

Advancing Research on Psychological Responses to Athletic Injury: Considering the Role of Emotion Regulation

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Abstract: This narrative review explores the psychological responses of injured athletes and, more specifically, the emotion-regulation processes that may occur within these athletes. The main guiding questions in this narrative review were: 1) how do current cognitive appraisal models compare to previous stage models of adjustment when examining athletic injury; 2) what characteristics of different cognitive appraisal models are best suited for specific injury circumstances; and 3) how can these cognitive appraisal models advance research on the psychological response to athletic injury? A review of the literature was conducted to address these questions across multiple sports and contexts. Overall, emotion-regulation is a reoccurring theme in sport and performance psychology that focuses on injury. Current literature suggests that while early stage models of adjustment may have offered clinical guidelines through recognition of pathological grief reactions, cognitive appraisal models offer a stronger evidence-based approach to understanding the emotion-regulation mechanisms behind athletic injury responses.

The results of this literature review provide several recommendations and potential outcomes for future research. First, further investigation of blended emotion-regulation strategies, such as polyregulation¹, can equip athletes with more versatile means of navigating complex emotions and situations. Second, there is a need to investigate how emotional suppression can significantly reduce athletic performance and why emotional suppression is regularly expected in competitive sporting environments². Third, the ability and consequences of external emotion-regulation must be considered, such as coaches and sports medicine professionals helping to regulate an athlete's fears, anxiety, or sadness in response to injury. Lastly, if the underlying mechanisms of emotional-regulation are better understood, emotion-regulation interventions can be tailored to populations with varied conditions, such as athletes that have experienced sport-related concussion or mild traumatic brain injury.

Introduction

The historical view in the psychological sciences is that emotional responses to tragic events, such as severe athletic injury or terminal illness, follow somewhat predictable stages toward an eventual completion³. However, over the past two decades, research has challenged this assumption by showing that emotions may be formed not only on the basis of feelings (affect) but also by perception of content (cognition), and emotional responses do not follow uniform tra-

jectories across individuals⁴. The concepts of affect- and emotion-related research are similar in that they are sometimes referred to as *affective phenomena*⁵ and are often used interchangeably. However, more recent distinctions have emerged that allow researchers to work within a converged classification system. Affect-related research refers to simple primitive non-reflective feelings (e.g., pleasure and displeasure, tension and relaxation), while emotion-related research refers to a complex set of interrelated sub-events related to a specific event or object⁶. Using this frame-

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work, researchers have been able to conduct more in-depth studies of emotional responses. The topic of psychological aspects of athletic injury has emerged rapidly in sport psychology research⁷. In recognition of the emotional processes involved with these injuries, the primary purpose of this paper is to review research on two cognitive appraisal models as they relate to athletic injury: Andersen and Williams' model of stress and athletic injury^{8,9} and Gross' model of emotion regulation^{10,11}. These particular models were chosen because the former represents a time-tested model in the sport psychology literature, while the latter offers a renewed, in-depth examination of emotions and emotion regulation, accompanied with encouraging directions for further study. This review will compare these cognitive appraisal models to an earlier stage model of responses to injury, provide supportive research, and ultimately argue that cognitive appraisal models offer a stronger evidence-based approach to understanding the emotions associated with athletic injury than stage models. In particular, Gross' extended process model of emotion regulation¹¹ offers several promising avenues for future research.

Models of Emotional Response to Athletic Injury

Despite being physical in nature, athletic injuries also have psychological effects. Existing literature demonstrates that both physical and psychological factors can significantly impact athletic injury susceptibility, injury occurrence, cognitive appraisals of injury, emotional and behavioural responses to injury, injury recovery, and return to sport¹². In this section, the Kubler-Ross 5-stage model of emotional adjustment¹³ will be examined and applied to athletic injury, along with Williams and Andersen's model of stress and athletic injury⁹. These models have been commonly used to examine psychological responses to athletic injuries³. Following this review, Gross' extended process model of emotion regulation¹¹ will be

explained, and suggestions proposed for integrating emotion regulation strategies with existing models of psychological responses to athletic injury.

