satisfying, ranging from.59 to.95. Only mastery-approach goal presented a Cronbach coefficient of.32 and was therefore excluded from subsequent analysis. The correlation matrix between the studied variables.

DISCRIMINANT ANALYSIS OF PLAYERS

In order to discriminate between players who made the cut and players who failed to, we used discriminant analysis (DA). Due to the high number of variables with regard to the number of subjects we used a similar procedure to the one used by Highlen and Bennett. First, an overall DA using all 13 variables was conducted to obtain each subject's discriminant score. These scores were then correlated with each subjects' raw scores on each of the 13 variables. The choice of the variables to enter into the subsequent DA was determined by rank-order magnitude of these correlations. To meet the recommended 5:1 subject to variable ratio, only the top 8 variables were considered. This resulted in the introduction of the following variables: somatic and cognitive anxiety, attentional and emotional control, performance-approach goal, relaxation strategies, performance-avoidance goal and self-talk.

DA showed that the two groups could be distinguished significantly: Wilks ë =.55, ÷² (8) = 21.15, p <.01. The discriminant function had an eigenvalue of.83 and a canonical correlation of.67. Overall, 80.5% of the total sample could be correctly classified, which is superior to a random assignment based on prior group membership probabilities. Since in DA, loadings > |0.30| are considered to be substantial, the discriminant function represents six variables that substantially contribute to differentiating the two groups. Players who made the cut are characterized by higher performance-approach goal, somatic and cognitive anxiety, relaxation strategies and emotional control strategies. They also tended to have lower performance-avoidance goal.

REGRESSION ANALYSIS OF PREDICTING PERFORMANCE

Regression analysis was used to test whether variables that discriminated players who made from players who failed the cut could predict their ranking. The six variables that were significant in the DA were regressed on performance. The regression was significant: F (6, 34) = 8.28, p <.001, R² =.59. Cognitive anxiety (â =-.57, p <.001) and emotional control strategies (â =-.44, p <.05)

significantly predicted performance, relaxation strategies (â =-.28, p =.07) had a marginal significant effect. The higher the scores on those variables, the better was the performance.

DISCUSSION OF PERFORMANCE INDICATORS

The goal of this study was to provide information on an under-explored population: professional golfers. Players completed a questionnaire the day before the beginning of an official competition of the French professional tour. Performance indicators (i.e., cut success/failure, ranking) were then collected at the end of the competition. These variables were subsequently used to see which types of psychological characteristics were related to performance. An examination of the cut result on the variables assessed was first conducted. Discriminant function analysis was then used to examine which variables contributed the most to differentiate players who made the cut from those who failed to. Lastly, a regression analysis was used to predict players' ranking.

Investigating the cut effect revealed significant differences between players who competed for the whole tournament and players excluded after two days of competition. Most successful players presented higher scores on performance-approach goal, cognitive and somatic anxiety, emotional control and attentional control. The results of the discriminant function analysis revealed that six variables significantly discriminated successful from unsuccessful players. Successful players were characterized by higher scores on performance-approach goal, cognitive and somatic anxiety, relaxation strategies and emotional control strategies and lower score on performance-avoidance goal. Lastly, regression analysis highlighted three predictors of performance among the six variables identified in the discriminant function analysis. The more athletes presented high levels of cognitive anxiety, frequent use of relaxation strategies and strategies of emotional control, the better their performance was. This regression accounted for 59% of the variance of players' ranking.

With regard to motivational characteristics, the finding that the best performing players have higher performance-approach goal is consistent with our hypothesis, as well as with the achievement goal literature which posits that high level athletes present high scores on the performance-approach goal. Hence, trying to demonstrate his/her competence to others seems to constitute a powerful source of motivation for elite athletes. The results also show that the players excluded after two days of competition tended to have higher performance-avoidance goal. An excessive focus on avoiding the demonstration of normative incompetence seems to be inimical for performance, a result conform to achievement goal literature and a past study.

Conversely, the results concerning perceived competence are rather unexpected. This variable neither varied in relation to the cut success/failure nor discriminated those two groups. This is surprising because perceived competence is likely to affect the type of goal pursued by athletes, with high perceived competence related to performance-approach goal whereas low levels

of perceived competence are more associated with avoidance performance goal. It might be that our sample was quite homogenous since all the participants were professionals, and the instrument used was not appropriated to this population. Specific tools for elite athletes such as the one used by Marsh and Perry should be used in future studies. Moreover, Mallet and Hanrahan also stressed the mediator role of perceived competence in the motivational process, in understanding the type of motivation that energizes elite athletes. In our study, performance-approach and performance-avoidance goals significantly appeared although perceived competence did not. Hence it might be that performance goals vary in this study depending on other processes or variables.

Our results regarding anxiety do not support our hypothesis and are inconsistent with the golf literature since those studies generally failed to find a link between pre-competitive anxiety and performance. They are also rather inconsistent with studies on elite athletes' characteristics that either found no specific differences regarding anxiety between successful and less successful athletes or indicated lower levels of anxiety for the best athletes.

In the present study, players who made the cut were cognitively and somatically more anxious before the beginning of the competition. This result contradicts the MAH that propose an increase in cognitive anxiety is always deleterious for performance. They nevertheless support findings by Jokela and Hanin, by Hardy and by Hanton and Jones, who found that increases in cognitive anxiety did not necessarily lead to impaired performance. They are also in agreement with qualitative studies showing that among elite swimmers higher levels of anxiety could be related to higher performance if they interpreted the intensity of their anxiety symptoms as facilitative. One has to note that the mean scores of cognitive and somatic anxiety were not very high in our study, since the maximum value approximated 4 with a scale ranging from 1 to 7. The intensity of the most performing players is therefore only "moderate". Perhaps very good golfers do not want to feel too relaxed prior to performance and want to feel moderately worried, and interpret these symptoms as facilitative. Future studies should consider this eventuality by assessing both intensity and direction of anxiety.

The regarding self-confidence do not support our hypothesis and are not consistent with the existing literature. Nevertheless, the correlation (r =-.27, p =.09) between self-confidence and performance (i.e., players' ranking) is consistent with the literature although it does not reach significance. The size of our somewhat limited sample may explain why the correlation does not reach significance. Moreover, it might be that self-confidence does not discriminate successful and unsuccessful players because it is correlated with more proximal variables of performance, that are more powerful in this function.

CERTAIN PERFORMANCE STRATEGIES

Players who completed the cut selection also reported higher use of certain performance strategies. In particular, the best achievers in this competition used more relaxation strategies, attentional control and emotional control which is

consistent with our hypothesis. This result is of great interest and seems to indicate that even elite golfers are discriminated by the use of those strategies that could reflect better competencies to manage emotions and anxiety. Consistent results were found by Hanton and Jones with elite swimmers. Using in-depth interviews these authors demonstrated that elite swimmers used relaxation strategies (either physical or mental) as well as other forms of mental skills (i.e., internal focusing, thought and feeling control) that could be related to emotional control and relaxation strategies. Although the terms are labelled differently, Gould et al. in their study of Olympic champions also reported an ability to cope and control anxiety. The notion of "handling with distractors" proposed by Orlick and Partington also supports the competence of emotional and attentional control. In summary, although the terms are often different, previous studies on elite athletes support the findings of this study in relation to relaxation, attentional control and emotional control strategies.

Imagery, self-talk, and negative thoughts neither were found to discriminate successful and unsuccessful players nor predicted performance. For negative thoughts this may be due to the selection procedure in the discriminant analysis because its correlation with performance is consistent with our prediction and indicates that less presence of negative thoughts is associated with better performance. This is in line with previous studies. For imagery strategies and self-talk, the results do not support previous findings. As proposed above, this might be due to shared variance with other strategies more correlated with performance: once the effects of these strategies are controlled, the influence of imagery and self-talk cannot explain more variance. However, the relatively high score of the players (respectively 5.14 and 5.25 for imagery and self-talk on a scale ranging from 1 to 7) indicate a rather frequent use of these strategies consistently with other studies on elite athletes.

Due to the design of the study, some limitations have to be mentioned. The goal of the study was to focus on a population that is difficult to explore: professional golf players. Although we managed to access this under-explored population, the sample size is somewhat limited, from a statistical point of view, and therefore the results must be interpreted cautiously. Secondly, we used a cross-sectional design that did not enable us to shed light on the consequences of goal performance. A field study using a longitudinal design should be used in the future. Another limitation concerns the absence of a variable in this study: mastery-approach goal. Although it was assessed, the low internal consistency observed resulted in its exclusion from subsequent analysis. This was unfortunate because some studies propose that elite athletes are motivated both by performance-approach and mastery-approach goals, a result we were unable to replicate. Similarly, it was decided not to use all the dimensions assessed by the Test of Performance Strategies, to keep the length of the questionnaire reasonable. Hence, dimensions such as goal setting, automaticity or practice strategies were not assessed. Lastly, some dimensions presented low internal consistencies and therefore some results have to be interpreted cautiously.

The best achievers can be discriminated from lower achievers on the basis of their psychological characteristics. Our results indicate that most successful athletes were more cognitively and somatically anxious, used more frequently relaxation strategies, attentional control and emotional control and pursued more performance-approach goal and less performance-avoidance goal. It was also found that 59% of the variance of players' ranking could be explained by some of these psychological factors. It appears that anxiety could be beneficial for performance to the extent that players possess the competencies to manage the affects related to this anxiety. In terms of application, this result contributes to the identification of the most efficient mental skills.

5

Elements of Environment Management

The following is a comprehensive list of elements of the environment that are authorized by the State Environmental Policy Act for potential analysis in an environmental impact statement. The first major step in the EIS process is Scoping. The intent of Scoping is to create a concise EIS that only addresses the key environmental issues. The purpose of scoping, as outlined in the SEPA regulations, is to narrow the focus of the EIS to just address "probable significant adverse impacts and reasonable alternatives."

Preliminary review of the North/East Cities Regional Municipal Jail proposal and alternatives indicates that those environmental elements highlighted below could be considered for analysis in the Draft EIS. After reviewing comments received during Scoping, the Lead Agency will determine the final scope of the EIS.

Earth:

- Geology
- Soils
- Topography
- Unique physical features
- Erosion/enlargement of land area

Air:

- Air quality
- Odour
- Climate

Water:

- Surface water movement/quantity/quality
- Run-off/absorption

- Floods
- Groundwater movement-quantity/quality
- Public water supplies

Plants and Animals:

- Habitat for/numbers of/diversity of species
- Unique species
- Fish or wildlife migration routes

Energy and Natural Resources:

- Amount required/rate of use/efficiency
- Source/availability
- Non-renewable resources
- Conservation and renewable resources

Environmental Health:

- Noise
- Risk of explosion
- Releases or potential releases to the environment affecting public health

Land and Shoreline Use:

- Land use patterns
- Relationship to existing land use plans, policies, and regulations

Population and Housing:

- Population
- Housing

Light and Glare:

- Light
  Glare

Aesthetics:

- Aesthetics

Recreation:

- Recreation

HISTORIC AND CULTURAL PRESERVATION

- Historic resources
- Cultural resources

Agricultural Crops:

- Agricultural crops

Transportation:

- Transportation systems
- Vehicular trips
- Waterborne, rail, and air traffic
- Parking
- Movement/circulation of people or goods
- Traffic hazards

Public Services and Utilities:

- Fire
- Police

- Schools
- Parks or other recreational facilities
- Maintenance
- Communications
- Water
- Stormwater
- Sewer
- Solid waste
- Other governmental services or utilities

ATMOSPHERE

The atmosphere of Earth is a layer of gases surrounding the planet Earth that is retained by Earth's gravity. The atmosphere protects life on Earth by absorbing ultraviolet solar radiation, warming the surface through heat retention, and reducing temperature extremes between day and night.

Dry air contains roughly 78.09 per cent nitrogen, 20.95 per cent oxygen, 0.93 per cent argon, 0.039 per cent carbon dioxide, and small amounts of other gases.

Air also contains a variable amount of water vapour, on average around 1 per cent. The atmosphere has a mass of about 5×10^{18} kg, three quarters of which is within about 11 km of the surface. The atmosphere becomes thinner and thinner with increasing altitude, with no definite boundary between the atmosphere and outer space. An altitude of 120 km is where atmospheric effects become noticeable during atmospheric reentry of spacecraft. The Kármán line, at 100 km also is often regarded as the boundary between atmosphere and outer space.

Composition

Air is mainly composed of nitrogen, oxygen, and argon, which together constitute the major gases of the atmosphere. The remaining gases are often referred to as trace gases, among which are the greenhouse gases such as water vapour, carbon dioxide, methane, nitrous oxide, and ozone. Filtered air includes trace amounts of many other chemical compounds. Many natural substances may be present in tiny amounts in an unfiltered air sample, including dust, pollen and spores, sea spray, and volcanic ash. Various industrial pollutants also may be present, such as chlorine, fluorine compounds, elemental mercury, and sulphur compounds such as sulphur dioxide.

Table. Composition of Dry Atmosphere, by Volume

Gas	Volume
Nitrogen (N_2)	780,840 ppmv (78.084%)
Oxygen (O_2)	209,460 ppmv (20.946%)
Argon (Ar)	9,340 ppmv (0.9340%)
Carbon dioxide (CO_2)	390 ppmv (0.039%)

Neon (Ne)	18.18 ppmv (0.001818%)
Helium (He)	5.24 ppmv (0.000524%)
Methane (CH_4)	1.79 ppmv (0.000179%)
Krypton (Kr)	1.14 ppmv (0.000114%)
Hydrogen (H_2)	0.55 ppmv (0.000055%)
Nitrous oxide (N_2O)	0.3 ppmv (0.00003%)
Carbon monoxide (CO)	0.1 ppmv (0.00001%)
Xenon (Xe)	0.09 ppmv (9×10^{-6}%) (0.000009%)
Ozone (O_3)	0.0 to 0.07 ppmv (0 to 7×10^{-6}%)
Nitrogen dioxide (NO_2)	0.02 ppmv (2×10^{-6}%) (0.000002%)
Iodine (I)	0.01 ppmv (1×10^{-6}%) (0.000001%)
Ammonia (NH_3)	Trace
Not included in above dry atmosphere:	
Water vapour (H_2O)	~0.40% over full atmosphere, typically 1%- 4% at surface

STRUCTURE OF THE ATMOSPHERE

Principal Layers

Earth's atmosphere can be divided into five main layers. These layers are mainly determined by whether temperature increases or decreases with altitude.

