Review

Psychology and socioculture affect injury risk, response, and recovery in high-intensity athletes: a consensus statement

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This consensus statement summarizes key contemporary research themes relevant to understanding the psychology and socioculture of sport injury. Special consideration is given toward high-intensity sport in which elite athlete training and performance efforts are characterized by explosive physical speed and strength, mental fortitude to push physical limits, and maximum effort and commitment to highly challenging goals associated with achieving exceptional performance. Sport injury occurrence in high-intensity sport is an adverse and stressful health event associated with a complex multitude of risks, consequences and outcomes. A biopsychosocial (Engel, 1980) view is advocated which contextualizes an understanding of the psychological aspects of sport injury in light of influential sociocultural, ethical, and biomedical issues. Outcomes related to athlete health and performance excellence are of equal importance in considering how psychological scholarship, expertise and services can be used to improve efforts focused on the prevention and management of sport injury among high-intensity athletes. The consensus view is that psychology and socioculture do affect sport injury risk, response and recovery in high-intensity athletes, and that continued efforts in psychological research and professional practice are needed to protect athlete physical and mental health and contribute toward performance excellence and career longevity.

Multidisciplinary efforts to understand sport injury risk, response, and recovery are at the forefront of those concerned with the health of high-intensity athletes. The unique demands of short duration high-intensity sport – such as heavy training volume, tedious and repetitious exercise, high pain tolerance, intermittent or continuous bursts of all-out effort, and contact with opponents or exposure to other physical hazards – are associated with sport injury and inter-related health risks like overtraining, burnout, and disordered eating. Scholarship blending the biological, behavioral, and social sciences – a biopsychosocial approach – advances our understanding of the complex etiology associated with sport injury, and the multitude of variables affecting response, recovery, and prevention. This paper overviews current literature outlining ways in which sport psychology and socioculture influence injury occurrence and response in high-intensity athletes contextualized within a broad biopsychosocial framework. Sport psychology is defined as the cognitions, affects, and behaviors of sport participants, and sport socioculture as the social and cultural structures, climates and processes influencing sport participants. In line with the ethic of elite sport organizations (e.g., International Olympic Committee, 2009), high-intensity athlete (a) health and (b) sport training and performance are both central outcomes of concern in assessing the roles of psychology and socioculture in sport injury.

Definition and surveillance considerations

Understanding the public health nature of the problem of sport injury involves definition and documentation. Although significant variability exists among definitions used for sport injury investigations, among their most common elements are that: (a) the injury was incurred while training for or competing in a sport, (b) medical care was sought, and (c) time loss from practice, training and/or competition occurred (Hootman et al., 2007). Current efforts advocate for broader, more inclusive definitions of sport injury that not only encompass time-loss based injuries, but also “transient” injuries that do not involve time loss (Hodgson et al., 2007). These injuries may not (a) result in time loss because of the normative culture of sport that expects athletes to “carry on” and train and compete even when injured, (b) be reported by athletes for fear of being denied a chance by medical professionals or coaches to train or compete, and/or (c) be intrusive enough in and of themselves to prevent participation,
but nonetheless still have undesirable consequences for health, performance, and further injury vulnerability. Causes and types of sport injury most broadly reflect a spectrum ranging from microtrauma (overuse, cumulative trauma over time) to macrotrauma (acute, specific traumatic event), and along with the structural damage common to both there may be a chronicity (unremitting or recurring) outcome being potentially characteristic of either (e.g., chronic tendinitis, chronic ankle sprains). These aspects of sport injury also have psychosocial underpinnings. For example, along with the exponential growth in numbers of intensely training youth athletes has come significant increases in microtrauma or overuse injuries; evidence suggests that youth athletes would otherwise rarely sustain these injuries if not being “trained” or “pressured,” often to excess, by someone such as a parent or coach. Current trends toward early and demanding sport specialization, overtraining and burnout, supervision by ill-trained coaches, and inadequate recovery intervals become normative experiences for many young athletes, and hold consequences for sport injury susceptibility and the associated health and performance outcomes.

The power and team sport nature of many high-intensity exercise sports also puts athletes at significant risk for macrotrauma orthopedic and brain injuries. Many of these injuries are artifacts of psychological and sociocultural processes that engrain a normative sport culture of ignoring pain and injury in quests for impression management (e.g., displaying toughness or earning respect) and performance success (e.g., a willingness to do whatever it takes to win, including sacrificing health). But the extent, severity, and lifespan health consequences of orthopedic damage, brain injury, and physiological excess exact an often heavy price for adherence to this normative socioculture. Chronicity outcomes have psychosocial implications for short-term impacts on such aspects as anxiety, confidence, and interpersonal relationships during the training and competing years, as well as post-career lifespan implications for factors such as quality of life and functional autonomy.