Stage Models

Stage models of adjustment to athletic injury propose that injured athletes proceed sequentially through a series of stages on-route to recovery³. Early researchers studying the psychology of athletic injury operated on the assumption that parallels existed between the responses of terminally ill patients and injured athletes^{14,15}. More specifically, these stage models assume that the relative or absolute disability associated with [athletic] injury served as a form of loss of self¹⁶.

The Kubler-Ross stage model¹³ assumes that an individual experiencing a traumatic event, such as an athlete sustaining a serious injury, experiences the following five stages: denial, anger, bargaining, depression, and acceptance on the way to positive adjustment. For example, an injured athlete may deny their level of pain or the severity of their injury until being formally diagnosed by a medical professional. Then, according to the stage model, that athlete is likely to experience anger about their situation and attempt to bargain with themselves, their family, or their coaching staff to better their position or outlook on their situation. This bargaining may take the form of promising strict rehabilitation adherence to coaches and physicians or leveraging personal relationships with friends or family to gain support. However, if bargaining is unsuccessful, the injured athlete may experience depression before reaching an acceptance of their injury and its ramifications.

Based on this stage model approach, researchers used a Q-sort instrument administered by Kubler-Ross-trained graduate students and found the validity of the Kubler-Ross theory to be ambiguous and unlikely to be supported when subjected to further empirical validation¹⁷. These findings supported earlier

criticisms of the Kubler-Ross model that found the emotional response processes to be less rigid and should even be considered stage-less¹⁸.

One of the early intents of stage models was to provide guidelines for physician recognition and management of pathological grief reactions¹⁹. However, these views lack empirical support and incite criticisms of over-generalization³. Through an exhaustive literature review, researchers concluded that there is no substantial evidence of consensual stage-like patterns of responses to negative life events²⁰. The limitations of stage models, particularly the Kubler-Ross model, have not been thoroughly acknowledged in the studies that use them and therefore, these models should be viewed as an incomplete taxonomy^{21,22}. Though researchers argued the stages of the Kubler-Ross model could be interpreted non-sequentially, this view contradicts Kubler-Ross' and Piaget's²³ assertion that if stage models were not sequential and discrete, they had little predictive value and utility²⁴.

Williams and Andersen's Model of Stress and Athletic Injury

Williams and Andersen introduced a model of stress and athletic injury to provide a broad theoretical framework in the area of athletic injury research⁸. Their model has been used in the prediction and prevention of stress-related injury by accounting for variables related to cognition, physiology, attention, behaviour, social, and stress history. The core of Williams and Andersen's model states that potentially stressful athletic situations feed into an internal stress response that includes bi-directional interactions between one's cognitive appraisals of the situation and the physiological and attentional changes taking place⁹. Though injury follows the stress response, the cognitive appraisals, physiological, and attentional changes, can be influenced by a number of factors including personality, history of stressors, and coping resources.

The last area of research informing the model is the implementation and assessment of interventions that may lessen the stress response and reduce injury vulnerability in athletes. The model suggests a two-pronged approach to these interventions, with one addressing the cognitive appraisals of athletic injury and the other modifying the physiological and attentional aspects of injury.

The main hypothesis stemming from Williams and Andersen's model of stress and athletic injury is that athletes in stressful situations are more likely to negatively perceive stress if they have a strong history of stressors, have personality characteristics that magnify their stress response, and perceive themselves to have few coping resources to deal with the stressor²⁵. According to the model's initial claims, an athlete's perception of stress in a given situation will influence their likelihood of injury²⁶. Perhaps the most functional element of Williams and Andersen's model of stress and athletic injury is its explanation of the relationship between psychology and the occurrence of athletic injury, as well as the value of psychological interventions in the prevention of injury and for coping with athletic injury.

Using Williams and Andersen's model of stress and injury to predict how the stress response intervenes in the relationship between psychosocial variables and athletic injury, researchers examined the predicted mechanisms by which stressful life events may increase the likelihood of athletic injury²⁵. Specifically, the authors sought to investigate the relationship between athletic injury and the mediating effects of negative life events, peripheral visual narrowing, and coping resources on athletic injury. Researchers administered surveys to 171 varsity soccer players to measure life event stress, perceived stress, competitive state anxiety, social support, psychological coping skills, and peripheral vision²⁵. Results showed that as an athlete's total negative life events stress increased, so did their likelihood of becoming

injured. Furthermore, an increase in psychological coping skills was associated with a decrease in the likelihood of athletic injury.