From highest to lowest, these layers are:

- *Exosphere*: The outermost layer of Earth's atmosphere extends from the exobase upward. Here the particles are so far apart that they can travel hundreds of kilometres without colliding with one another. Since the particles rarely collide, the atmosphere no longer behaves like a fluid. These free-moving particles follow ballistic trajectories and may migrate into and out of the magnetosphere or the solar wind. The exosphere is mainly composed of hydrogen and helium.
- *Thermosphere*: Temperature increases with height in the thermosphere from the mesopause up to the thermopause, then is constant with height. The temperature of this layer can rise to 1,500 °C, though the gas molecules are so far apart that temperature in the usual sense is not well defined. The International Space Station orbits in this layer, between 320 and 380 km. The top of the thermosphere is the bottom of the exosphere, called the exobase. Its height varies with solar activity and ranges from about 350-800 km.
- *Mesosphere*: The mesosphere extends from the stratopause to 80-85 km. It is the layer where most meteors burn up upon entering the atmosphere. Temperature decreases with height in the mesosphere. The mesopause, the temperature minimum that marks the top of the mesosphere, is the coldest place on Earth and has an average temperature around –85 °C.

Due to the cold temperature of the mesophere, water vapour is frozen, forming ice clouds. A type of lightning referred to as either sprites or ELVES, form many miles above thunderclouds in the troposphere.

- *Stratosphere*: The stratosphere extends from the tropopause to about 51 km. Temperature increases with height, which restricts turbulence and mixing. The stratopause, which is the boundary between the stratosphere and mesosphere, typically is at 50 to 55 km. The pressure here is 1/1000th sea level.
- *Troposphere*: The troposphere begins at the surface and extends to between 7 km at the poles and 17 km at the equator, with some variation due to weather. The troposphere is mostly heated by transfer of energy from the surface, so on average the lowest part of the troposphere is warmest and temperature decreases with altitude. This promotes vertical mixing. The troposphere contains roughly 80 per cent of the mass of the atmosphere. The tropopause is the boundary between the troposphere and stratosphere.

Other Layers

Within the five principal layers determined by temperature are several layers determined by other properties:

- The ozone layer is contained within the stratosphere. In this layer ozone concentrations are about 2 to 8 parts per million, which is much higher than in the lower atmosphere but still very small compared to the main components of the atmosphere. It is mainly located in the lower portion of the stratosphere from about 15-35 km, though the thickness varies seasonally and geographically. About 90 per cent of the ozone in our atmosphere is contained in the stratosphere.
- The ionosphere, the part of the atmosphere that is ionized by solar radiation, stretches from 50 to 1,000 km and typically overlaps both the exosphere and the thermosphere. It forms the inner edge of the magnetosphere. It has practical importance because it influences, for example, radio propagation on the Earth. It is responsible for auroras.
- The homosphere and heterosphere are defined by whether the atmospheric gases are well mixed. In the homosphere the chemical composition of the atmosphere does not depend on molecular weight because the gases are mixed by turbulence. The homosphere includes the troposphere, stratosphere, and mesosphere. The turbopause at about 100 km, the composition varies with altitude. This is because the distance that particles can move without colliding with one another is large compared with the size of motions that cause mixing. This allows the gases to stratify by molecular weight, with the heavier ones such as oxygen and nitrogen present only near the bottom of the heterosphere. The upper part of the heterosphere is composed almost completely of hydrogen, the lightest element.

- The planetary boundary layer is the part of the troposphere that is nearest the Earth's surface and is directly affected by it, mainly through turbulent diffusion. During the day the planetary boundary layer usually is well-mixed, while at night it becomes stably stratified with weak or intermittent mixing. The depth of the planetary boundary layer ranges from as little as about 100 m on clear, calm nights to 3000 m or more during the afternoon in dry regions.

The average temperature of the atmosphere at the surface of Earth is 14 °C or 15 °C, depending on the reference.

PHYSICAL PROPERTIES

Pressure and Thickness

The average atmospheric pressure at sea level is about 1 atmosphere (atm) = 101.3 kPa (kilopascals) = 14.7 psi (pounds per square inch) = 760 torr = 29.9 inches of mercury (symbol Hg). Total atmospheric mass is 5.1480×10^{18} kg (1.135×10^{19} lb), about 2.5 per cent less than would be inferred naively from the average sea level pressure and the Earth's area of 51007.2 megahectares, this defect having been displaced by the Earth's mountainous terrain. Atmospheric pressure is the total weight of the air above unit area at the point where the pressure is measured.

Thus air pressure varies with location and time, because the amount of air above the Earth's surface varies.

If atmospheric density were to remain constant with height the atmosphere would terminate abruptly at 8.50 km. Instead, density decreases with height, dropping by 50 per cent at an altitude of about 5.6 km. As a result the pressure decrease is approximately exponential with height, so that pressure decreases by a factor of two approximately every 5.6 km and by a factor of e = 2.718… approximately every 7.64 km, the latter being the average scale height of Earth's atmosphere below 70 km.

However, because of changes in temperature, average molecular weight, and gravity throughout the atmospheric column, the dependence of atmospheric pressure on altitude is modeled by separate equations. Even in the exosphere, the atmosphere is still present. This can be seen by the effects of atmospheric drag on satellites.

However, the following published data are given for reference:

- 50 per cent of the atmosphere by mass is below an altitude of 5.6 km.
- 90 per cent of the atmosphere by mass is below an altitude of 16 km. The common altitude of commercial airliners is about 10 km and Mt. Everest's summit is 8,848 m above sea level.
- 99.99997 per cent of the atmosphere by mass is below 100 km, although in the rarefied region above this there are auroras and other atmospheric effects. The highest X-15 plane flight in 1963 reached an altitude of 108.0 km.

Density and Mzass

The density of air at sea level is about 1.2 kg/m^3. Density is not measured directly but is calculated from measurements of temperature, pressure and humidity using the equation of state for air. Atmospheric density decreases as the altitude increases. This variation can be approximately modeled using the barometric formula. More sophisticated models are used to predict orbital decay of satellites.

The average mass of the atmosphere is about 5 quadrillion tonnes or 1/ 1,200,000 the mass of Earth. According to the National Centre for Atmospheric Research, "The total mean mass of the atmosphere is 5.1480×10^{18} kg with an annual range due to water vapour of 1.2 or 1.5×10^{15} kg depending on whether surface pressure or water vapour data are used; somewhat smaller than the previous estimate. The mean mass of water vapour is estimated as 1.27×10^{16} kg and the dry air mass as $5.1352 \pm 0.0003 \times 10^{18}$ kg."

Optical Properties

Solar radiation is the energy the Earth receives from the Sun. The Earth also emits radiation back into space, but at longer wavelengths that we cannot see. Part of the incoming and emitted radiation is absorbed or reflected by the atmosphere.

Scattering

When light passes through our atmosphere, photons interact with it through scattering. If the light does not interact with the atmosphere, it is called direct radiation and is what you see if you were to look directly at the Sun. Indirect radiation is light that has been scattered in the atmosphere. For example, on an overcast day when you cannot see your shadow there is no direct radiation reaching you, it has all been scattered. As another example, due to a phenomenon called Rayleigh scattering, shorter wavelengths scatter more easily than longer wavelengths. This is why the sky looks blue, you are seeing scattered blue light. This is also why sunsets are red. Because the Sun is close to the horizon, the Sun's rays pass through more atmosphere than normal to reach your eye. Much of the blue light has been scattered out, leaving the red light in a sunset.

Absorption

Different molecules absorb different wavelengths of radiation. For example, O_2 and O_3 absorb almost all wavelengths shorter than 300 nanometres. Water absorbs many wavelengths above 700 nm. When a molecule absorbs a photon, it increases the energy of the molecule.

We can think of this as heating the atmosphere, but the atmosphere also cools by emitting radiation. The combined absorption spectra of the gases in the atmosphere leave "windows" of low opacity, allowing the transmission of only certain bands of light. The optical window runs from around 300 nm up

into the range humans can see, the visible spectrum, at roughly 400-700 nm and continues to the infrared to around 1100 nm. There are also infrared and radio windows that transmit some infrared and radio waves at longer wavelengths. For example, the radio window runs from about one centimetre to about eleven-metre waves.

Emission

Emission is the opposite of absorption, it is when an object emits radiation. Objects tend to emit amounts and wavelengths of radiation depending on their "black body" emission curves, therefore hotter objects tend to emit more radiation, with shorter wavelengths. Colder objects emit less radiation, with longer wavelengths. For example, the Sun is approximately 6,000 K, its radiation peaks near 500 nm, and is visible to the human eye.

The Earth is approximately 290 K, so its radiation peaks near 10,000 nm, and is much too long to be visible to humans. Because of its temperature, the atmosphere emits infrared radiation. For example, on clear nights the Earth's surface cools down faster than on cloudy nights. This is because clouds are strong absorbers and emitters of infrared radiation. This is also why it becomes colder at night at higher elevations. The atmosphere acts as a "blanket" to limit the amount of radiation the Earth loses into space.

The greenhouse effect is directly related to this absorption and emission effect. Some chemicals in the atmosphere absorb and emit infrared radiation, but do not interact with sunlight in the visible spectrum. Common examples of these chemicals are CO_2 and H_2O. If there are too much of these greenhouse gases, sunlight heats the Earth's surface, but the gases block the infrared radiation from exiting back to space. This imbalance causes the Earth to warm, and thus climate change.

Refractive Index

The refractive index of air is close to, but just greater than 1. Systematic variations in refractive index can lead to the bending of light rays over long optical paths. One example is that, under some circumstances, observers onboard ships can see other vessels just over the horizon because light is refracted in the same direction as the curvature of the Earth's surface. The refractive index of air depends on temperature, giving rise to refraction effects when the temperature gradient is large. An example of such effects is the mirage.

Circulation

Atmospheric circulation is the large-scale movement of air, and the means by which heat is distributed around the Earth. The large-scale structure of the atmospheric circulation varies from year to year, but the basic structure remains fairly constant as it is determined by the Earth's rotation rate and the difference in solar radiation between the equator and poles.

APPROACH TO STUDYING ENVIRONMENTAL MANAGEMENT

A fruitful approach to studying environmental management is the analysis of industry-government relationships. Policy is defined and translated into action in this context. We find that industrial managers legitimize government regulation of industrial water use. However, the pattern of responses suggests that some of the support may be based on economic self-interest and industry's ability to control agency action. Managers legitimize a policy-setting role for federal agencies and an enforcement role for local and state government. Across the Asian region, natural resource exploitation is accelerating dramatically as countries, cities and small communities are ever more incorporated into the global economy.

Economic reform programmes that favour domestic and global market expansion rather than a social welfare agenda, policy responses to climate change, pressures associated with population growth and intensified geographical mobility, and urbanization and commoditization, are reconfiguring patterns of natural resource use and governance at both a national and local level and are having complex effects on peoples' lives. These processes are themselves not innocent of gendered power relations: they are inflected with gender discourses that set in motion differentiated and unjust life opportunities and exclusions.

At the same time, sustainable development policy initiatives that seek to ameliorate environmental degradation and its negative livelihood effects not only bring gendered impacts and responses, they also work through and produce particular framings of gender and gendered power relations. The impact of this is apparent in the unintended consequences associated with sustainable development initiatives that target women as a homogeneous and undifferentiated social category, at times exacerbating social and gender injustices. Related to this process of globalized marketization, natural resource management is embedded in the increasing diversification of livelihoods: a process buoyed by policies that support entrepreneurialism and appear to be producing individualized portfolio livelihood strategies across Asia.

ENVIRONMENTAL IMPACT OF SCIENCE AND TECHNOLOGY

The life support systems and non-renewable resources on the Earth are being decimated by a burgeoning population which possesses unprecedented power born of science and technology. The impact of technology on the environment has in many ways been devastating. Yet science and technology have also been the greatest forces for beneficient social change in human history and will continue to be needed Lo solve the economic and social problems of the future. Since the future lies in the hands of our youth we must educate them to cope with its environmental problems.

The damage already done to the environment is so great that all education and especially education in science must become imbued with an environmental

ethic to reverse the present trend. It is noticed that the solution does not lie in adding environmental ethics courses to the science curriculum but in finding ways to allow ecological and environmental concerns to permeate existing courses and textbooks. This could have the added advantage of making them more relevant and interesting. The environmental ethic must guide all aspects of our lives and will also have to be taught by example outside of formal education.

"How, should the science curriculum be structured and science teaching organized so as to give insights into the ecological and environmental impact of technology in modern society and instill in young people a feeling of global responsibility?" This is the charge to which this chapter is addressed.

In response we shall consider the ecological problems that confront humanity and how they are related to science and technology. We will give some examples of how to incorporate environmental concerns into basic science courses to achieve not only an awareness of the impact of science and technology but also a motivation on the part of young people to participate in revitalizing the Earth's environment. Introduction of the environmental dimension could, at the very least, make science courses more relevant and interesting.

The Problem: an Earth in Crisis

It has been noticed that the environment is in crisis. All around us it is suffocating and crumbling under the impact of human action. The Worldwatch Institute states: "Our generation is the first to be faced with decisions that will determine whether the Earth our children inherit will be habitable.

Recital of the major trends has become a litany: the altering of the Earth's asphere by the burning of fossil fuels, the destruction of the protective ozone layer by man-made chemicals, the depletion of tropical rain forests, the extinction of plant and animal species, the spread of deserts, the acid poisoning of lakes and forests, the toxification of air, soil and water and the continuing nuclear threat. Concern for the Earth, which found massive expression in the first Earth Day 20 years ago, has been raised to a new level of public awareness by the media.

To cite just two examples, Time magazine recently broke from its tradition of celebrating a—Man of the Year— by choosing instead the Earth as—Planet of the Year— and—National Geographic— devoted its last issue in 1988 to the topic of mending the Earth. Its cover was a hologram showing the Earth both whole and shatred.

During the past 20 years countless individuals and organizations, large and small, have worked quietly and incessantly towards conservation and ecological sanity to bring about a heightened interest in and concern for a life-sustaining Earth.

Our task as science educators is twofold. One is to clarify the role that science and technology have had in disrupting the Earth's ability to sustain life and the other is to motivate students to use their knowledge, including that of science and technology, to restore the Earth's environment.

Four Related Problems

It now seems clear that the disruption of the ecological balance in the biosphere is due to the impact of—homo sapiens—the culprit species. All the trends mentioned have their origin in human activities. It is no wonder, then, that most of them are exacerbated by the explosive growth of human populations.

A child born today has 5,000 million neighbours. At age 35 they will, according to present projections, number about 10,000 million and close to 20,000 million at age 70. The burgeoning population problem is probably the most serious of the four so-called Ps:—population, pollution, poverty— and the—proliferation— of weapons of mass destruction-chemical, biological and nuclear. A not unique example of the interaction of the first three is to be found in Mexico.

