

The Effect of Psychological Factors on Athletic Injury and Recuperation

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Abstract

In spite of the evident benefits of exercise on health, it is also an irrefutable fact that exercise and injury come together as well.

Over a million injuries occur each year in the United States alone, and that only counts collegiate sports; should we factor in high school athletics, professional leagues, gyms and street athletes, the incidence rate would be astounding, affecting millions of Americans.

Prior research shows that injury comes from training, more than from competition. It also shows that athletes keep on training in spite of their injuries because of the pressure to compete. This project shows that psychology plays a negative role in the rate and incidence of injury; but that a positive disposition on the part of the athlete goes on to contribute in the injured athlete's recovery.

Coaches and sports federations must address the psychological factors that adversely affect injury and positively affect recovery as much as they now focus on the medical aspects of injury and recovery.

Keywords: Injury, Recovery, Sports, Athlete, Athletics, Psychology, Psychological Factors, Attitude, Moderator, Coach, Stress, Pressure, Competition...

Introduction

Warburton, Nicol and Bredin confirm that there is irrefutable evidence of the effectiveness of regular physical activity in the primary and secondary prevention of several chronic diseases like cardiovascular illnesses, diabetes, cancer, hypertension, obesity, depression and osteoporosis, and premature death [1]. They report that increased levels of physical activity and fitness were found to have reduction effects in relative risk of death, from original studies, going from 20%–35% in older studies to 50% in the most recent ones. On the other hand, physically inactive middle-aged women (engaging in less than 1 hour of exercise per week) experienced a 52% increase in all-cause mortality, a doubling of cardiovascular-related mortality and a 29% increase in cancer-related mortality compared with physically active women.

Indeed, it has been scientifically proven that physical exercise is vital for a healthy lifestyle [2]. It acts as a therapeutic agent, preventing numerous illnesses. However, despite its potential, exercise, especially if extreme or intense, as in high performance athletics, may exceed the endogenous antioxidant system's capacity and often results in

oxidative stress and injury. These are the main reasons why athletes prematurely abandon a sports career, spend long periods away from training and competition, or experience a decline in athletic performance, even causing functional limitations later in life.

On the other hand, as well, athletic injuries are also an unavoidable side effect of sport participation [3]. While most can be managed with little or no disruption in training or competition, some impose substantial physical and mental burden. For some student-athletes, in particular, the psychological response to injury triggers serious mental health issues as depression, anxiety, disordered eating, and substance abuse.

Over 1.05 million injuries occur during any year, according to National Collegiate Athletics Association statistics. The NCAA reports that more injuries occur from practice than from competition, for all sports, with the exception of men's ice hockey and baseball [4]. However, injuries incurred during competition tend to be more severe than those suffered during practice, requiring an average of over seven days to return to full participation, than those suffered during practice.

Review of the Literature on Athletic Injury

The vast majority (81.5%) of martial arts injuries also occur during training, said Lystad, Graham and Poulos [5]. The training injury

incidence was estimated to be 1.6 per athlete-year, 11.8% per training-session, and 7.0% per hour of training. The severity and pattern of training injuries were the same as for competition injuries. Approximately 60% of training injuries required some kind of treatment. Not only overuse, but aging, will cause damage to articular cartilage, producing pain, loss of joint mobility, and eventual damage to the bone [6].

However, it is not unusual for athletes to decide to participate in important competitions, despite the pain of an ongoing injury [7]. A study among Brazilian wrestlers, recently conducted, evaluated the degree of confidence exhibited by injured athletes concerning their participation in a major competitions, and to profile the musculoskeletal injuries. 12.8% of the injured athletes sought medical care, of these 42.7% had been injured for periods longer than two months. The mean score on the Injury-Psychological Readiness to Return to Sport scale, as cited by the authors, was 52 points. The authors observed that some athletes participating in a major competition with existing musculoskeletal complaints were worried about their injuries affecting their well-being and performance.

Another study involved dancers; 79% had one or more injuries [8]. The ankle (31%) and foot (25%) were the most frequently injured. 63% of the injured dancers took over 21 days to recover. Effective interventions exist that can reduce the incidence of ankle injury without critically impairing performance [9].

Psychological research has shown a connection between negative perceptions of emotion, emotional suppression, and athletes' subsequent disregard for their health [10]. Elite sports, in particular, can be extremely stressful for most athletes, provoking emotions that can have explosive reactivity such as high levels of anxiety that can and do have negative effects on performance. Clement, Granquist and Arvinen-Barrow reported that stress/anxiety, anger, and treatment adherence problems were rated as the primary psychological responses athletes may present upon injury [11]. Adherence and having a positive attitude were identified as key determinants in defining athletes' successful coping with their injuries. The top three selected psychosocial strategies were keeping the athlete involved with the team, using short-term goals, and creating variety in rehabilitation exercises.