According to the researchers, the coping resource variable has three components: general coping skills, social support systems, and stress management skills²⁵. Although the Williams and Andersen's model of stress and athletic injury does not predict a direct relationship between coping resources and athletic injury, the researchers argued that if the proposed mediated relationships exist, there should be significant direct effects between the variables²⁵. These findings support earlier research reporting that athletes with greater overall coping resources have fewer injuries than athletes with fewer coping resources^{27,28}. Overall, the results provided evidence for the mediating effect of negative life event stress and coping resources on athletic injury occurrence²⁵.

In another example of research using Williams and Andersen's model of stress and injury, interrelated studies were conducted to examine the ability of life stress, personal psychology, coping resources, social support, and history of stressors to predict athletic injury in 470 New Zealand rugby players²⁹. Results from their first study supported earlier research³⁰, suggesting when social support and coping are considered to be separate, negative life events accounted for minimal (up to 5%) injury variance²⁹. However, negative life events had a larger effect (10 to 15%) on injury variance for athletes low in social support and high in avoidance- or problem-focused coping²⁹. These results suggest that athletes low in social support, high in avoidance- or problem-focused coping, as well as an injury history were most likely to miss training or competition time due to injury, as well as sustain more injuries than athletes with the opposite profile. Although the Williams and Andersen model proposes a relationship between the stress response and occurrence of injury, it does not specifically refer to time missed as an injury outcome.

The second study from the same authors worked on the assumption of the Williams and Andersen stress and injury model that in order to prevent injuries caused by stress, an intervention would need to focus on altering the cognitive appraisal of potentially stressful events and modifying the physiological and attentional aspects of the stress response²⁹. Noting that only a limited number of studies have offered experimental evidence for preventing or reducing athletic injury through a cognitive behavioural stress management (CBSM) approach³¹⁻³³, this study sought to examine the effectiveness of a CBSM intervention in athletes identified in the first study as having an at-risk psychological profile to injury. Results supported a reduction in injury vulnerability for athletes who completed a 6-session CBSM intervention, as well as a reduction of time missed due to injury in the intervention group compared to the control group²⁹. Overall, researchers found strong empirical support for the Williams and Andersen model and demonstrated that social support, the type of coping, previous injury, and competitive anxiety interacted together to maximize the life stress and injury relationships in their first study²⁹. Furthermore, their second study found that a CBSM intervention was effective in reducing injury among athletes identified as having an at-risk psychological profile. Taken together, both studies underscore the importance of psychological factors and emotion regulation in response to athletic injury.

Although it was introduced over 20 years ago, the Williams and Andersen's model of stress and athletic injury remains one of the most dominant frameworks guiding current research in the psychology of athletic injury²⁶. One of the reasons for the model's durability is its revisions addressing critiques that the original model centered around the psychological antecedents of athletic injury³. In an effort to represent current empirical trends, an updated model was released by the same authors 10 years later and includ-

ed more dynamic relationships between personality and stress history, as well as stress history and coping⁹. Changes to the model also included a more concise explanation of the prediction and prevention of acute injuries, which is critical, as acute injuries likely involve different stress-response processes²⁶. Despite the strengths of the Williams and Andersen model of stress and athletic injury, our critique is that it does not adequately consider the role of emotions and emotion regulation in the response to athletic injury. As such, integrating perspectives of emotion and emotion regulation in models of psychological response to athletic injury may provide valuable context to understand how athletes cope with their emotions during the course of their injury, rehabilitation, and return to play.

Gross' Extended Process Model of Emotion Regulation

One model that does account for the emotions experienced during stressful events is Gross' extended model of emotion regulation¹¹. Gross defined emotion regulation as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions"^{10 (p275)}. Gross' initial model suggested that emotions may be regulated at the emotional cue input or output and that certain cognitive strategies could reduce stress responses, and in turn, benefit psychological health¹⁰. As an overview, Gross' model distinguished five emotional regulation processes that encompass specific strategies that can be used to control emotions³⁴. Four of these five processes (situation selection, situation modification, attentional deployment, and cognitive change respectively) are antecedent-focused, while one (response modulation) remains a response-focused process¹⁰.