The close to 20 million population of Mexico City, exceeding that of the entire continent of Australia, has a fossil fuel pollution problem that often turns day into night and poverty which belies the fact that Mexico is rich in natural resources, The proliferation of weapons of mass destruction also poses a serious threat to the biosphere. A nuclear holocaust must, of course, be avoided at all costs inasmuch as it represents the ultimate environmental catastrophe but the other weapons of mass destruction-chemical and biological-also pose massive environmental threats. It seems ironic that these weapons bear the imprint and the titles of the three basic sciences: physics, chemistry and biology.

Even preparations for conventional war leave ecological scars on the Earth. In a Sierra Club publication titled—Air, Water, Earth, Fire-The Impact of the Military on World Environmental Order— it says: "We should have been alarmed long ago.

It is a sad commentary on our powers of foresight that we did not understand sooner that the shadow of Armageddon hovers over mankind." The list of problems could easily be extended beyond the four Ps but they give us aeasily remembered combination of environmentally related global woes and their common characteristics: they are all interrelated, they all have an impact on the environment and they all tend to deteriorate the quality of life. In varying degrees they are the byproducts of technology.

ENVIRONMENTAL EDUCATION VERSUS ENVIRONMENTAL MANAGEMENT

The relationship between environmental education and management presents a dilemma. The dilemma is whether greater emphasis should be placed globally on environmental education (information, the raising of awareness of these issues) or on environmental management (regulating practices, providing the resources to meet objectives, and ensuring norms are respected).

At the heart lies the problem of attributing responsibilities: Responsibility lies either with the people, the residents as individuals, or with society as a facilitating or impeding structure of behaviours and the authorities as establishers of norms and controllers.

However, the dilemma is false since both levels share the responsibilities, and, therefore, both are necessary and complementary. Furthermore, as Corraliza points out, an environmental management that adequately considers the psychological processes involved in the changes of attitude and behaviour required of the residents is in itself a tool for education to advance towards sustainability.

CRITICISMS MADE OF SUSTAINABLE DEVELOPMENT

The concept of sustainable development is not exempt from criticism. One criticism can be summarised in the fact that the Brundtland Report offers only technocratic solutions that in the medium term are not sustainable, whereas the best solutions would preserve the self-sufficiency of the world's regions.

The solution is not provided by growing more but rather by redistributing resources and technology more equitably, respecting the local forms of production adapted to the capacity of the ecosystem. Milbrath identifies the problem as lying within the current system of beliefs of the "dominant social paradigm." Corson recommends that environmental awareness programmes be intensified while social and political injustices should be reduced.

ENVIRONMENTAL MANAGEMENT AND THE ROLE OF THE PSYCHOLOGIST

Environmental intervention can be defined as any change in the physical structures of a place that, directly or indirectly, causes an alteration in the ecosystem, the social structure, or the social interaction of the population—in other words, an environmental impact (including the natural and built environments). It may be a spontaneous or a planned action. This change might be the result of direct action on the environment and population— whether by strengthening, inhibiting, or altering forms of social relations—that in the final instance will change the forms of interaction with the ecosystem. Every intervention is managed, by action or omission.

Thus, management can be conducted with awareness of the environment or by giving priority to other interests and values. *Environmental management* can be defined as the management process that incorporates the values of sustainable development in the corporate aims of the firm or mission of the government agency. EM integrates programmes and practices that respect the environment in a process that seeks to constantly improve its management. Environmental management entails educating, teaching, and motivating both the employees and the community to adopt the values of environmentalism and sustainability. It seeks the development of products and services with the smallest possible impact on the environment.

Moreover, it seeks the highest degree of eco-efficiency and applies the best and cleanest technologies available. It also seeks the reduction of energy consumption and use of raw materials and non-renewable resources, that is, an improvement in efficiency. It places a premium on minimizing waste, recycling,

reusing, and eventually disposing unavoidable waste in a way that poses no threat to the environment. EM seeks transparency at all times in its undertakings, with an emphasis on dialogue, participation, and control by the social groups that are directly or indirectly affected and residents in general.

EM requires frameworks and information concerning the initial situation with which it has to deal and the acceptable range of possibilities. Concerning the physical environment, the parameters are usually fixed by specific legislation or by the carrying capacity of an ecosystem that provide guidelines such as those for acceptable levels of carbon dioxide or nitrogen oxide.. The social frameworks are typically much more fuzzy, varied, and determined by the history and the specific context of the place of intervention. Frequently, it is argued that the only valid frame of reference for evaluating a social impact is the community potentially involved.

THE ROLE OF THE ENVIRONMENTAL PSYCHOLOGIST IN EM

No environmental problem, nor any social problem, has just one solution. Such problems have several feasible solutions. The solution chosen depends on the effects sought and the framework that has been established. In this context, the role of the environmental psychologist, in common with that of any other technical expert in environmental intervention or management, is not to make decisions on his or her own. Rather his or her role is to make available to the client (policy maker, industrialist, manager, consultant, trade union, non-governmental organisation NGO, etc.) his or her expertise in analysing the reality and proposing actions aimed at meeting the objective proposed (whether intervention for no change or conservation).

The final decision lies with the policy maker, who must draw on the proposals of the technical expert and act in line with a previously established policy and explicit or implicit values and with a thorough technical understanding of the problem that includes a transdisciplinary analysis and construction of proposed solutions. The environmental psychologist in her or his role as a citizen can act as an environmental activist and apply her or his knowledge within this framework.

However, the most typical intervention of the psychologist in EM arises when an environmental policy has already been explicitly established (for example, the National Environmental Protection Act [NEPA] in the United States and the Environmental Action Programmes in the European Union and the legislation derived from these). This context defines various opportunities for professional action that we may classify as four types of organisations working within the field of environmental protection.

- *NGOs, green parties, residents associations, and the like.* Environmental psychologists working within EM might collaborate as experts through organisations that seek environmental change. They might apply their professional expertise in seeking a change in the environmental values, attitudes, and behaviours of residents. Also, environmental psychologists

might supervise or place pressure on firms or public institutions to change their environmental policies and even the laws and regulations governing the environment.

- *Environmental consultancy:* In this framework, the psychologist (based on social and psychological background) assesses, evaluates, and proposes environmental actions and strategies linked in most cases with the prototypical tools of environmental management, including environmental impact assessments, environmental auditing, environmental certificates, and so forth. In this context, the psychologist also analyses, proposes, and assesses processes of communication and environmental participation that are always present in EM.
- *A company's environmental department:* In this case the psychologist usually forms part of the human resources management team and is concerned with environmental behaviour, internal processes of communication, community relations, environmental training, organisational culture, management of organisational change in the introduction of environmental management systems, and so forth.
- *Government agencies:* The work of the environmental psychologist is determined by the three roles played by public administration:
- The government agency is the *responsible body* for the control of firms' environmental action (industrial permits, environmental impact assessment, environmental certificates to companies or their products, etc.).
- The governmental body applies *its own environmental management* in those areas over which it has jurisdiction (establishment of environmental policies at the national, regional, and local levels; regional planning; management of natural spaces; energy policy and management of waste; transport; application of a local Agenda 21, etc.).
- Yet at the same time, the government agencies are also *organisations* and as such can possess their own environmental management system that has the right to be recognised or accredited (via International Organisation for Standardisation [ISO] 14000, for example).

The interactions between the different levels of responsibility in the processes of intervention and management and between organisations and government agencies. Private firms applying systems of environmental management and the most common tools interact with government agencies insofar as the latter are the relevant bodies exercising control. Yet this interaction, which takes place at the same time as the carrying out of the duties that are specific to each firm or government agency, always depends on the characteristics and specific nature of the place and the culture of the community.

This gives special importance to the individual and social dimensions, areas in which environmental psychology has developed its own background. In any case, as Oskamp warns in referring to R. Miller, social scientists have to be careful not to promise too much or to make hasty recommendations for public policies that oversimplify the problem. Each intervention, each policy, interacts

with countless other variables. It is the context of each intervention that allows us to assess success or failure based on the other variables and synergies that are operational.

MANAGEMENT AND ENVIRONMENTAL MANAGEMENT SYSTEMS: THE ISO 14000

An EMS, according to the definition provided by ISO 14000, is that part of the general management system of an organisation comprising the organisational structure, responsibilities, practices, procedures, processes, and resources that determine and dictate the implementation of its environmental policy. The introduction of an EMS within an organisation represents a significant change.

Optimising the technological, productive, and management processes frequently requires the restructuring of the organisation chart, changes in the places of work, a change of habits, establishment of "best practices," and, therefore, the education and training of the personnel.

There are many studies that, for example, following an analysis of environmental management in the chemical industries or the management of forests, conclude that the adoption of environmental management systems should always be based on basic changes in the organisational culture. Furthermore, EMS needs to pay particular attention to strategies of communication and the dissemination of information. EMS requires that all members of the organisation adopt and identify with the values of sustainability, explicit in the establishment of the Environmental Policy, in a public declaration. However, given the nature of these principles, this is not something that can be attained with information alone (what was called "management by instruction"); neither can it be an objective in itself, which can be attained simply by "management of objectives."

In criticizing the ISO 14000 system, Moxen and Strachan highlight the need to convert it into a system based on wider participation and geared better to establish the objectives. The model of "management by values" would appear to be more closely in line with the proposals of EMS. Management by values is centered more on the development of principles and values than on changes of the organisation chart or on the transmission of technological knowledge. EMS requires the involvement of those responsible for different areas of the organisation as well as of all of the personnel who develop activities with environmental effects. As many of the policies of the EMS must be registered in the *Manual of EM,* they must define the *Environmental Objectives* that should include a commitment to continuous improvement.

Of these objectives, some environmental goals must be defined as detailed performance requirements that must be quantifiable and reachable. The *Environmental Programme* must specify the means to achieve the objectives and the environmental goals. It must include the schedule, the assignment of responsibilities inside the organisation, and the adopted means foreseen to reach the fixed objectives. Finally, the *Programme of Environmental Audits* will settle down to evaluate, in a systematic way, the concordance of the EMS with the

environmental policy of the company. Once proved and the effectiveness of the system and the fulfilment of the requirements have settled down in the norm, the next step is to apply for an *Accreditation System.* Obtaining an accreditation implies the recognition of the EMS goodness.

In other words, it means the successful implementation of the organisational structure, operative procedures, monitoring systems to assure the success of the environmental policy and its programme. There are two ways to obtain the accreditation, which have differences between them: the ISO 14000 and the EMAS.

United States law has been in discussion since 2000. In implementing and certifying an EMS, the ISO 14000 norms are the most widely adopted because of their international, rather than regional, nature. However, certain criticisms have been raised and various limitations identified. There is a significant gap between EMS theory and practice. The main obstacles to introduce an EMS are to be encountered within the organisation itself, because it requires internal changes, in addition to the relationships with external partners.

Moreover, the typical practice in the introduction of ISO 14000, because of the dominant organisational culture, encourages risk avoidance, places a premium on tradition and precedent, and discourages originality and creativity. ISO 14000 should be revised to incorporate a real participatory and more flexible system of management. In this sense, Klaver and Jonker say that organisations lag behind society. The shortage of trained personnel and errors in the management of human resources, the high financial costs of the certification systems and the uncertainty of the market profits are some of the main problems that act as obstacles to the introduction of an EMS.

Moreover, positive attitudes towards the environment are not always appropriately transferred to management. Firms have the perception that they do not cause any major environmental impacts, and they believe that customers are indifferent to environmental performance. Customers are the key driver for the adoption of an EMS, but legislation and the regulators are more important drivers for general environmental improvements. A more far-reaching criticism considers that the private nature of some regulatory programmes generates problems for equity, laws, and democracy because of its significant reshaping of domestic and international policy institutions. Despite the obstacles and criticisms, the introduction of an EMS is a step forward compared with the previous situation.

An example of this is that the EMS, designed originally for contaminating industries and those with a high environmental risk, is being extended to other productive sectors and services, including universities. In particular, universities have an amplifying effect since the future technical experts and managers are being trained there. More and more frequently, however, we hear about *integrated management* as a new approach that has put together environmental management systems, quality management, and the management of health and risk prevention at work. This already constitutes a common practice in some leading multinational firms.

ENVIRONMENTAL IMPACT ASSESSMENT

The EIA is the oldest tool for the preventive management of the environment. An EIA is performed on an industry, infrastructure, or service project before the authorisation is given for its construction. An EIA seeks to assess the effects that an industrial plant or service project might have on the environment, human welfare, and the cultural heritage and, where they are deemed necessary, to recommend corrective or preventive measures or compensation.

An EIA is an administrative procedure with a prescriptive nature for the authorisation of any intervention. EIAs are regulated by NEPA in the United States and by Directives 85/337/EEC and 97/11/EC in the European Union. In Wathern acts from all regions and their enforcement are reviewed. A distinction should be drawn between the environmental impact study and the environmental impact assessment. An EIS is the report produced following the analysis, detection, and description of the foreseeable effects linked or potentially linked to the installation or service project and should include proposals to minimize these effects.

The study should accompany the project that is to undergo the assessment. The EIA is the global decision process that the official agencies must apply in examining the project and the study of the environmental impact. The corresponding agency will undertake to make an environmental impact statement, will grant or refuse to grant its authorisation for the construction of the project, and if necessary will increase the preventive or compensatory measures. There are many methods for conducting an environmental impact study, but relatively few are sensitive enough to detect and assess social impacts. In a review of 110 studies subjected to EIAs in the United Kingdom, Glasson and Heaney found that social and economic impacts were considered in less than half of the projects, and this despite the fact that legislation usually considers, in an explicit manner, the effects on people and communities.

The main problem impeding the integration of human and social aspects in the studies of environmental impact is that the techniques employed for so doing have been found to be lacking in efficiency for social aspects. However, many methods have been proposed to do just this. Moreno and Pol briefly outline more than 40 different methods for social impact studies. One of the main difficulties affecting the techniques and methods employed is the definition of the aspects that should be taken into consideration.

The Interorganisational Committee on Guidelines and Principles for Social Impact Assessment in the United States lays down the guidelines as to what the social component of an EIA should contain. It defines *social impact* as the consequences for human populations of any action, either public or private, that alters the way in which people live, work, behave, relate to each other, and organise themselves to satisfy their needs and in general how they behave as members of society.