From a surveillance standpoint, in order to obtain accurate estimations of sport injury incidence and associated psychosocial causes and consequences a three element definition is suggested (Hodgson et al., 2007): sport injury incidence as (a) risk (number of athletes at risk to injured athlete ratio), (b) rate (incidence vs exposure), and (c) treatments (seeking medical care). The roles of psychology and socioculture are apparent in all of these, such as for (a) risk, which could be related to the nature of the sport chosen and the type of athlete personality that chooses it (e.g., high sensation seeking athletes and more risky sport choices and training behaviors), (b) rate, which is related to higher exposures associated with increased levels of training intensity and competitive play (e.g., a child athlete transitioning from a lower to a more intense talent development stage), and (c) treatments, which is related to the normative sport culture of athletes downplaying injury reporting so as to “stay in the game” (e.g., failing to report a concussion).

**Socioculture influences**

The normative culture of high-intensity sport is such that athletes learn through socialization experiences into the normative ethos of sport that the expectation is for them to be “tough” and play through pain and injury. Writings on the ethics of sport and sports medicine question whether participation and risk in sport as related to injury and other negative health outcomes is voluntary or coerced through social pressure mechanisms (Murphy & Waddington, 2007) such as organizational stress (Fletcher & Hanton, 2003), and raise issues related to the often incongruous ethics of health and sport performance (Mathias, 2005). The willingness to sacrifice ethics, health, or common sense in pursuit of high achievement in sport is highly visible through many actions of athletes such as willingness to use drugs to mask pain (e.g., Tricker, 2000). Playing through pain and injury has been the subject of study in a variety of high-intensity sports (e.g., gymnastics, see Nippert, 2005; rowing, see Pike & Maguire, 2003). Others have considered influences of sociodemographic factors such as gender (e.g., Charlesworth & Young, 2006) and age (e.g., Wiese-Bjornstal, 2003) on the willingness to train and compete while in pain or injured, physical activity risk taking and injury incidence (e.g., Kontos, 2004), response to sport injury (e.g., Henert, 2000), and differential incidence of injury (e.g., Renstrom et al., 2008).

Relevant also are examinations of the social norms of accepted behavior when participants sustain injury, such as the common practice of using bodies or other coverage to shield an injured player from spectator view, kicking the ball out of bounds in football/soccer so as to allow an injured athlete to receive medical attention (Hardman, 2009), or the demonstration of sportsmanship evident in the story of collegiate softball players carrying an anterior cruciate ligament (ACL)-injured opponent around the bases thus enabling her to score the winning run for her team (Lake, 2009). The counterpart socioculture and acceptability of aggressive and/or illegal behavior also relates to sport injury risk and response, with a significant number of athlete injuries related to illegal behavior (e.g., Collins et al., 2008), and athletes injured as a result of illegal behavior perhaps more likely to evidence certain emotional responses such as anger. Cross-sport and cross-cultural considerations have
received relatively minimal research attention, although anecdotal evidence and intuition would lead to the conclusion that the socioculture of different sports, countries and among varying ethnicities and philosophic traditions is influential in athlete injury; for example, the harsh and abusive training methods tolerated and used by coaches in certain sports and countries are physically and psychologically harmful to many athletes. The hopes and dreams of not only an athlete but an entire nation or culture can be dashed by an injury, such as the Achilles tendon injury that forced the withdrawal of national track and field hero Liu Xiang of the host Chinese team from the 2008 Beijing Olympics. These examples illustrate that a consideration of socioculture is central to understanding the chronology of sport injury psychology risks, consequences, and recoveries.

Pre-injury etiology, risks, and protections

A number of pre-injury conceptual models and frameworks continue to provide grounding for sport injury scholarship efforts including biomedically based models (Meeuwisse et al., 2007), psychosocial-specific models derived from the behavioral medicine literature (Andersen & Williams, 1988), and biopsychosocial views on a Sport Injury Risk Profile (Wiese-Bjornstal, 2009, see Fig. 1). Factors associated with risk, causality, and etiology of adverse health events like sport injury include the interaction of intrinsic biological and psychological characteristics and actions of the athlete with the extrinsic physical and sociocultural characteristics and events of the sport environments, and the associated implications for athlete behavior and risk vulnerability based on the resultant exposures, choices, and hazards. Actual injury occurs as a result of some proximate cause or “inciting event” (Meeuwisse et al., 2007) based on controllable behaviors and uncontrollable risks inherent in sport training and competition and the specific risk vulnerabilities of the involved athlete. In a continued quest to understand the etiology of sport injury and its prevention, not only should researchers consider the risk factors and the mechanisms of injury, but also the protective factors and “mechanism of no injury” (Meeuwisse, 2009); the “protections” likely include psychological and sociocultural protective factors (such as “proactive coping,” developing coping skills and resources as preventers of or buffers to life event stress) as well as biological and environmental ones.