Methodology

From the review of the literature, it seems evident that athletic injury should not be looked at only from a physiological or anatomical angle, as psychological considerations come to moderate in the model Attitude > Injury > Attitude > Treatment > Recovery.

Mann, Grana, Indelicato, O'Neill, D. F. and George indicated that a survey of Sports Physicians revealed that the most common psychological factors affecting athletic injury were stress/pressure, anxiety, and burnout [12]. Patterson, Smith, Everett and Ptacek, and Lee Sinden, reaffirmed the effect of stress [10, 13]. Hinkle centered just on that factor alone [14]. So we focused on stress > pressure to compete > anxiety as they relate to injury. Burnout, we must point out, is not related to our study.

We posit the following hypotheses:

Ho: psychological factors have no influence on the rate of athletic injury and recuperation.

H1: psychological factors moderate the rate of athletic injury and recuperation.

To prove or disprove our hypotheses, we held a series of interviews with top athletes in different sports, and coaches from our National Team, to pinpoint the role of psychological considerations in injury, recuperation, the athlete's wellbeing, and his or her successful return to practice and competition. Nila Jeyapriya, a USA National Karate Federation athlete, expressed her opinion about the relationship between the stress of training and competition, saying that it "was evident (by) watching the senior US Team camp in my dojo. All the athletes were tired and stressed after an intensive camp, and they wrapped up with full intensity kumite. Within an hour, (something) like five injuries happened, most serious being Adrian tearing his ACL bad enough not to compete in Senior PKF..." Another karate athlete from the Venezuelan Karate Federation's National Team answered the question about training in spite of being injured simply by simply saying "Always!"

The World Shotokan Karate-do Federation and its Foundation were so interested in the study that they suggested a survey to generate statistically significant data. Accordingly, and considering that we have been involved in competitive athletics for 16 years, being seriously injured several times, searching for better answers, we posted a Google® survey on our social media, based on the criteria used in the aforementioned studies (<https://goo.gl/forms/0ONaupVI2AXbrcZs1> enclosed), and obtained 76 (N) valid responses from athletes. A few responses showing partial answers were excluded to avoid dealing with missing data. The responses were run initially through Factor Analysis using SPSS to identify latent factors and to reaffirm the constructs. Linear regression was then used to define a simple model, following Cohen's recommendations of simplicity [15]. Lastly, Amos was used to apply Confirmatory Factor Analysis to prove the hypothesized cause and effect relations.

Results of the Study

Out of 76 valid responses, 57% reported having been injured seriously, 84% of them continued to train nonetheless, and 68% went on to compete while injured; 71% consulted a doctor but only 11% saw a psychologist, though 86% of them indicated their attitude contributed positively to their recuperation. Respondents tend to agree that more pressure leads to more stress and injury (3.72 on a scale of 5.00), that competitive anxiety leads to injury (3.45/5.00), and that, regardless of that, they feel pressured to keep training (3.15/5.00).

As seen on Table 1, four components emerged from Factor Analysis: One relating injury and pressure to keep training, another related to actions and attitude, a third one combining training while injured and competing while injured, and a last one relating to consulting a psychologist.

Table 1: Component Matrix^a

	Component			
	1	2	3	4
Q1: Ever injured? Y1	.698	-.263	-.228	-.210
Q2: Trained injured? Y1	.498	.029	.668	.239
Q3: Comp. injured? Y1	.320	-.240	.668	.119
Q4: Consult MD? Y1	.497	-.606	-.178	-.199
Q5: Psych? Y1	.021	-.078	-.392	.780
Q6: Attitude effect? +0	-.384	.618	.260	-.011
Q7: Intensive train stress	.390	.355	-.369	-.297
Q8: More stress = Injury	.440	.458	-.412	.325
Q9: Feel pressured to train	.722	.403	.167	.160
Q10: Easier injury anxiety	.245	.631	.052	-.307

These components explain two thirds of the variance of an emerging model, which would seem to be in line with our alternate hypothesis, as seen on Table 2 below.

Extraction Method: Principal Component Analysis.
a. 4 components extracted.

Table 2: Total Variance Explained by the Components

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.160	21.595	21.595	2.160	21.595	21.595
2	1.779	17.793	39.389	1.779	17.793	39.389
3	1.535	15.346	54.735	1.535	15.346	54.735
4	1.077	10.774	65.509	1.077	10.774	65.509
5	.853	8.532	74.041			
6	.691	6.905	80.946			
7	.649	6.491	87.437			
8	.509	5.091	92.528			
9	.435	4.347	96.875			
10	.313	3.125	100.000			

Extraction Method: Principal Component Analysis.