It presents a series of items for inclusion as well as the steps to take in drawing up an environmental impact study. Thus, a social impact study should be

concerned with: land use and the resources available to the community, the provision of essential services and how they might be affected, the impact on employment opportunities, the distribution of costs and profits, social relations, the quality of life, the subjective meanings that spaces might have, resources, and the effects that intervention might have. SISs have used *network systems and matrices*; methods of *numerical orientation*; *methods based on indicators and indices*; *checklists and questionnaires* and *methods of qualitative and participative orientation*. Another methodological revision and contribution on SIS may be found in the work of Finsterbusch and his team.

Useful tools, although complementary are the cartographic systems and computerised geographical information system that allow simulation models to be devised. Some local and national government agencies allow databases to be consulted in GIS format. For example, the Miramon project offers a large quantity of geographical information as well as data about human land uses of a small region, Catalonia, in Europe. On a larger scale, the Environmental Information Management System of the U.S., Environmental Protection Agency offers descriptive information, databases, projects, and spatial data. Environmental psychology has recorded significant experiences in its history such as the development of the environmental simulator at the University of California, Berkeley, directed at the beginning of the 1970s by Appleyard and Craik. A multimethod approach combining various forms of recording and processing data.

Flexible in its nature and adaptable to each social reality and project, it uses checklists, qualitative methods, indicators, and indexes in a format that is compatible with the technological and ecological dimensions of the EIA. The DIS/BCN includes a manual for conducting an initial social inventory and a protocol for detecting, assessing, and systematising social, cultural, and economic aspects susceptible to the effects of an intervention. It also includes a theoretical framework for the analysis and interpretation of its parameters and categories.

LIFE CYCLE ASSESSMENTS AND ECO-LABELS

A life cycle assessment is a management tool for evaluating specific products rather than the overall activity of an organisation. Its purpose is to evaluate and reduce the environmental impacts associated actually and potentially with the product while it is still in the design phase. It seeks to reduce consumption of raw materials and the impacts associated with their extraction and transport, substituting them with the subproducts of other industrial processes or recycling used products. It seeks to reduce and optimise the consumption of energy in the phases of industrial production and use of the product. It aims to reduce the volume and toxicity of the wastes produced.

Like the various national regulations, LCAs are standardised by ISO 14040. The human and social dimension of the LCA is linked in particular to the uses (those that are foreseen in the design stage as well as those that are not) to which the consumer puts the product and the adequate and inadequate forms of

disposal and/or elimination that is made of it. It should be borne in mind that there is a certain tendency towards the reuse of products (often out of a simple economic necessity and sometimes as a result of environmental awareness). The use of the product for secondary purposes not originally foreseen in its design is not always desirable and can have major environmental impacts. It is necessary to draw up a catalogue of possible secondary functions and uses and of eventual ways of disposal that should be avoided.

The role of the environmental psychologist in this case is to analyse, explain, and predict the uses and processes that intervene between the person and the product. The practical application of the LCA that follows the standards of ISO 14042 has been criticized for being biased towards the natural sciences, promoting corporate secrecy about emissions, and inhibiting or distorting innovation in LCA methods. Weidema argues for the need to understand the public's perception of a product's environmental impact and points out the uncertainties related with the product, the type of substitutions to which it will give rise in the market, and the habits that will undergo a change with the substitution of one product for another, and so forth—none of which is not easily obtained from quantitative data. Among other aims linked to eco-efficiency, the LCA is associated with the granting of eco-labels to identify those products that are environmentally friendly. The eco-labels are regulated by ISO 14020 and the specific laws of each country.

6

Environment in Achieving Health Fitness

Do you have the same eye and hair colour as many of your family members? The same thing can happen with diseases—they can be passed down from one family member to another. The way this happens is through genes, the genetic information that you get directly from your parents. In most cases, diseases or other problems do not have one single cause. They come from a combination of your genes, your choices, and your environment.

Mutations Cause Disease

Proteins do the work that builds the parts of your body and keeps it moving. When the genes that instruct the making of proteins have mutations and do not work properly, whole systems in the body can have problems. These upsets can be caused in a number of ways.

A new copy of your genes is made in every new cell that your body creates throughout your life. If those copies have mistakes, this can cause problems. For example, some gene changes can make you more likely to get cancer. Your environment can also directly cause changes to DNA inside your cells. For example, the sun damages DNA in the cells that are exposed to it, and if the damage goes unrepaired, these gene changes will be copied as your body creates new cells.

You might read about "a gene for" a condition. This is not quite right. When we describe genes that cause disease, we are really talking about a gene that has a genetic mutation. The gene should help create a normal, healthy state, but a mutation of that gene can cause problems. For example, everyone has a gene

called CFTR, but only people with a mutation in the CFTR gene have cystic fibrosis a genetic disease. The cell's system for making copies of genes is very good because it safeguards against many of the mistakes that are bound to happen as your body makes billions of new cells throughout your life. Even when your genes are not copied perfectly, they will usually still function correctly, or at least well enough that you will not notice a problem. Only a small number of mutations cause a genetic disorder. Sometimes, your body can repair the gene to help protect itself from disease. Mutations can sometimes even have a positive effect, such as resistance against disease, although this is rare.

ROLE OF GENETICS

Although there are many possible causes of human disease, family history is often one of the strongest risk factors for common disease complexes such as cancer, cardiovascular disease (CVD), diabetes, autoimmune disorders, and psychiatric illnesses. A person inherits a complete set of genes from each parent, as well as a vast array of cultural and socioeconomic experiences from his/her family. Family history is thought to be a good predictor of an individual's disease risk because family members most closely represent the unique genomic and environmental interactions that an individual experiences. Inherited genetic variation within families clearly contributes both directly and indirectly to the pathogenesis of disease.

Medical genetics is a young discipline. Its roots go back to around the middle of the 20th century, and it was formally recognized as a medical specialty in the United States only within the past decade. For most of its history, medical genetics has concerned itself with relatively rare single gene or chromosomal disorders—conditions that are very important to the families who must deal with them, but occupy little of the attention of most medical practitioners. With the elucidation of the human genome sequence and efforts to understand the links between the genome and human health, genetics is now a major driving force in medical research. It is clear that genetics is relevant to all aspects of medicine. Exciting predictions have been made,1 questions have been raised about the complexity of presymptomatic genetic diagnosis,2 and concerns have been raised about ethical implications of genetics in medical practice.

HEALTH-RELATED PHYSICAL FITNESS

The Definition of Physical Fitness is Relative: Definition of Physical Fitness is Ageless When you think of physical fitness you may think of athletic feats such as Lance Armstrong riding endlessly through the Swiss Alps.

Maybe you think of professional football players sprinting past their competition? You may even think of bodybuilders flexing their ripped muscles on stage.

What about the contortionists performing on stage bending their bodies as far as they can bend?

What about someone who is confined to a wheel chair? Do you think physical fitness means the same thing to them as it dos to you or a professional athlete?

THE POINT IS, PHYSICAL FITNESS VASTLY DIFFERS FROM PERSON TO PERSON

What you consider physically fit others may not. You may be proud of your 7 minute mile, but professional track stars would think it is slow. You may feel tremendously proud for your 200 pound bench press but a professional powerlifter would not be so happy.

Athletic feats are part of physical fitness but there is far more reasons why physical fitness is important. It is best to look at physical fitness as a hierarchy to attempt an accurate general definition.

Base Level: The base level of the physical fitness pyramid highlights the primary reason why physical fitness is important. This level of physical fitness directly relates to quality of life. A physically fit body has less chance of acute health problems and chronic disease.

The base level of physical fitness represents your ability to efficiently perform the anaerobic and aerobic activities of daily living (ADLs) which exist in your environment on a daily basis in addition to novel tasks which may arise during day to day living.

Mid Level: Only after your body has grown accustomed to the the base level of physical fitness you can advance to the mid level. The middle level of the pyramid is about adaptation and improvement.

Most people remain at the mid level for their entire lifetime as they adapt and progress only to regress and start the process over and over again.

In order to improve mid level physical fitness it is important to have a balanced exercise programme. Exercise selection should focus on all 5 components of fitness.

CONCEPT OF FITNESS

Benefits of Fitness

1. *There are many benefits:*
   a. Restful sleep.
   b. Nutritional health.
   c. Optimal body composition.
   d. Optimal bone density.
   e. Resistance to colds and other infectious diseases.
   f. Low risks of some types of cancer.
   g. Strong circulation and lung function.
   h. Low risk of cardiovascular disease.
   i. Low risk of type 2 diabetes.
   j. Reduced risk of gallbladder disease.
   k. Low incidence and severity of anxiety and depression.
   l. Promotes strong self-image
   m. Long life and high quality of life in the later years.

2. The *2008 Physical Activity Guidelines for Americans* state that people should avoid inactivity and stay physically active to promote health.
   a. Aerobic physical activity is necessary to obtain substantial health benefits.
   b. The duration of activity recommended is dependent on whether the activity is a moderate-intensity activity or a vigorous-intensity activity.

DEVELOPING FITNESS

1. Guidelines for conditioning that is achieved through training.
   a. Cardiorespiratory Endurance
      1. Frequency – 5-7 days per week.
      2. Intensity – moderate.
      3. Duration – at least 30 minutes.
   b. Strength
      1. Frequency – 2 or more nonconsecutive days per week.
      2. Intensity – enough to enhance muscle strength, enhance muscle endurance, and improve body composition.
      3. Duration – 8 to 12 repetitions of 8 to 10 different exercises.
   c. Flexibility
      1. Frequency – 2-3 days per week.
      2. Intensity – enough to develop and maintain a full range of motion.
      3. Duration – 4 repetitions of 10-30 seconds per muscle group.
2. The Overload Principle – to slightly increase comfortable capacity in each area. This is also called the progressive overload principle.
   a. Increase frequency – how often an activity is performed.
   b. Increase intensity – the degree of exertion while exercising.
   c. Increase duration – the length of time.
3. The Body's Response to Physical Activity
   a. Hypertrophy is muscle gain in size and strength, the result of repeated work.
   b. Atrophy is muscle loss in size and strength, the result of lack of activity.
   c. Other Tips
      1. Be active all week.
      2. Use proper equipment and attire.
      3. Use proper form when exercising.
      4. Include warm-ups and cool-downs.
      5. Challenge yourself, but not every time you exercise.
      6. Pay attention to body signals.
      7. Build intensity slowly.
4. Cautions on Starting a Fitness Programme
   a. Healthy people can start with a moderate exercise programme without seeking medical advise first.
   b. People with risk factors may need medical advice.

COMPONENTS OF HEALTH-RELATED FITNESS

Physical fitness refers to the ability to function as healthy human beings with energy and alertness in all daily activities. There are many places to learn about fitness, but the most common resources are easily found and can be used by anyone.

These resources include libraries, the Internet, a physical fitness instructor, or a health teacher. Libraries contain vast amounts of information about health in general and physical fitness in particular. Libraries have medical journals, magazines, and many books that can inform people about the ways to become fit and to maintain their fitness levels. Information sources can provide information about the physical and psychological benefits of being fit, as well as the benefits for a persons self-esteem and emotions. Libraries also may offer an opportunity to obtain audio and video materials that can provide the same types of information as magazines or books. Libraries also give low-income people a chance to see fitness materials that they may not readily have.

The Internet represents an excellent source of information about physical fitness. It is like a combination of many articles, books, libraries, and information from other people. If a search is performed on the word fitness using one of the popular search engines on the Internet, a list of many, many resources will be returned.

Search engines generally provide their lists in terms of the relevance of the material to the initial questions, so users should keep that in mind and ask relevant questions. With any search engine, the first few pages will provide the most useful links to information about the topic. Using a search engine, individuals can find information about local fitness centers and instructors in their area who offer specialized, one-to-one fitness training programmes.

Local schools are also good sources of information. A schools physical education instructors and health teachers represent valuable sources of fitness information. They understand and are educated about the major issues related to physical fitness. Their expertise can help individuals find other reliable sources of fitness data. Many articles that are found may not always be totally accurate, so having the ability to ask teachers and health instructors specific questions is very useful to those interested in pursuing a physical fitness routine.

Additionally, the federal government publishes lots of information about fitness issues in the United States from a variety of perspectives. The United States Department of Agriculture, which is responsible for setting the daily recommended allowances of various vitamins and other food substances for human consumption, collects and provides information about fitness alternatives, the status of fitness in the country, and how well Americans participate in fitness programmes.

The local fitness centre also has considerable information to share about the subject of physical fitness. These centers may provide posted information or current magazines that address the most current fitness questions. The centers often let people observe fitness programmes in action as well.

Definition of Physical Fitness

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Top Level: Very few are able to reach the top level of the physical fitness hierarchy. Elite athletes often spend their entire lifetime aiming to reach the very top level. The top level of physical fitness tends to mesh physiology and psychology. In order to reach the top level of physical fitness one must reach their full potential.

BODY COMPOSITION

Definition: The relative amount of fat, muscle, bone, and other vital parts of the body.

Measurement: Skin fold calipers, BIA, DEXA

Significance: Of all 10 facets of physical fitness, body composition is the only non-performance metric. For this reason, it is sometimes not included in other physical fitness lists. While it is possible for an individual to have a high degree

of fitness and still have excess body fat, losing body fat while retaining lean muscle will improve all other physical fitness metrics given the strength/power to weight ratio will be improved, along with other general health markers.

Strength

Measurement: Multiple tests must be completed to test more than one muscle group. Examples include max effort on exercises like the squat, bench press, or deadlift from 1-6 repetitions.

Significance: Strength is required to perform basic functional movements in our life like squatting, lunging, pushing, pulling, and bending are important in our everyday life. In addition, as we age muscle size and strength tend to decrease along with bone mass, which can be reversed with strength training.

Cardiovascular Fitness

Definition: Ability of the circulatory systems and respiratory systems to supply oxygen during sustained physical activity.

Measurement: VO2 Max Test, sub-maximal YMCA Step Test

Significance: Improved cardiovascular increases lung capacity so the heart does not have to work as hard to pump blood to the muscles. Also important for overall heart health and prevention of lifestyle diseases.

CARDIO-RESPIRATORY ENDURANCE

Cardiorespiratory conditioning is measured by maximum oxygen uptake (VO_2max).

a. Increases cardiac output and oxygen delivery.
b. Increases stroke volume.
c. Slows resting pulse.
d. Increases breathing efficiency.
e. Improves circulation.
f. Reduces blood pressure.

Muscle Conditioning:

a. Muscles use oxygen efficiently.
b. Muscles can burn fat longer.

A Balanced Fitness Programme:

a. Individualized.
b. Choose an activity that is enjoyed.
c. Should improve cardiorespiratory fitness, flexibility, muscle strength, muscle power, and muscle endurance.