With respect to specific psychosocial vulnerabilities to sport injury, one of the most consistent findings in the pre-injury (Williams & Andersen, 1998) literature surrounds life event stress. In line with the theoretical predictions of Andersen and Williams’ (1988) Model of Stress and Athletic Injury, major life event stress (defined as the perceived strain associated with major life event stressors such as starting at a new school or death of a family member), and in particular negative life event stress (the self-rated negative impact of these major events or stressors on personal strain levels), in most studies to date is predictive of sport injury occurrence (e.g., among female youth football/soccer players, see Steffen et al., 2009). This seems particularly apparent among those high major life event stress athletes who simultaneously self-report few coping skills or social resources to deal with the stress. Minor life event stress, studied under constructs such as daily hassles and everyday problems, has also been implicated in the relationship between accumulative small stressors and sport injury incidence, although it has received lesser research attention.

Other psychological factors have shown some research-based indication of their pre-injury influences on risk. Mood state is one example, with evidence relating pre-injury negative mood to increased injury incidence (e.g., Smith et al., 1997; Heniff, 1998), particularly with respect to high fatigue or lack of vigor. Personality (e.g., Deroche et al., 2007), risk behaviors (e.g., Brovard, 2008), and physiological indictors of allostatic load (e.g., Galambos et al., 2005) or excessive training behaviors (such as may be associated with perfectionistic, high achieving personalities common to high-intensity sport) are evidenced as injury risk factors. Clinical psychological issues such as eating disorders are risk factors for specific sport injuries like stress fractures (American College of Sports Medicine, 2007). Neurocognitive function,
such as is compromised by concussions and other brain injury (Jantzen et al., 2008), is another psychological factor with research evidence beginning to show connection to further sport injury through the resulting deficits in cognitive and motor function, neuromuscular control and coordination (e.g., as associated with non-contact ACL injury in Swanik et al., 2007).

**Post-injury response and outcome processes**

Post-injury response and outcome entails themes of stressors, coping, and adjustment, and of psychological and physical rehabilitation and return-to-play. Cognitive appraisal and stress process conceptual models such as the Integrated Model of Psychological Response to the Sport Injury and Rehabilitation Process (Wiese-Bjornstal et al., 1998) have consistent research support (e.g., Albinson & Petrie, 2003); the injury itself now becomes another stressor in the athlete’s life leading to process cycles of thoughts, feelings, and actions. Affecting these are moderators and mediators of response (Wiese-Bjornstal et al., 1995) including a variety of interacting personal and social factors such as age and gender (e.g., Wiese-Bjornstal, 2003), personality and individual differences (e.g., Brewer et al., 2007), injury history, and interactions with medical professionals (e.g., Bone & Fry, 2006).

Components of the post-injury psychological response process surround cognition, affect, and behavior; all are inter-related, cyclic, spiraling, dynamic, and recursive in their influences on each other and on short- and long-term outcomes through biopsychosocial pathways (see Fig. 2). Cognitive appraisal encompasses the many conscious assessments athletes make post-injury, such as about senses of self (e.g., Smith et al., 1993), identity, loss, optimism, challenge, or burnout (e.g., Cresswell & Eklund, 2006), and influence affect-related psychological responses of emotion and behavior, as well as physical recoveries. Cognitions such as attributions relate to rehabilitation and adherence behaviors (e.g., Brewer et al., 2000). Pain assessments and perceptions affect wound healing (e.g., McGuire et al., 2006) and are associated with speed of return (e.g., Berlin, 2001). Maladaptive catastrophizing of pain (e.g., Campbell & Edwards, 2009) is related to greater fear, anxiety and reports of pain and can hinder effective mental and physical recoveries. Baseline neuropsychological testing as an indicator of cognitive processing is used with increasing frequency as a proactive strategy for effective concussion management (Lovell, 2009).