Pressure to keep training correlated highly with training while injured (R=.434, sig. 0.001). In the end, training while injured seemed to be the determining factor in injury (β=.352, sig. 0.029). Competing while injured showed a small beta coefficient and did

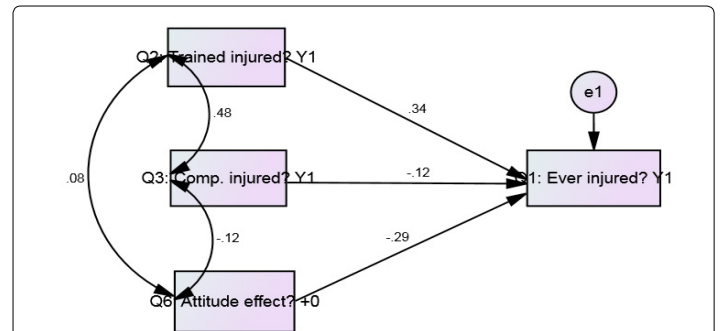
not prove to be statistically significant, though training while injured correlated with competition (R=.460, sig. 0.000), suggesting that pressure to train relates, logically, in the end, to competing.

Table 3: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.273	.146		1.864	.066
	Q2: Trained injured? Y1	.352	.158	.252	2.225	.029

a. Dependent Variable: Q1: Ever injured? Y1

Amos' Confirmatory Factor Analysis ratifies that the biggest determinant for injury is the training, not the competition, but it also shows that training and competition co-vary, suggesting that—as other responses indicate—athletes feel pressured to keep training to compete in the end. A Chi Square of .000 reflects the fit of the model shown below.



The paired regression weights shown on Table 4 further reaffirm the relationship between training and injury, which suggests that athletes put themselves in that predicament, but they also indicate a negative and significant ($p < .01$) correlation between attitude and injury, suggesting that in the end, it is their seeking and following treatment what leads to recovery.

Table 4: Regression Weights (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Q1EverinjuredY1	<---	Q2TrainedinjuredY1	.455	.168	2.706	.007	par_1
Q1EverinjuredY1	<---	Q3Comp.injuredY1	-.127	.133	-.961	.337	par_2
Q1EverinjuredY1	<---	Q6Attitudeeffect0	-.404	.154	-2.626	.009	par_3

Discussion

With an observed 57% incidence in our sample, it seems evident that athletic injuries are an unavoidable side effect of sport participation, as Putukian found; and it is training, not competition, the cause, as Lystad, Graham & Poulos said, and as indeed reflected by a .455 regression weight generated by our study's statistics [3, 5]. But it is the athlete's decision to keep training and participate in important competitions, despite the pain of an ongoing injury, which leads to complications, as Dias Lopes et al. found, and as indicated by a -.404 regression weight [7].

Mann et al. defined these psychological factors as stress, pressure, anxiety, and frustration or burnout [12]. Patterson et al. and Lee Sinden reaffirmed the effect of stress, and Hinkle singled it out as the main moderator in athletic injury and recuperation; but as reflected by positive and negative regression weights, the effects of these factors seem to be a contribution to injury, on one side, while at the same contributing to recuperation, on the other [10, 13, 14].

Indeed, psychological antecedents and emotional reactions play a key role in rehabilitation, according to Thompson [16]. However, rehabilitation may also be affected by problematic emotional reactions, the most common of which are loss of identity, fear and anxiety, and a loss of confidence, which Mann et al. define as burnout, according to a panel of physicians and psychologists assembled in 2006 to evaluate the issue [12]. Yet, some doctors still seem to cling to the purely medical approach to injury prevention.

As Putukian suggests, coaches and federations need to address not only the physical aspects of injury, but the psychological implications and complications that may lead to injuries or may confound recuperation [3, 17, 18].

Conclusions and Recommendations

Our research confirmed our hypothesis, H1, that "psychological factors moderate the rate of athletic injury and recuperation". As previous research has shown, the pressure to compete leads athletes to keep training in spite of the alerts sent out by their bodies, and the vast majority goes on to compete; so, psychological factors do moderate, negatively, in the incidence and severity of injury, but attitude and a positive disposition also play an important role in recovery.

Coaches must address the psychological aspects of injury by trying to reduce peer pressure during training and by not allowing injured athletes to compete, especially when doing so may cause

them irreversible damage; and then, keeping the convalescent athlete involved with the team during recuperation will surely speed up recovery without any lasting psychological trauma. By the time an injured athlete reaches a doctor's office, the role of the coach in preventing the injury has passed, but the doctor must also consider the psychological factors in recuperation.

Limitations and further Research

This study was limited to self-reporting scales that did not discriminate between respondents. It would be interesting to rerun the statistical programs, and define a control group, which allows us to compare different answers, between those who were injured, and those who were not, and those who continued to train vs. those who stopped; and to adjust the questionnaire to create a better model that shows training as the main determinant of injury, coaching as mediator and attitude as the moderating factor, although a larger sample would be needed to obtain statistically valid indicators from the minorities.

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