Resistance Training is also called weight training:

1. Increases muscle strength, power, and endurance.
2. Prevents and manages cardiovascular disease.
3. Enhances psychological well-being.
4. Maximizes and maintains bone mass.
5. Improves posture and decreases the risk for back injury.
6. Enhances performance in other sports.

ENERGY SYSTEMS AND FUELS TO SUPPORT ACTIVITY

The mixture of fuels used during physical activity depends on diet, intensity and duration of the activity, and training. Well-nourished active people and athletes do not need nutritional supplements. Water, iron, and sodium are nutrients that may need attention.

The Energy Systems of Physical Activity—ATP and CP:

1. ATP is adenosine triphosphate – a high-energy compound that delivers energy instantaneously.
2. CP is creatine phosphate – a high-energy compound in the muscles, used anaerobically.
3. The Energy-Yielding Nutrients
   a. Nutrients work together while one may predominate.
   b. Depends on diet, intensity and duration of the activity, and training.
      1. Extremely intense activity
   a. 8-10 seconds.
   b. ATP-CP (immediately available).
   c. No oxygen needed (anaerobic).
   d. Activity examples – 100 yard dash and shot put.
      2. Very highly intense activity
   a. 20 seconds to 3 minutes.
   b. ATP from carbohydrate.
   c. No oxygen needed (anaerobic).
   d. Activity example – ¼ mile run at maximum speed.
      3. Highly intense activity
   a. 3-20 minutes.
   b. ATP from carbohydrate.
   c. Oxygen needed (aerobic).
   d. Activity examples – cycling, swimming, and running.
      4. Moderately intense activity
   a. More than 20 minutes.
   b. ATP from fat.
   c. Oxygen needed (aerobic).
   d. Activity example – hiking.

GLUCOSE USE DURING PHYSICAL ACTIVITY

1. Diet Affects Glycogen Storage and Use
   a. High-carbohydrate diets increase glycogen stores.
   b. Enhance endurance.
2. Intensity of Activity Affects Glycogen Use
   a. Moderate activities use glycogen slowly.
   b. Intense activities use glycogen quickly.

3. Lactate
   a. Low-intensity activities can clear lactate from the blood.
   b. During highly intense activities lactate accumulates and activity can only be maintained for 1-3 minutes.
   c. Lactate is converted to glucose in the liver (Cori cycle).
4. Duration of Activity Affects Glycogen Use
   a. First 20 minutes – primarily use glycogen.
   b. After 20 minutes – use glycogen and fat.
5. Glucose Depletion
   a. "Hitting the wall" – exhaustion of glucose stores.
   b. Maximizing glucose supply
      1. High-carbohydrate diet – 8 g/kg body weight or 70% of total energy intake.
      2. Glucose during activities if activity lasts longer than 1 hour (sports drinks or diluted fruit juice).
      3. Eat approximately 60 g of high-carbohydrate foods after activity.
      4. Carbohydrate loading is a regime of diet and exercise that maximizes glycogen storage. It is also called glycogen loading or glycogen super compensation.
6. Glucose during Activity
   a. Activities lasting longer than 1 hour.
   b. Should consume 30-60 grams of carbohydrate per hour.
7. Glucose after Activity
   a. High-carbohydrate meal within 15 minutes accelerates glycogen storage by 300%.
   b. Within 2 hours, rate of glycogen storage after a high-carbohydrate meal declines by half.
   c. High-glycemic index foods.
8. Training Affects Glycogen Use
   a. Muscles that repeatedly deplete glycogen through hard work will store greater amounts of glycogen.
   b. Conditioned muscles rely less on glycogen and more on fat for energy.
   c. Trained muscle cells have more mitochondria and can use oxygen better.
   d. Untrained muscle cells depend more heavily on anaerobic pathways.

FAT USE DURING PHYSICAL ACTIVITY

1. Duration of Activity Affects Fat Use
   a. Beginning of activity uses fatty acids in the blood.
   b. After 20 minutes, uses body fat as major fuel.
2. Intensity of Activity Affects Fat Use
   a. As intensity increases, fat makes less of a contribution to the fuel mix.
   b. Oxygen must be abundant to break down fat.

3. Training Affects Fat Use
   a. The better trained the muscles, the more fat is used.
   b. The better trained, the stronger the heart and lung to deliver oxygen.
   c. If better trained, then hormones prevent glucose release from the liver, so they rely more on fat.

PROTEIN USE DURING PHYSICAL ACTIVITY—AND BETWEEN TIMES

1. Protein Used in Muscle Building
   a. Synthesis of protein is suppressed during activity.
   b. After activity protein synthesis accelerates.
   c. Repeated activities cause body adaptations to support needs.
   d. Remodeling.
   e. Daily, ¼ to 1 ounce of body protein is added to muscle mass during muscle-building phase.
2. Protein Used as Fuel
   a. During physical activity muscles use amino acids for fuel.
   b. 10% of total fuel used.
3. Diet Affects Protein Use during Activity
   a. Diets rich in energy and carbohydrate allow the body to use less protein for fuel.
   b. Carbohydrates spare protein.
4. Intensity and Duration of Activity Affect Protein Use during Activity
   a. If glycogen stores get depleted, then more reliance on protein.
   b. Anaerobic strength training demands more protein to build muscles but not large amounts.
5. Training Affects Protein Use – the more trained the less protein used for energy.
6. Protein Recommendations for Active People
   a. Athletes in training need more protein than sedentary people.
   b. Athletes in training need to meet energy and carbohydrate needs first.
   c. Adult RDA: for males 56 g/day, for females 44 g/day.
   d. Strength athletes: for males 84-119 g/day, females 66-94 g/day.
   e. Endurance athletes: for males 84-98 g/day, females 66-77 g/day.
   f. U.S., average intake of protein: for males 102 g/day, females 70 g/day.

FLEXIBILITY

Definition: The range of motion at a joint

Measurement: There is no specific test because there are many joints in the human body, but a range of stretches can identify flexibility like the sit and reach test, shoulder reach, etc.

Significance: The optimal range of motion about various joints has a direct effect on almost all other facets of physical fitness.

For example, if one's hip flexors are tight, that can affect the ability to reach maximum speed, or perform agility drills to maximum effect.

Improve your Flexibility

- Having good flexibility is important in the prevention of strains, sprains, and body pain, especially as you grow older. While flexibility is perhaps the most difficult of the three components of physical fitness to improve, doing so is essential for good health.
- Participate in stretching routines on a regular basis if you want to improve your flexibility. In most cases, individuals who wish to become more flexible can improve their flexibility by doing a series of stretches a couple times a day. If doing the same stretches over and over seems mundane, consider participating in a beginning yoga class.
- When aiming to improve your flexibility, target which areas need the most work, and focus on them. The areas where people typically have the least flexibility include the hamstrings and the lower back. If you cannot touch your toes while standing, you may be inflexible in these parts of your body, indicating you could benefit from working on them.

MUSCULAR STRENGTH

Muscular strength is the amount of force your muscle can exert against resistance for short duration, anaerobic (without oxygen) activities. Resistance includes external objects such as free weights or household objects as well as your own body weight. Physiologically, muscular strength it is the ability to your body to supply ATP (Adenosine Tri-Phosphate or muscle energy) to your muscle fibers for concentric, eccentric and isometric contractions in short times, which range from 0 to around 15 seconds.

WHY IS MUSCULAR STRENGTH IMPORTANT?

While muscular strength may be subjective, the primary reason why muscular strength is important is your efficiency at Activities of Daily Living (ADLs). ADLs one of the most important reasons why being proficient at all 5 components of physical fitness are important. At the very least, to be physically fit for in the muscular strength department, you should demonstrate the basic muscular strength needed to efficiently your ADLs. While ADLs vary from person to person, you can also consider activities such as push-ups, pull-ups and carrying heavy objects as ADLs. Even though each of the 5 components of fitness depends on one another, poor muscular strength can also effect aerobic fitness and muscular endurance negatively.

PHYSICAL EXERCISES VIDEOWEIGHT TRAINING EXERCISE VIDEOS

You can use all forms of resistance training to increase your muscular strength. If your strength is your weakest of the 5 components of physical fitness you need to start weight training.

MUSCULAR ENDURANCE PHYSICAL FITNESS COMPONENT 3. MUSCULAR ENDURANCE

WHAT IS MUSCULAR ENDURANCE?

While muscular strength deals with short duration muscle contractions muscle endurance deals with sustained muscle contractions and other anaerobic activities lasting less than about 90 seconds.

WHY IS MUSCULAR ENDURANCE IMPORTANT?

Muscular endurance is the bridge between muscular strength and cardiovascular endurance. In order to be cardiovascularly fit, you must demonstrate muscular endurance.

Physiologically while muscle strength deals primarily with type II, fast twitch muscle fibers, muscular endurance deals with primarily type I, slow twitch muscle fibers.

Your body contains both but only anaerobic exercises which last longer than around 15 seconds and less than 90 seconds strengthen your type I muscle fibers.

SETS AND REPS

Learn all about how your resistance training workouts can best improve each of the 5 components of physical fitness through different exercise selection, sets, reps, weight training volume and training splits.

MUSCULAR ENDURANCE

Definition: The ability of muscles to continue to perform repeated contractions against submaximal resistance.

Measurement: Given there is more than on major muscle group, testing muscular endurance requires testing each individual muscle, or group. Examples include maximum number of push-ups, sit-ups, pull-ups, and dips.

Significance: Performing repetitious physical activity such as gardening, raking leaves and washing your car will become less fatiguing.

ROLE OF ENVIRONMENT

Disparities in health outcomes in the United States and other high-income countries have been widely discussed in recent years.

Many reasons have been suggested for these disparities, including the income levels of individuals, their educational attainment and employment status, as well as a variety of neighbourhood socioeconomic and environmental factors. During my many years of inpatient and outpatient attending, I have been convinced of the veracity of these observations. Many patients cared for at the inner-city university hospitals where I have worked have low income and educational levels and reside in areas that are rife with the threat of violence. These patients have limited access to stores selling healthy foods such as fresh

fruits and vegetables, and they live in rural or urban zones often characterized by high levels of environmental pollution. Finally, the quality of the schools in these neighbourhoods is often substandard.

Given this situation, it is not surprising that individuals living in communities exhibiting these negative qualities would find it difficult to follow the various lifestyle factors known from years of clinical and epidemiological investigation to increase longevity (eg, healthy diet, regular exercise, and freedom from air and environmental pollutants). Add to this picture the mental stress associated with living in neighbourhoods with heightened levels of violence, and the result is an increased expression of many acute and chronic degenerative diseases, including a variety of cardiovascular illnesses and cancer. I have also noted that as a result of the high cost of quality dental care, there is a very high level of poor dental health in patients living in socioeconomically challenged neighbourhoods. Poor oral hygiene increases levels of systemic inflammation and thereby increases the risk for both cardiovascular disease and cancer.

NUTRITION

Continuing to reduce cardiovascular disease and the prevention of cancer and health problems associated with overweight and obesity are currently the most important challenges facing nutrition policy. Prescriptions for a healthier, and in the WHO global strategy on diet, physical activity and health. A healthy diet and regular physical activity can reduce the incidence of cardiovascular disease and cancer and prevent increases in overweight, obesity and type 2 diabetes.

The nutritional needs and health problems change throughout the life cycle. The risk of developing chronic diseases can be influenced at all ages. Health-promoting and preventive nutrition work must take a comprehensive approach to the human life cycle and to different needs at the various stages of life.

The foundation for health and disease is laid already in utero. The mother's nutrition during pregnancy has consequences not only for the child's health as a newborn, but also for its health later in life. In other words, the eating habits and nutrition of pregnant women and women of childbearing age have consequences not only for themselves but for the next generation as well. It is important to ensure that women in this stage of life have proper nutrition, and that their intake of folic acid and iron meets recommended levels.

Breastmilk is of great importance to infants' nutrition, immune systems and development. The greatest possible number of infants should be breastfed in accordance with recommendations. Infants and toddlers are in a biologically vulnerable stage of life, and it is essential that baby and toddler food is healthy and safe, and contains the nutrients required to meet their nutritional needs.

Commissioned by the Ministry of Health and Care Services and completed in the spring of 2005, the action plan for infant and toddler nutrition identifies measures designed to achieve these objectives. Eating habits established during childhood and adolescence, have an impact on the risk of disease later in life. Food

and drinks are important indicators of social and cultural identity for everyone, and perhaps particularly for adolescents. The physiological need for nutrients is greater during adolescence than during childhood, and high-quality diet is important. Given society's obsession with perfect bodies, many young people feel pressured to lose weight, and eating disorders are a problem. Children and adolescents are an important target group for health-promoting nutrition work. People who have developed diet-related diseases may benefit greatly from dietary measures to improve their condition. Most chronic diseases have their onset during adulthood. The need for certain nutrients increases with age. Many elderly people experience a loss of appetite and some eat too little, becoming undernourished and frailer than need be.

Settling in a new country that has a different culture and language can lead to changes in diet, physical activity and health. Dietary changes, including a higher intake of fats and sugar and a lower intake of vegetables, fruits, lentils and beans, have been documented. Immigrants from non-Western countries differ in many ways, and there are substantial differences in health among the various groups. Some nutritional problems, such as overweight and obesity, type 2 diabetes, and iron and vitamin D deficiency, occur more often in certain immigrant groups.

Cardiovascular disease

Cardiovascular disease is the most common cause of death and has a great impact on morbidity. For people under the age of 70, deaths from cardiovascular disease have been reduced by more than half in the past 30 years. A large part of this decline is due to improvements in diet. In particular, decreased consumption of solid fats has improved the blood cholesterol level in the population. There is great potential for prevention of these diseases through reduced dietary intake of solid fats and salt and increased intake of fruits and vegetables. A combination of a healthy diet, regular physical activity and no smoking plays an important part in preventing and treating cardiovascular disease.

Cancer

Cancer is the second most common cause of death and the overall incidence is on the rise. Obesity and physical inactivity are important risk factors for cancer. Diet plays an important role in preventing and treating cancer. A healthy diet with a high intake of fibre-rich foods, fruits and vegetables combined with a low salt intake can help prevent the development of a number of types of cancer. Cancer treatment not only exacts toil on the body mentally and physically, it may also alter or disrupt eating habits. As a consequence, proper nutrition is crucial when undergoing treatment.

Overweight and obesity

Overweight and obesity have become increasingly prevalent in population in recent decades, as in other Western countries.