Emotional or affective responses include mood disturbances such as depression (e.g., Appaneal et al., 2009), anxiety, low vigor, fatigue, grief (e.g., Evans & Hardy, 1995), and burnout. Fears of re-injury are common (e.g., Heijne et al., 2008), as are fears of pain and movement (“kinesiophobia”). Perceptions and emotions associated with stress, such as depression and anger (e.g., Gouin et al., 2008), negatively affect wound healing through psychoneuroimmunological pathways (e.g., Kiecolt-Glaser et al., 1998; Christian et al., 2006). Adding to the complexity, different types of injuries may

![Fig. 2. Dynamic biopsychosocial cycles of post-sport injury response and recovery (reprinted by permission of the author).](image-url)
elicit different emotional responses (e.g., Henert, 2000; Hutchison et al., 2009). With certain injuries such as traumatic brain injury, it is difficult to separate the psychological consequences associated with the injury physiology from interpretive emotional responses of athletes which are based more on cognitive appraisal and meaning (Putukian & Echemendia, 2003). Characteristics of the injury, like chronicity, are often tied to short- and long-term affective responses, such as in the case of recurrent concussions and long-term risk of depression (e.g., Guskiewicz et al., 2007). Emotional inhibition (Mankad et al., 2009) evidenced by some athletes is not surprising given the effects of socioculture on impression management and demonstrating toughness.

Cognitions and emotions influence behaviors (e.g., Haggar et al., 2005), such as attendance at rehabilitation, rehabilitation adherence (e.g., Pizzari et al., 2002), exercise dependence, suicidal behavior (e.g., Baum, 2005), NSAID and nutritional supplement use (e.g., Tricker, 2000; Gorsline & Kaeding, 2005), and steroid use (e.g., National Collegiate Athletic Association, 2001). Social support seeking behavior (e.g., Rees et al., 2003) and use of social support networks are demonstrated by some athletes, although factors such as perceptions of availability and comfort with help seeking (e.g., Hoar & Flint, 2008) influence the effectiveness of the behaviors in ameliorating distress and aiding recovery. Emotions can interfere with such behaviors; for example, depression is a risk factor for noncompliance with rehabilitation (e.g., DiMatteo et al., 2000).

Temporal aspects of post-injury psychological sequelae are variable and dynamic (e.g., LaMott, 1994; Morrey et al., 1999; Wiese-Bjornstal, 2004) (see Fig. 3). Stage or phase approaches are often used as a general rubric to understand changes over time in the components of cognition, affect, and behavior (Quinn & Fallon, 1999), while recognizing that thoughts, feelings, and actions (e.g., Schwenz, 2001; Tracey, 2003) and emotion representations (Haggar et al., 2005) are in fact quite dynamic over time. Mental models and itineraries are tied to successful outcomes and the restoration of healthy self-concepts over the course of the injury lifespan (Vergeer, 2006). Insight into specific phases (such as the return to sport phase, adjustment, reconciliation, evaluative, and immediate) provides landmarks (Flint, 2007) for future sport psychologists to orient frameworks for future research and practice.

**Fig. 3. Temporal flow of psychological response to sport injury lifespan (reprinted from Wiese-Bjornstal 2009).**

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Podlog & Eklund, (2006) and past research about effective means of managing psychological stress and recovery (Podlog & Eklund, 2007) informs sport practitioners about key aspects of phase transitions and return to sport processes.

**Psychological interventions**

Matching psychological intervention strategies to the specific needs of individual athletes (Smith et al., 1990) and integrating psychological recovery interventions with physical rehabilitation efforts and landmarks (Flint, 2007) provide logical and systematic conceptual orienting frameworks for future research and practice. Research evidence supports the effectiveness of a variety of psychological interventions both pre- and post-injury on outcomes of athlete health and performance. Pre-injury, prophylactic stress management programs have been associated with reduced sport injury incidences when used with global athlete groups (e.g., Perna et al., 2003) and with high-injury risk players specifically (e.g., Johnson et al., 2005; Maddison & Prapavessis, 2005). Post-injury, a variety of individual psychological interventions such as imagery (e.g., Driediger et al., 2006), relaxation (e.g., Johnson, 2000), and goal setting (e.g., Evans & Hardy, 2002) have been advocated and supported as of benefit to athlete recoveries through outcomes like improved rehabilitation adherence and efficacy. Interventions often-times involve multiple components in combination or sequence, generally to good effect.

Interpersonal interventions such as solution-focused brief counseling (e.g., Gutkind, 2004) and social support (e.g., Bianco, 2001; Bianco & Eklund, 2001) from coaches (e.g., Malinauskas, 2008) and teammates (e.g., Corbillion et al., 2008) also appear efficacious in their use within sport injury contexts. The positive health effects of social contact are well-supported in many contexts, particularly in stressful circumstances. An understanding of biopsychosocial interactions reveals that the stress system is a hormone-based system, and biological variables such as hormones affect neurocognitive function and human social behavior. Recent evidence on hormones and behavior would support that hormones involved in bonding, such as social bonding through support, are associated with reductions in stress and anxiety (e.g., Brown et al., 2009) and as such one would expect similar benefits in sport injury contexts.