The key difference between antecedent-focused and response-focused processes is their timing. Specifically, *antecedent-focused* emotion regula-

tion processes start from the position that individuals are unable to avoid or change the emotion-eliciting experience, and therefore deal with the experience by means of directing attention elsewhere via attentional deployment or actively interpreting the situation differently via cognitive change³⁴. As an example of antecedent-focused regulation using attentional deployment, researchers asked study participants to "quickly think of something else"^{35(p1268)} in order to deal with the anxiety of an impending electrical shock. While showing an example of cognition, Gross advised participants to "try to think about what you are seeing objectively ..."^{10 (p227)} in an attempt to elicit cognitive change and decrease disgust in a group viewing a gruesome medical procedure. Conversely, *response-focused* processes occur after the initial emotional responses are generated and typically refer to efforts to suppress emotional experience and/or expression³⁴. For example, Gross' experiment asked participants to "try to behave in such a way that a person watching you would not know you were feeling anything"^{10 (p227)}.

Research examining the two forms of emotion regulation, suppression and cognitive reappraisal, aims to understand how each strategy differs in affective, cognitive, and social consequences. To test the distinction between antecedent-focused and response-focused emotion regulation, Gross showed over 120 participants a gruesome amputation video while measuring and recording participants' experiential, behavioural, and physiological responses to the film¹⁰. Participants were assigned to groups and asked to either: (1) think about the film in a way that would make them feel nothing (reappraisal, a form of antecedent-focused regulation), (2) behave in a way that portrays they are feeling nothing (suppression, a form of response-focused regulation), or (3) watch the film without instruction (control group). Key findings from this study were that when compared to reappraisal, emotional suppression decreased the ex-

pression of emotions (i.e., how emotions appeared to affect someone) but did not lead to decreased *experienced* behaviour (i.e., how emotions actually affected them). This means that the majority of participants who were able to appear unaffected by the film still experienced negative emotions.

In terms of affect, the participant group practicing emotional suppression elicited significantly greater physiological changes, measured by cardiovascular and autonomic nervous system activation (i.e., increased heart rate), in comparison to the group that used the cognitive reappraisal strategy to successfully decrease their negative psychological experience while watching the film^{10,36,37}. Cognitively, participants who used the emotional suppression strategy showed a decline in their performance of a memory task, whereas those who used the cognitive reappraisal strategy did not¹⁰. Experimental studies have shown that emotional suppression imposes a strong cognitive load on individuals to the extent that attention, engagement, and social interaction suffers^{4,38}. Lastly, in terms of social consequences, emotional suppression negatively interferes with social interactions because expressive suppression, as seen in the study participants in Gross' study¹⁰, may lead to decreased positive emotions but does not decrease the actual negative experience^{34,39}. Ultimately, emotional suppression is likely to negatively interfere with social signalling processes that largely determine if social support from others is received.

More recently, Gross presented the extended process model of emotion regulation with the purpose of reviewing evidence that different emotion regulation strategies have different consequences¹¹. Specifically, the model considers emotion regulation to be a type of valuation which discriminates what is "good for me" and "bad for me"⁴⁰, and further distinguishes three emotion regulation stages: identification, selection, and implementation¹¹. Gross asserts that these three emotion regulation stages extend

over time and are functionally linked¹¹.

An example of an injured athlete using the first-level valuation system of identification could include acknowledging their frustration of having to stop playing, determining whether the value attached to the emotion is positive or negative (frustration being negative in this example), and activating a goal to regulate those emotions. The second-level valuation system of selection is where potential emotion regulation strategies are represented. For example, the injured athlete may prefer cognitive reappraisal to distraction when emotion intensity is low, but that same athlete may prefer distraction to reappraisal when emotion intensity is high, where reappraisal is less effective than distraction^{41,42}.

The final-level valuation system in Gross' extended model is the implementation stage, where the task is to translate the general strategy explored in the previous stage into tactics that are appropriate to the given situation one is in¹¹. For example, if an injured athlete chose cognitive reappraisal as an emotion regulation strategy, they may frame their injury as a time to rest and heal their entire body in order to come back stronger, rather than framing their injury as a pathway to muscle atrophy and a loss of coordination. Overall, Gross' extended model suggests both emotion generation and emotion regulation have valuation systems at their core that consist of perception-valuation-action cycles, and emotion regulation may be conceived in terms of interactions among these valuation systems¹¹. Furthermore, when applied to and considered with Williams and Andersen's model of predicting athletic injury, Gross' extended model of emotion regulation offers a more dynamic view that better captures fluctuations in emotions during athletic injury.