All segments of the population are experiencing weight gain, regardless of age, gender or education level. Nevertheless, overweight and obesity are

most common in the lower socio-economic strata. Weight gain is the result of an imbalance between energy intake and energy expenditure. Overweight readily occurs when a reduced level of physical activity is combined with easy access to energy-dense foods.

There is a need for viable treatment options for those who become seriously overweight or obese. Obesity is a risk factor for developing type 2 diabetes, cardiovascular disease, certain types of cancer and osteoarthritis of the hips and knees. Overweight and obesity represent a growing pro-blem for individuals and society-at-large, meaning prevention is of tremendous importance.

Diabetes mellitus

Diabetes mellitus is the most common metabolic disorder in Norway. Diabetes is a result of a combination of genetic disposition and environmental factors. Overweight, obesity and physical inactivity increase people's risk of developing type 2 diabetes. These days, people are developing diabetes at an increasingly younger age. Diabetes is a contributing factor to cardiovascular disease, stroke, kidney failure, blindness, foot ulcers and amputation.

It is estimated that many people may have undiagnosed diabetes. Among immigrants from the Middle East and the Indian sub-continent, particularly among females, there is a substantial over-representation of type 2 diabetes. Dietary changes, increased physical activity, smoking cessation, controlling high blood pressure and weight loss play important roles in the treatment of type 2 diabetes. The single most important nutrition-related risk-factor of bone fractures is underweight. It is important to prevent underweight among the elderly. It is also important to ensure an adequate intake of vitamin D and calcium.

SUBSTANCE ABUSE

Substance abuse isn't something you should take lightly. It occurs when you use alcohol, prescription medicine, and other legal and illegal substances too much or in the wrong way.

Substance abuse differs from addiction. Many people with substance abuse problems are able to quit or can change their unhealthy behaviour. Addiction, on the other hand, is a disease. It means you can't stop using even when your condition causes you harm.

Commonly Abused Drugs

Both legal and illegal drugs have chemicals that can change how your body and mind work. They can give you a pleasurable "high," ease your stress, or help you avoid problems in your life.

Alcohol

Alcohol affects everyone differently. But if you drink too much and too often, your chance of an injury or accident goes up. Heavy drinking also can cause liver and other health problems or lead to a more serious alcohol disorder.

If you're a man and you drink more than four drinks on any day or more than 14 in a week, you're drinking too much. For women, heavy drinking means more than three drinks in one day or more than seven drinks a week.

NATURAL CALAMITIES

A natural disaster is a major adverse event resulting from natural processes of the Earth; examples include floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, storms, and other geologic processes. A natural disaster can cause loss of life or damage property, and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience and on the infrastructure available.

In modern times, the divide between natural, man-made and man-accelerated is quite difficult to draw with human choices like architecture, fire, resource management or even climate change potentially playing a role. An adverse event will not rise to the level of a disaster if it occurs in an area without vulnerable population. In a vulnerable area, however, such as Nepal during the 2015 earthquake, an adverse event can have disastrous consequences and leave lasting damage, which can take years to repair. The disastrous consequences also impact the mental health of effected communities often leading to post-traumatic symptoms. These increased emotional experiences can be supported through collective processing, leading to resilience and increased community engagement.

LACK OF ACTIVITY

Chronic diseases are major killers in the modern era. Physical inactivity is a primary cause of most chronic diseases. The initial third of the article considers: activity and prevention definitions; historical evidence showing physical inactivity is detrimental to health and normal organ functional capacities; cause vs. treatment; physical activity and inactivity mechanisms differ; gene-environment interaction [including aerobic training adaptations, personalized medicine, and co-twin physical activity]; and specificity of adaptations to type of training. Next, physical activity/exercise is examined as primary prevention against 35 chronic conditions [Accelerated biological aging/premature death, low cardiorespiratory fitness (VO_2max), sarcopenia, metabolic syndrome, obesity, insulin resistance, prediabetes, type 2 diabetes, non-alcoholic fatty liver disease, coronary heart disease, peripheral artery disease, hypertension, stroke, congestive heart failure, endothelial dysfunction, arterial dyslipidemia, hemostasis, deep vein thrombosis, cognitive dysfunction, depression and anxiety, osteoporosis, osteoarthritis, balance, bone fracture/falls, rheumatoid arthritis, colon cancer, breast cancer, endometrial cancer, gestational diabetes, preeclampsia, polycystic ovary syndrome, erectile dysfunction, pain, diverticulitis, constipation, and gallbladder diseases].

People of all ages and conditions can benefit from more physical activity, including aerobic and muscle-strengthening exercises. Physical activity

contributes to normal growth and development, reduces the risk of several chronic diseases, and helps people function better throughout the day and sleep better at night. Even short bouts of physical activity can improve health and wellness.

Many Americans live in communities that are not designed for physical activity. CDC works to increase the nation's physical activity levels by promoting better community design and more active school and work environments. CDC also supports programmes that include physical activity as a way to prevent type 2 diabetes and reduce arthritis pain.

PSYCHOLOGICAL FACTORS

Physiological needs are at the first level of Maslow's hierarchy: hunger, thirst, and other basic drives. All living beings, regardless of their level of maturity, possess physiological needs. Physiological needs are omnipresent and recur throughout nature.

Safety and security are second in Maslow's hierarchy. Safety and security needs imply a continued fulfillment of physiological needs, as well as the absence of the threat of physical harm. Safety and security encompass both physical and financial security, because financial security is linked to a person's ability to have her physiological needs met. Health and physical well-being and protection from accidents are also associated with this level of need. This is considered an extension of the more basic needs.

Love and belonging are third in Maslow's hierarchy of needs. Love encompasses the needs for belonging, friendship, human intimacy, and family. They involve a person's interaction with others and the need to feel accepted by social groups, large or small.

Esteem is the fourth level. Esteem includes the need to feel good about oneself, to be respected and valued by others, and to have a positive self-image.

Self-actualization is the fifth and highest level in Maslow's needs hierarchy. Also described as self-fulfillment, this is the need humans feel to reach their full potential and to accomplish all that they can with their talents and abilities.

Different people may express this need in very different ways: for one person, self-actualization might involve musical or artistic pursuits, for another, it's parenting, and for a third the focus might be athletics. At different points in their lives, individuals might express this need through different pursuits.

In his work, Maslow asserts that these five levels of needs operate on an unconscious level. In other words, people may not even be aware that they are concentrating on one particular level of need or an assortment of needs. Maslow's theory suggests that lower levels of need must be met before an individual can focus on the upper levels of needs. At the same time, a person may experience several different needs simultaneously. How an individual is motivated to act depends on the importance of each need.

7

Functional Training for Sports Conditioning

FASCIA TRAINING

Fascia training describes sports activities and movement exercises that attempt to improve the functional properties of the muscular connective tissues in the human body, such as tendons, ligaments, joint capsules and muscular envelopes. Also called fascia, these tissues take part in a body-wide tensional force transmission network and are responsive to training stimulation.

ORIGIN

Whenever muscles and joints are moved this also exerts mechanical strain on related fascial tissues. The general assumption in sports science had therefore been that muscle strength exercises as well as cardiovascular training would be sufficient for an optimal training of the associate fibrous connective tissues. However, recent ultrasound-based research revealed that the mechanical threshold for a training effect on tendinous tissues tends to be significantly higher than for muscle fibres.

This insight happened roughly during the same time in which the field of fascia research attracted major attention by showing that fascial tissues are much more than passive transmitters of muscular tension (years 2007 – 2010). Both influences together triggered an increasing attention in sports science towards the question whether/how fascial tissues can be specifically stimulated with active exercises.

The first print publication addressing this question in more detail was a chapter contribution in the first academic text book on fascia, of which an extended version of this chapter was subsequently published in a scientific journal. In these texts the authors Robert Schleip and Divo Gitta Müller described major training principles as well as practical applications. In collaboration with other sports therapist they later developed this into a specific training method called Fascial Fitness. Significant contributions in this development were made by the author and body therapist Thomas W. Myers (USA), the sports chiropractor Wilbour Kelsick (Canada), as well as the German physical education teachers Markus Rossmann and Stefan Dennenmoser.

Other fascia oriented training approaches that particularly aim at a remodeling of fascial tissues include the MELT Method (Myofascial Energetic Length Technique), Yin Yoga, Fascial Yoga, several forms of Pilates, as well as the self-defence method of Wujifa and similar styles of Martial Arts.

THE CATAPULT EFFECT

The large jumping power of kangaroos and gazelles stems less from their muscles but rather from their highly elastic tendons. These tissues are able to store and release kinetic energy with a very high efficiency. A similar impressive storage capacity has also been found in human running, hopping and walking.

Using high resolution ultrasound imaging it was shown that during such movements the engaged muscle fibres hardly change their length; in fact they contract rather isometrically. In contrast, the involved tendionous and aponeurotic fibres change their operating length significantly. Fascial training methods attempt to improve this capacity by including movements with a high elastic rebound quality. It was shown that few elastic bounces per week can be sufficient to induce – over a period of several months – a higher elastic performance capacity in the affected related fascial tissues.

PRINCIPLES

According to a publication by Divo G. Muller and Robert Schleip a fascial training rest on the following principles:

- Preparatory counter-movement (increasing elastic recoil by pre-stretching involved fascial tissues);
- The Ninja principle (focus on effortless movement quality);
- Dynamic stretching (alternation of melting static stretches with dynamic stretches that include mini-bounces, with multiple directional variations);
- Proprioceptive refinement (enhancing somatic perceptiveness by mindfulness oriented movement explorations);
- Hydration and renewal (foam rolling and similar tool-assisted myofascial self-treatment applications);
- *Sustainability:* respecting the slower adaptation speed but more sustaining effects of fascial tissues (compared with muscles) by aiming at visible body improvements of longer time periods, usually said to happen over 3 to 24 months.

TRAINING ELEMENTS

Usually these four training elements are combined:

- Elastic rebound
- Dynamic stretching
- Myofascial self treatment
- Proprioceptive refinement

GENERAL CLAIMS

Fascia training is suggested as a sporadic or regular addition to comprehensive movement training. It promises to lead towards remodeling of the body-wide fascial network in such a way that it works with increased effectiveness and refinement in terms of its kinetic storage capacity as well as a sensory organ for proprioception.

EVIDENCE

While good to moderate scientific evidence exists for several of the included training principles – *e.g.*, the inclusion of elastic recoil as well as a training of proprioceptive refinement – there is currently insufficient evidence for the claimed beneficial effects of a fascia oriented exercises programme as such, consisting of a combination of the above described four training elements.

FEMALE ATHLETE TRIAD

Female athlete triad is a syndrome in which eating disorders (or low energy availability), amenorrhoea/oligomenorrhoea, and decreased bone mineral density (osteoporosis and osteopenia) are present. Also known simply as the Triad, this condition is seen in females participating in sports that emphasize leanness or low body weight. The triad is a serious illness with lifelong health consequences and can potentially be fatal.

CLASSIFICATION

The female athlete triad is a syndrome of three interrelated conditions. Thus, if an athlete is suffering from one element of the Triad, it is likely that she is suffering from the other two components of the triad as well. With the increase in female participation in sports, much of it attributable to Title IX legislation in the United States, the incidence of a triad of disorders particular to women — the female athlete triad—has also increased.

Due to this increasing prevalence, the female athlete triad and its relationship with athletics was identified in the 1980s as the symptoms, risk factors, causes and treatments were studied in depth and their relatedness evaluated. The condition is most common in cross country running, gymnastics, and figure skating. Many of those who suffer from the triad are involved in some sort of athletics, in order to promote weight loss and leanness.

The competitive sports that promote this physical leanness may result in disordered eating, and be responsible for the origin of the Female Athlete Triad. For some women, not balancing the needs of their bodies and their sports can have major consequences. In addition, for some competitive female athletes, problems such as low self-esteem, a tendency towards perfectionism, and family stress place them at risk for disordered eating.

SIGNS AND SYMPTOMS

Clinical symptoms of the Triad may include disordered eating, fatigue, hair loss, cold hands and feet, dry skin, noticeable weight loss, increased healing time from injuries (*e.g.*, lingering bruises), increased incidence of bone fracture and cessation of menses. Affected females may also struggle with low self-esteem and depression.

Upon physical examination, a physician may also note the following symptoms: elevated carotene in the blood, anemia, orthostatic hypotension, electrolyte irregularities, hypoestrogenism, vaginal atrophy, and bradycardia.

An athlete may show signs of restrictive eating, but not meet the clinical criteria for an eating disorder. She may also display subtle menstrual disturbances, such as a change in menstrual cycle length, anovulation, or luteal phase defects, but not yet have developed complete amenorrhea.

Likewise, an athlete's bone density may decrease, but may not yet have dropped below her age-matched normal range. These signs can be considered "occult," as no one symptom may be severe enough to seek medical attention, leaving the Triad to go unnoticed or untreated.

Eating Disorder

Energy availability is defined as energy intake minus energy expended. Energy is taken in through food consumption. Our bodies expend energy through normal functioning as well as through exercise. In the case of female athlete triad, low energy availability may be due to eating disorders, but not necessarily so. Athletes may experience low energy availability by exercising more without a concomitant change in eating habits, or they may increase their energy expenditure while also eating less. Disordered eating is defined among this situation due to the low caloric intake or low energy availability.

While most athletes do not meet the clinical criteria to be diagnosed with an eating disorder such as anorexia nervosa or bulimia nervosa, many will exhibit disordered eating habits such as fasting, as well as avoiding certain types of food the athlete thinks are "bad" (such as foods containing fat). More severe examples of disordered eating habits may include binge-eating; purging; and the use of diet-pills, laxatives, diuretics, and enemas.

By restricting their diet, the athlete may worsen their problem of low energy availability. Having low dietary energy from excessive exercise and/or dietary restrictions leaves too little energy for the body to carry out normal functions such as maintaining a regular menstrual cycle or healthy bone density.

Amenorrhea

Amenorrhea, defined as the cessation of a woman's menstrual cycle for more than three months, is the second disorder in the Triad. Weight fluctuations from dietary restrictions and/or excessive exercise affect the hypothalamus's output of gonadotropic hormones. Gonadotropic hormones "stimulate growth of the gonads and the secretion of sex hormones." (*e.g.*, gonadotropin-releasing hormone, lutenizing hormone and follicle stimulating hormone.) These gonadotropic hormones play a role in stimulating estrogen release from the ovaries. Without estrogen release, the menstrual cycle is disrupted. Exercising intensely and not eating enough calories can lead to decreases in estrogen, the hormone that helps to regulate the menstrual cycle. As a result, periods may become irregular or stop altogether.