**Psychoeducational prevention and management efforts**

An understanding of the evidence bases and real-world implications of sport injury prevention measures and strategies are fundamental to their
effectiveness (Finch & Donaldson, 2009). Comprehensive conceptual models of sport injury prevention (e.g., van Tiggelen et al., 2008) have incorporated an understanding of factors such as attitudes, behaviors, motives, and culture into their approaches to preventions based on evidence suggesting that such efforts rely on psychology and socioculture for their effectiveness and implementation. Psychosocial educational efforts lay at the forefront of advocating for behavior change, through the psychology of behavior modification (e.g., Dvorak, 2009) in changing risk-taking behaviors and improving compliance with prevention protocols, and broader integrated and multidisciplinary efforts (e.g., Timpka et al., 2007).

Multiple examples of such are evident in the research literature. Engaging athletes in neuromuscular interventions for injury prevention such as ACL (e.g., Hewett et al., 2006) or ankle sprain (e.g., Hrysomallis, 2007) involves education and cognitive-emotional “convincing” of athletes, coaches, and trainers of their efficacy and worthiness as a use of valued practice time. Convincing athletes to wear protective gear such as that documented to reduce injury risk (e.g., eyewear in squash, Eime et al., 2004; protective headgear in junior cricketers, Shaw & Finch, 2008) poses similar challenges in areas of changing attitudes, behaviors, and microcultures. Mandating protective equipment and other preventive measures, however, raises considerations of “risk compensation” (Hagel & Meeuwisse, 2004), in which reducing one set of risks merely creates another (such as high sensation seeking children’s tendency to engage in more risky physical activity behavior when wearing safety gear than when not, Morrongiello & Lasenby-Lessard, 2007); the equipment disrupts the risk “homeostatis” (van Tiggelen et al., 2008) thereby contributing to risks of another kind.

Coach interventions, such as reducing advocacy for or limiting tolerance of excessively risky behaviors, overtraining, overestimations of ability, and improper mechanics (e.g., Rebella et al., 2008) are central to prevention efforts (e.g., Juhn et al., 2002). Monitoring stress and recovery variables and encompassing psychometric data (e.g., Määstu et al., 2005) along with biochemical and performance parameters as indicators of overtraining and burnout are other examples of prevention efforts under investigation. Careful consideration of the advisability of early sport specialization, intensive training and excessive focus on early talent development, multi-sport/season competition, and limited rest or recovery time, by parents, coaches, and athletes has the potential to contribute to injury prevention efforts among developing young competitors.

Post-injury, management efforts, and the prevention of psychological complications associated with sport injury would benefit from mental health resource availability (e.g., Wiese-Bjornstal, 2009). Injury is among the most common “presenting problems” when athletes seek help and utilize team assistance programs (e.g., McDuff et al., 2005). Considering that for many athletes the most difficult step is admitting that they need help, research evidence would justify having psychological assistance proactively ready and available to injured athletes seeking help. Philosophical interventions (e.g., Shaffer & Wiese-Bjornstal, 1999) strive to prevent injury or aggravation of existing injury through modifications in the prevailing ethos and norms of expected sport attitudes and behaviors.

Perspectives

High-intensity sport injuries are stress and trauma-related; in addition to the more common causality attributions to mechanical and physiological stressors and traumas, there is significant evidence to demonstrate that psychological and sociocultural stressors and traumas are implicated in their etiology as well. Inherent in evaluating the high-intensity sport physical stressors (such as repetitive microtrauma, growth tissue compromises, and risky exposures) are psychological stressors (such as life event stress, burnout, and under-recovery) resulting in less than optimal attention and physiology manifested in injury risk factors such as tunnel vision, mental fatigue, and muscle tension, and social and ethical stressors that lead athletes toward misuse, abuse or overuse of their bodies and minds. Once sport injury occurs, it becomes yet another stressor that athletes must manage during their recovery, rehabilitation and return efforts: efforts also affected by psychology and socioculture through such mechanisms as cognitive, emotional, and behavioral response cycles and the normative attitudes, pressures and expectations for athletes to continue to train and compete when injured. Examining literature from sports medicine, psychology, and sport science with a biopsychosocial view leads to a better understanding of the integrated nature of the mental and physical health of injured high-intensity athletes and best practices for psychological intervention, prevention and management efforts, effective recoveries, successful sport performance, and healthy futures.

Key words: sport injury psychology, sports medicine, biopsychosocial, athlete health, rehabilitation, vulnerability, cognitive appraisal, emotion.

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References


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