Applying Models of Emotional Regulation: Considerations for Future Research

There are a number of key recommendations and potential outcomes for future investigations of psychological adjustment to athletic injury. These future research considerations, influenced by Gross' growth points for the field¹¹, include blending and sequencing emotion regulation strategies, focusing on long-term consequences of emotion suppression, focusing on extrinsic emotion regulation, and studying the neural basis of regulating emotions.

Blending multiple emotion regulation strategies, known as polyregulation¹, is informed by fundamental emotion regulation processes (e.g., Gross' extended model of emotion regulation) and expands on those processes by using multiple approaches within different regulation stages or time courses. For example, polyregulation is often used during more intense stressful situations where individuals may not be able to successfully down-regulate negative emotions using one specific strategy, and therefore attempt other strategies as a compensatory mechanism¹. Polyregulation has been shown to be an approach so common that most researchers cannot help but find evidence of emotional polyregulation, even in instances where study participants are explicitly asked to use only one strategy⁴³. A seminal study from Folkman and Lazarus found that participants used more than one regulation strategy 98% of the time when they were asked to choose from a list of 68 possible regulation tactics⁴⁴. The frequency and prevalence of emotional polyregulation seems to warrant further investigation in identifying what combination of regulation strategies work best, and what personality factors may influence these outcomes.

Based on the findings of Gross, future research could also be well served exploring the long-term performance and health consequences of these cognitive stages for cumulative effects, particularly the consequences of emotional suppression. For example, while examining the effects of emotional regulation on familiar physical endurance tasks, researchers

found emotional suppression resulted in slower cycling performance, lower power outputs, and elevated rates of perceived exertion⁷. Given that sporting organizations regularly impose chronic expectations and requirements for emotional suppression by athletes², further inquiry into how emotional suppression negatively impacts sport performance and physical well-being would be useful in helping injured athletes feel supported in their recovery by offering an alternative to suppressing their emotions.

Examining extrinsic emotional regulation could also prove valuable in advancing research in athletic injuries. Extrinsic emotion regulation refers to efforts to regulate other individuals' emotions, such as an athletic therapist or physiotherapist attempting to help regulate an athlete's fear, anxiety, or sadness in response to athletic injury⁴⁵. Although intrinsic and extrinsic emotion regulation are interconnected, not all extrinsic emotion regulation is motivated by intrinsic needs⁴⁶. For example, a coach or team captain may attempt to regulate another player's emotions for their own sake, such as maintaining control of team morale. In this way, extrinsic emotion regulation can be regarded as similar to the concept of interpersonal emotion regulation^{47,48}, where individuals can influence one another to improve or worsen affective and motivational outcomes⁴⁹. Extrinsic emotion regulation can have particular relevance to sport and exercise psychology as coaches and athletes often attempt to regulate each other's emotions^{49,50}.

Finally, if researchers are better able to understand the underlying mechanisms of emotion regulation, better potential targets for intervention can be identified. The impact of brain damage on emotion regulation has been studied to some extent^{51,52}, but further studies examining how injured athletes, particularly sport-related concussion patients, regulate emotions could present an exciting avenue for sport psychology research.

Conclusion

Emotional regulation surrounding athletic injury is a rapidly growing field built on the venerable foundations of self-regulation researchers⁵³, as well as stress and coping theorists^{44,45}. In the sport psychology literature in particular, a number of emotion regulation strategies have been identified in relation to athletic injury. This paper compared Williams and Andersen's model of stress and athletic injury and Gross' extended model of emotional regulation to the well-cited 5-stage Kubler-Ross model of emotional adjustment, and found that the two cognitive appraisal models (i.e., Williams & Andersen model and Gross model) offered a stronger evidence-based approach to understanding the psychological mechanisms behind athletic injury responses. Kubler-Ross has been credited for bringing significant changes in conceptualizing the ways in which many people psychologically respond to tragic events²², however, more appropriate theoretical models should be used to analyze emotional processes involved in athletic injuries.

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