There are two types of amenorrhea. A woman who has been having her period and then stops menstruating for ninety days or more is said to have secondary amenorrhea. Primary amenorrhea is characterized by delayed menarche (the onset of menses during puberty). Delayed menarche may be associated with delay of the development of secondary sexual characteristics.

Osteoporosis

Osteoporosis is defined by the National Institutes of Health as ''a skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture.'' Low estrogen levels and poor nutrition, especially low calcium intake, can lead to osteoporosis, the third aspect of the triad. This condition can ruin a female athlete's career because it may lead to stress fractures and other injuries. Patients with female athlete triad get osteoporosis due to hypoestrogenemia, or low estrogen levels. With estrogen deficiency, the osteoclasts live longer and are therefore able to resorb more bone. In response to the increased bone resorption, there is increased bone formation and a high-turnover state develops which leads to bone loss and perforation of the trabecular plates. As osteoclasts break down bone, patients see a loss of bone mineral density. Low bone mineral density renders bones more brittle and hence susceptible to fracture. Because athletes are active and their bones must endure mechanical stress, the likelihood of experiencing bone fracture is particularly high. Additionally, because those suffering with female athlete triad are also restricting their diet, they may also not be consuming sufficient amounts vitamins and minerals which contribute to bone density; not getting enough calcium or vitamin D further exacerbates the problem of weak bones.

Bone mass is now thought to peak between the ages of 18-25. Thus, behaviours which result in low bone density in youth could be detrimental to an athlete's bone health throughout her lifetime.

CAUSES

Gymnastics, figure skating, ballet, diving, swimming, and long distance running are examples of sports which emphasize low body weight. The Triad is

seen more often in aesthetic sports such as these versus ball game sports. Women taking part in these sports may be at an increased risk for developing female athlete triad.

Athletes at greatest risk for low energy availability are those who restrict dietary energy intake, who exercise for prolonged periods, who are vegetarian, and who limit the types of food they will eat. Many factors appear to contribute to disordered eating behaviours and clinical eating disorders. Dieting is a common entry point and interest has focused on the contribution of environmental and social factors, psychological predisposition, low self-esteem, family dysfunction, abuse, biological factors, and genetics. Additional factors for athletes include early start of sport-specific training and dieting, injury, and a sudden increase in training volume. Surveys show more negative eating attitude scores in athletic disciplines favouring leanness. Disordered eating behaviours are risk factors for eating disorders.

TREATMENT

The underlying cause of the female athlete triad is an imbalance between energy taken into the body (through nutrition) and energy used by the body (through exercise). The treatment includes correcting this imbalance by either increasing calories in a diet or by decreasing calories burned by exercise for 12 months or longer. Persons with female athlete triad should get treatment from a multi-disciplinary team that includes a physician, dietitian, and mental health counselor, and seek support from family, friends, and their coach.

Because a symptom of the female athlete triad is menstrual dysfunction, some physicians may recommend oral contraceptives because those pills will regulate the menstrual cycle. However, the underlying cause of the menstrual disorder is an energy imbalance, and using pills to regulate the menstrual cycle without changes in diet and behaviour is likely to mask the food deficiency and delay appropriate treatment. A woman taking contraceptives to treat menstrual dysfunction without correcting this energy imbalance will continue to lose bone density.

Less Exercise

Continued participation in training and competition depends on the physical and mental health of the athlete. Athletes who weigh less than 80 percent of their ideal body weight may not be able to safely participate. Persons with female athlete triad are often asked by health care providers to reduce the amount of time they spend exercising by 10-12 percent.

Eating More

Low energy availability with or without eating disorders, functional hypothalamic amenorrhea, and osteoporosis, alone or in combination, pose significant health risks to physically active girls and women. Prevention, recognition, and treatment of these clinical conditions should be a priority of

those who work with female athletes to ensure that they maximize the benefits of regular exercise. Patients are recommended to work with a dietician who can monitor their nutritional status and help the patient work towards a healthy goal weight. Patients should also meet with a psychiatrist or psychologist to address the psychological aspects of the triad. Therefore, it is important that trainers and coaches are made aware of the athlete's condition and be part of her recovery.

Medicine

Patients are also sometimes treated pharmacologically. To both induce menses and improve bone density, doctors may prescribe cyclic estrogen or progesterone as is used to treat post-menopausal women. Patients may also be put on oral contraceptives to stimulate regular periods. In addition to hormone therapy, nutrition supplements may be recommended. Doctors may prescribe calcium supplements. Vitamin D supplements may be also used because this vitamin aids in calcium absorption. Bisphosphonates and calcitonin, used to treat adults with osteoporosis, may be prescribed, although their effectiveness in adolescents has not yet been established. Finally, if indicated by a psychiatric examination, the affected athlete may be prescribed anti-depressants and in some cases benzodiazepines to help in alleviating severe distress at mealtimes.

PROGNOSIS

Sustained low energy availability, with or without disordered eating, can impair health. Psychological problems associated with eating disorders include low self-esteem, depression, and anxiety disorders. Medical complications involve the cardiovascular, endocrine, reproductive, skeletal, gastrointestinal, renal, and central nervous systems. The prognosis for anorexia nervosa is grave with a six-fold increase in standard mortality rates compared to the general population. In one study, 5.4% of athletes with eating disorders reported suicide attempts. Although 83% of anorexia nervosa patients partially recover, the rate of sustained recovery of weight, menstrual function and eating behaviour is only 33%.

Amenorrheic women can be infertile, due to the absence of ovarian follicular development, ovulation, and luteal function. Consequences of hypoestrogenism seen in amenorrheic athletes include impaired endothelium-dependent arterial vasodilation, which reduces the perfusion of working muscle, impaired skeletal muscle oxidative metabolism, elevated low-density lipoprotein cholesterol levels, and vaginal dryness. Due to low bone mineral density that declines as the number of missed menstrual cycles accumulates, and the loss of BMD may not be fully reversible.

Stress fractures occur more commonly in physically active women with menstrual irregularities and/or low BMD with a relative risk for stress fracture two to four times greater in amenorrheic than eumenorrheic athletes. Fractures also occur in the setting of nutritional deficits and low BMD.

SOCIETY AND CULTURE

The American Academy of Pediatrics and the AAFP contend that exercise is important and should be promoted in girls for health and enjoyment, however pediatricians should be wary of health problems that may occur in female athlete. The health related issues concerning this topic are grave and can lead to numerous health issues as previously demonstrated. The treatment plan will depend on the severity of the disorder, however some form of treatment has been shown as helpful to produce successful progress towards a better health condition. Clearly, many health problems arise due to disordered eating.

Coaches are discouraged from active participation in the treatment of eating disorders. In addition to conflicts of interest, coaches may be perceived to pressure athletes and potentially perpetuate components of the Female Athlete Triad. For example, in maintaining a place on the team or continued scholarship support, a female athlete may feel compelled to overtrain or restrict eating.

MOVING FORWARD

Coaches, athletic trainers, and health care providers should also be educated about the female athlete triad to detect and recognize its components before athletes reach the pathologic end of the spectrum. Awareness levels among athletes, coaches, and health care professionals should be assessed to determine where education is needed most. A patient may present with any of the components of the triad; therefore, an awareness of these components among all involved in the care of female athletes is prudent. Athletes should also be taught proper nutrition for athletic performance by their coaches and health providers, because a specific breakdown of macronutrients combined with healthy dietary choices will help these athletes perform the best they possibly can, instead of forcing them to only care about their physique. The female triad may also present in para-athletes.

SPORTS CONDITIONING FOR FUNCTIONAL TRAINING

Functional training prepares you for training functionally, but what prepares you for functional training? Functional training has its origins in rehabilitation and has been around for 40 years or more. In this time we have established that biomechanical screening is a critical *precursor* to functional screening and functional training, otherwise you simply continue to experience problems. As the functional concepts start to become more widely accepted in fitness, coaching and conditioning fields, it is important to recognise that the biomechanical screening has not yet followed into these arenas. Functional and biomechanical screening and training are very important aspects of an overall conditioning programme for any sport or activity and are complimentary in every way. For example, there are many people who pass a functional screen, yet fail a biomechanical screen. They detect different factors, both of which are important to the trainer.

SPORTS INJURY PREVENTION

There are many causes of injury ranging from poor technique, poor 'core' strength, poor preparation, insufficient range of movement in the relevant structures and many others. Your correct biomechanical function is also a critical factor, but is generally less understood. A biomechanical screen will highlight the flaws in your pelvic, shoulder and knee function, as well as check whether you have any low grade muscle spasm in key muscles, which may be restricting both movement and the correct functioning of a joint. In addition a biomechanical screen will check your nervous system and highlight any problems that may cause your body to compensate and break down. For example, a rotated pelvis causing a functional leg length discrepancy can result in a variety of different injuries depending upon how you compensate. It can cause lower back pain, knee pain, shin pain, hamstring injuries, even foot pain. By screening issues like pelvic function, the risk of many of these injuries can be significantly reduced.

SPORTS PERFORMANCE

The performance of an exercise is affected by many different factors. Your biomechanical function has a profound affect on how your movement patterns are controlled and compensated for during the performance of a movement or series of movements. It is often these compensations for biomechanical issues that lead to faulty movement patterns and ultimately compromised sports performance. For example, if a golfer had an overactive infraspinatus muscle (one of the rotator cuff) in the shoulder, it would significantly affect their ability to deliver a consistent high velocity swing. This is due to the shoulders inability to control the arm at high speeds before and after impact. The same principle applies to all arm related events, including javelin throwing and tennis.

SPORTS INJURY MANAGEMENT

Sports therapists are becoming increasingly skilled at being able to diagnose and treat injury. One factor that is now recognised to compliment that process is the understanding of biomechanics. The kinetic chain and how structures relate to each other in biomechanical terms can have a profound affect on outcomes. For example, a player with 'non-specific' groin pain which had been failed to be diagnosed despite specialist consultation and MRI scanning was treated successfully by working on the biomechanical function of his opposite shoulder. The body is an integrated system and all of its component parts affect each other in ways that we hadn't fully appreciated. So if you have a person with a sports injury that is failing to respond to treatment, chances are there is a biomechanical cause somewhere else in the body that is loading that susceptible area. Finding the biomechanical cause can be critical in getting that person back to sport and importantly minimizing the risk of recurrence.

Sports biomechanics is the study of forces and stresses of athletic activity and their affects on athletic performance and safety. Biomechanist analyse areas

such as sports injuries, sports equipment, and sports techniques. The science can be broken up into two main areas: kinetics and kinematics.

Kinematics is the study of motion and Kinetics is the study of forces. The science of sports biomechanics helps improve performance, reduce the chance of injury through employment of proper technique and equipment design, and enhance rehabilitation and surgical capabilities by improving techniques, equipment, and training. Sports biomechanics is a cutting edge science that is becoming increasingly popular. The future of this science and its contributions to athletics is presently and will in the future change athletics as we know it today. Athletes are stronger and more powerful that ever before. Sports biomechanics is responsible for a majority of these advancements in the modern day athlete.

THE COACHING-BIOMECHANICS INTERFACE

The coaching-biomechanics interface is a term that we use to conceptualise how coaching can be informed from a biomechanical perspective. The process involved here is a continuous one, with each cycle starting and ending with the athlete. The process is based on a coach's tacit knowledge in relation to the practices that are routinely used to develop athletes' skills. This information, through systematic conversation with a biomechanist, is then turned into biomechanical variables which can either be measured or theoretically analysed.

The key to these variables is that they are directly related to successful performance of the skill. Once understanding of the key aspects of skills and any associated progressions or drills has been understood, informed feedback can be delivered to the athletes via the coach. Integral to this process, is the communication between the biomechanist and the coach and athlete. This cycle of extracting, processing and imparting new scientifically grounded knowledge or understanding represents the whole or the actuality of the coaching-biomechanics interface. Sometimes this new knowledge may simply reinforce existing practices or it can provide new insights which inform future skill development.

The overall purpose of developing the coaching-biomechanics interface is to bridge the gap between coaching practice and the science of biomechanics. The interface aims to make training more effective and efficient, particularly for athletes who are working near to their physiological limits.

COMPUTER MODELLING

The computer modelling research conducted in the group is centred on the development, evaluation and application of whole body mechanical models of sports movements. An integral part of the modelling approach requires the integration of the theoretical model with laboratory-based data collections, which ensures a realistic predicted movement is produced by the model. Following customisation of the model to an individual, the forces causing a movement can be controlled and manipulated and the subsequent movement response

(technique) examined. A computer modelling approach allows examination of movement responses, which may otherwise be difficult to achieve by an individual, perhaps due to physiological constraints, and additionally reduces the potential effects of fatigue incurred in experimental, laboratory-based data collections. Key variables influencing an individual's movement response can be isolated and modified and understanding and determination of optimum performance and/or progression of a physically less demanding movement may be achieved. Knowledge of the limits of sports performance and the risk factors of sport-related injury, gained through application of computer models of human movement, has been beneficial in informing coaching practices and in developing effective injury prevention programmes.

BASIS OF BIOMECHANICAL PHYSICAL EXERCISE

PERFORMANCE IMPROVEMENT

Technique Improvement

In many sporting events technique is the major factor of performance. Martens (2004) defines sport technique as follows:

Sport technique is a physical action of an athlete which leads to the best possible execution of a physical motion, in conformity with a required task of a given sporting event.

Improvement of technique with the help of biomechanics can be used by teachers and coaches to correct motions of students or athletes. Moreover, research workers in the field of biomechanics may develop a new and more effective technique for better execution of a sport motion. In the former case teachers and coaches make use of the methods of qualitative biomechanics analysis in their every day practice to produce changes in the technique used by their charges. In the latter case research workers in the field of biomechanics use quantitative biomechanics methods to develop new techniques which can then be implemented into teaching and training processes.

For instance if a gymnastics coach sees that her charge has difficulties to turn a somersault she can come up with three recommendations to help the gymnast execute this exercise correctly:

- To jump higher,
- To fling arms with more energy before taking off, or
- To curl up more tightly.

All these recommendations can help to execute this task correctly and are based on the principles of biomechanics. If the gymnast jumps higher, she has more time to finish the turn during the flight phase. To curl up more tightly means to increase the speed of rotation while keeping the same angular momentum. To fling arms with more energy increases the angular momentum which helps the gymnast to rotate faster.

With the use of biomechanics it is possible to specify motor actions or positions that can increase sport performance. I have already mentioned that with the use of biomechanics we can decide which technique is better than other and to justify such decision. Let us have a look at an example of quantitative biomechanics research. Researchers Estevan, Falco and Jandacka (2011) presented novel scientific information in taekwondo. The stance position is a factor that affects the mechanical performance of taekwondo athletes' kicks. The 90° stance position of feet with regards to the rival involves longer execution and total time than the 0° and 45° stance positions in the roundhouse kick. They concluded that the 0° and 45° stance positions seem more appropriate than the 90° stance position.

Among sport events that saw in the past substantial changes in technique are javelin, high jump, and cross country skiing.

Equipment Improvement

Use of biomechanics can also lead to a better look and better functioning of sport equipment. For example ski boots can have a real impact on sport performance. Sophisticated sport equipment gives advantage to both elite and recreational athletes. Artistic gymnastics offers good examples. An introduction of the new vaulting equipment (vaulting table) after the 2000 Olympics represents the most substantial transition in the development of gymnastics equipment in the last decades. New vaulting equipment allows gymnasts to produce bigger angular momentum and thus to execute more complex vaults with multiple rotations around horizontal and vertical axes. Researchers have recently also developed a new swimming suit which helped swimmers at the Sydney Olympics in 2000 better several world records because it has a favourable influence on the draft force and buoyancy of water that is acting against swimmers. This swimming suit had such an influence on sport performance in swimming, in fact, that its use was later banned.

Training Improvement

Biomechanics can help improve training of athletes in two ways:

By the analysis of mechanical values a coach defines such training conditions that may lead to threshold stimuli.

We can use as an example the research project by Jandacka and Uchytil (2011) who carried out mechanical analysis of bench press with various loads in elite footballers. They discovered that the use of a load equalling to 30 – 50 per cent of the load which the footballers were only able to lift once leads to maximal produced mechanical power output. The recommendation resulting from this research project was as follows: Soccer players should train maximal strength during the preparatory period for their competitive season along with training for speed and endurance. When athletes maximally develop muscular power towards the end of a season when the most important competitions are scheduled, dynamic effort strength training with loads from 30 to 50 per cent of 1RM BP should be used. During the competitive season, loads of 50 per cent of

1RM BP should be used to maintain muscular power over a wide load range. By the analysis of technical imperfections of a given athlete the coach/teacher identifies the type of training needed for this athlete to improve.

An athlete is limited by strength or endurance of certain muscle groups, by speed of motion, or by specific aspects of motion technique. Sometimes the limits are quite obvious. For example a gymnast executing the crucifix on the gymnastic rings must have very strong shoulder adductors. In the case of certain sport skills the required abilities to execute a motor task are not easy to detect and quantitative biomechanics analysis must be used.

INJURY PREVENTION

By injury prevention it is meant an attempt to prevent or to limit the seriousness of injuries before they are actually incurred.

The concept of injury prevention is part of public health and its goal is to improve the general health of the population and thus to increase the quality of life. Biomechanics is a tool that can be used in sport medicine to identify forces and mechanical energy that cause injuries. It helps to understand how injuries originate, how to avoid them during sport performance, and how to identify exercise suitable for injury prevention and rehabilitation. Biomechanics offers possibilities to create alternative techniques of executing specific movements, using new equipment, and carrying out more effective training methods, which also contributes to injury prevention.

Good examples of how biomechanics helps reduce the prevalence of injuries can be found in volleyball. Zahradník and Jandacka (2011) examined whether it is possible to adapt the landing after a volleyball blocking to reduce impact reaction forces acting on knee joints. They found that it is better for volleyball players to make one step back after blocking as opposed to staying on the landing spot and absorbing the relevant forces there.

Another interesting result of biomechanics analysis with the purpose of injury prevention was the causation study of the so-called iliotibial band syndrome. Research workers Hamill, Miller, Noehren, Davis (2008) allege that the lateral knee pain, typical for many distance runners who train regularly, represents roughly 12 per cent of all injuries in runners. They also discovered that this syndrome may be caused by increased hip abduction and knee internal rotation during the stance phase, which causes strain in iliotibial band. From a large prospective study, female runners who incurred iliotibial band syndrome during the study were compared to a control group who incurred no injuries. Strain, strain rate and duration of impingement were determined from a musculoskeletal model of the lower extremity. This study indicated that a major factor in the development of iliotibial band syndrome was the strain rate. Therefore, Hamill et al. (2008) suggested that strain rate, rather than the magnitude of strain, could be a causative factor in developing the iliotibial band syndrome.

Injury prevention and rehabilitation are currently among very important goals of research in the field of biomechanics of sport and physical exercise.

Injury Reduction Through Changes to Equipment Function

One of the examples of using the results of biomechanics research for improving the functioning of sport equipment can be found in running. The number of people who realise the importance of healthy life style is recently growing. Running, as an elementary human locomotion, is a legitimate part of healthy lifestyle. But the growing numbers of people engaged in running also brought higher prevalence of injuries. Running shoes at the beginning of the 1970s were too stiff for inexperienced runners. Among the injuries with growing prevalence were stress fractures and shin bone pain. Shoe manufacturers therefore started to market shoes with soft soles. However, soft soles did not offer good stability and motor control. Runners started to suffer from ankle, knee and hip injuries. Biomechanics research has made it possible to manufacture running shoes which reduce impact forces and, at the same time, offer good stability and motor control. With the help of biomechanics it is even possible to recommend custom made shoes for individual athletes. Prevalence of injuries in running has decreased again.

Isn't human body itself the best equipment for running? People who wear shoes from very early age mostly touch the ground first with their rear foot when they walk. Lieberman et al. (2010) studied the style of running in Kenyans who never wore shoes and assert that in barefoot running people naturally touch the ground first with their forefoot. This produces slower loading rate in foot compared to running in shoes and touching the ground first with rear foot. Grand reaction forces during running may cause chronic injuries that runners often suffer from.

EXERTIONAL RHABDOMYOLYSIS

Exertional rhabdomyolysis (ER) – sometimes called exercise-induced rhabdomyolysis – is the breakdown of muscle from extreme physical exertion. It is one of many types of rhabdomyolysis that can occur and because of this the exact prevalence and incidence are unclear.

CAUSE

ER is more likely to occur when strenuous exercise is performed under high temperatures and humidity. Poor hydration levels before, during, and after strenuous bouts of exercise have also been reported to lead to ER. This condition and its signs and symptoms are not well known amongst the sport and fitness community and because of this it is believed that the incidence is greater but highly underreported.

Risks that lead to ER include exercise in hot and humid conditions, improper hydration, inadequate recovery between bouts of exercise, intense physical training, and inadequate fitness levels for beginning high intensity workouts. Dehydration is one of the biggest factors that can give almost immediate feedback from the body by producing very dark coloured urine.

MECHANISM OF INJURY

Anatomy

Exertional rhabdomyolysis results from damage to the intercellular proteins inside the sarcolemma. Myosin and actin break down in the sarcomeres when ATP is no longer available due to injury to the sarcoplasmic reticulum. Damage to the sarcolemma and sarcoplasmic reticulum from direct trauma or high force production causes a high influx of calcium into the muscle fibres increasing calcium permeability. Calcium ions build up in the mitochondria, impairing cellular respiration. The mitochondria are unable to produce enough ATP to power the cell properly. Reduction in ATP production impairs the cells ability to extract calcium from the muscle cell. The ion imbalance causes calcium-dependent enzymes to activate which break down muscle proteins even further. A high concentration of calcium activates muscle cells, causing the muscle to contract while inhibiting its ability to relax.

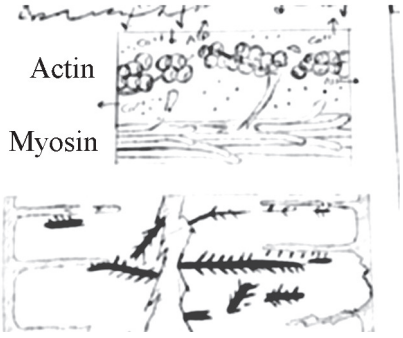

Fig. Actin and myosin.

The increase of sustained muscle contraction leads to oxygen and ATP depletion with prolonged exposure to calcium. The muscle cell membrane pump may become damaged allowing free form myoglobin to leak into the bloodstream.

Physiology

Rhabdomyolysis causes the myosin and actin to degenerate into smaller proteins that travel into the circulatory system. The body reacts by increasing intracellular swelling to the injured tissue to send repair cells to the area. This allows creatine kinase and myoglobin to be flushed from the tissue where it travels in the blood until reaching the kidneys.

In addition to the proteins released, large quantities of ions such as intracellular potassium, sodium, and chloride find their way into the circulatory system. Intracellular potassium ion has deleterious effects on the heart's ability to generate action potentials leading to cardiac arrhythmias. Consequently, this can affect peripheral and central perfusion that can affect all major organ systems in the body.

When the protein reaches the kidneys it causes a strain on the anatomical structures reducing its effectiveness as a filter for the body. The protein acts like a dam as it forms into tight aggregates when it enters the renal tubules. In addition, the increased intracellular calcium has greater time to bind due to the blockage allowing for renal calculi to form. As a result this causes urine output to decrease allowing for the uric acid to build up inside the organ. The increased acid concentration allows the iron from the aggregate protein to be released into the surrounding renal tissue. Iron then strips away molecular bonds of the surrounding tissue which eventually will lead to renal failure if the tissue damage is too great.

Mechanical Consideration

Muscle degeneration from rhabdomyolysis destroys the myosin and actin filaments in the affected tissue. This initiates the body's natural reaction to increase perfusion to the area allowing for an influx of specialized cells to repair the injury. However, the swelling increases the intracellular pressure beyond normal limits. As the pressure builds in the muscle tissue, the surrounding tissue is crushed against underlying tissue and bone. This is known as compartment syndrome which leads to greater death of the surrounding muscle tissue around the injury. As the muscle dies this will cause pain to radiate from the affected area into the compartmentalized tissue. A loss of range of motion from swelling will also be seen in the affected limb. Along with muscle strength weakness associated with the muscles involved from loss of filament interaction.

Dehydration is a common risk factor for exertional rhabdomyolysis because it causes a reduction of plasma volume during exertion. This leads to a reduction of blood flow through the vascular system which inhibits blood vessel constriction.

PREVENTION

Military data suggest lowering the risk of exertional rhabdomyolysis can be obtained by engaging in prolonged lower intensity exercise, as opposed to high intensity exercise over a shorter time period. In all athletic programmes, three features should be present;

- Emphasizing prolonged lower intensity exercise, as opposed to repetitive max intensity exercises.
- Adequate rest periods and a high carbohydrate diet replenish glycogen stores.
- Proper hydration will enhance renal clearance of myoglobin.

Also, exercise in above average temperature and humidity can increase risk for exertional rhabdomyolysis. Exertional rhabdomyolysis can be avoided by gradually increasing intensity during new exercise regimens, properly hydrating, acclimatization, and avoidance of diuretics during times of strenuous activity.

Supplementation

Sodium bicarbonate supplementation can reduce myoglobin, and prevent exertional rhabdomyolysis.

DIAGNOSIS

Exertional rhabdomyolysis, the exercise-induced muscle breakdown that results in muscle pain/soreness, is commonly diagnosed using the urine myoglobin test accompanied by high levels of creatine kinase (CK). Myoglobin is the protein released into the bloodstream when skeletal muscle is broken down. The urine test simply examines whether myoglobin is present or absent. When results are positive the urine normally obtains a dark, brown colour followed by serum CK level evaluation to determine the severity of muscle damage. Elevated levels of serum CK greater than 5,000 U/L that are not caused by myocardial infarction, brain injury, or disease generally indicate serious muscle damage confirming diagnosis of ER.

TREATMENT

After ER is diagnosed, treatment is applied to 1) avoid renal dysfunction and 2) alleviate symptoms. This should be followed by recommended rehabilitation programme, exercise prescription (ExRx). Treatment involves extensive hydration normally done through IV fluid replacement with administration of normal saline until CK levels reduce to a maximum of 1,000 U/L. Proper treatment will ensure hydration and normalize muscle discomfort (pain), flu-like symptoms, CK levels, and myoglobin levels for patient to begin ExRx.

Although sufficient evidence is currently lacking, supplementation with a combination of sodium bicarbonate and mannitol is commonly utilized to prevent renal failure in rhabdomyolysis patients. Sodium bicarbonate alkalizes urine to stop myoglobin from precipitating in renal tubules. Mannitol has several effects including, vasodilatation of renal vasculature, osmotic diuresis, and free radical scavenging.

RECOVERY

Before initiating any form of physical activity, the individual must demonstrate a normal level of functioning with all previous symptoms absent. Physical activity should be supervised by a health care professional in case of a recurrence. However, in some low risk individuals, supervision by a medical professional is not required as long as individual follows up with weekly check ups. Proper hydration prior to performing physical activity and performing exercise in cool, dry environments may reduce the chances of developing a reoccurring episode of ER. Lastly, it is imperative for urine and blood values to be monitored along with careful observation for redevelopment of any signs or symptoms.

The recovery programme focuses on progressively conditioning/ reconditioning the individual and improving functional mobility. However,

special considerations prior to participating in rehabilitation programme include the individual's 1) extent of muscle injury, if any 2) level of fitness before incident and 3) weight training experience. These special considerations collectively are a form of assessing the individual's capacity to perform physical activity, which is ultimately used to specify the ExRx design.

COSTS

Actual cost for this condition is unknown and also dependent of the level of the condition. In some cases ER can lead to acute renal failure and bring medical costs up due to the need for hemodialysis for recovery/treatment.

SPORTS AND ENVIRONMENT EDUCATION

Sports and Environmental Education explores the intersection of sports activities with environmental awareness and sustainability. It integrates principles of environmental science, ecology, and conservation with physical education and sports participation. This educational approach aims to instill in individuals an appreciation for the natural environment while promoting physical activity and health. Through sports and environmental education, participants learn about the importance of preserving natural habitats, conserving resources, and mitigating environmental impacts. They engage in outdoor activities such as hiking, camping, and nature walks, allowing them to connect with the environment firsthand while participating in physical exercise. Moreover, sports and environmental education often involve experiential learning opportunities, such as field trips to parks, nature reserves, or eco-friendly facilities. Participants may also take part in community-based environmental projects, such as tree planting, beach cleanups, or recycling initiatives, to actively contribute to environmental stewardship. Ultimately, sports and environmental education promote not only physical fitness and well-being but also environmental literacy and a sense of responsibility towards the planet. By fostering a deeper connection with nature and encouraging sustainable practices, this educational approach contributes to building a more environmentally conscious and socially responsible society. The book on Sports and Environmental Education provides insights into integrating environmental awareness and sustainability principles into sports activities, fostering a deeper connection with nature while promoting physical health and well-being.

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