

PSYCHOLOGICAL FACTORS OF REHABILITATION OF ATHLETES AFTER KNEE INJURY

PSIHOLOŠKI DEJAVNIKI REHABILITACIJE ŠPORTNIKOV PO POŠKODBI KOLENA

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ABSTRACT

Key words:

athletic injuries, knee injuries, anxiety coping behavior, motivation, social support, recovery of function

Objective. The majority of the literature regarding sports injuries is concentrated on specific characteristics related to sports injuries and injuries at sport activities at all. We strove to establish whether the success of the rehabilitation process can be predicted based on numerous psychosocial variables.

Methods. Our sample comprised of 68 competing athletes who underwent an operative knee surgery. The rehabilitation process for athletes lasted one or 6 months; all athletes obtained serious injuries by the standards of National Athletic Injury Reporting System (1). The following variables were measured: coping with pain (SIP 15), rehabilitation behaviours (SIRBS), motivation for rehabilitation, anxiety (STAI X1) and social support. A questionnaire that measures the functioning of the knee (2000 IKDC) was taken as an indicator of the rehabilitation success. Participants were tested both prior to and following the process of rehabilitation.

Results. Our results showed that the success of psychological rehabilitation could be predicted from changes in certain psychosocial variables (a decrease in anxiety and an increase in susceptibility, self-efficacy and catastrophizing). After the rehabilitation, only 10 % of athletes were able to reach the criteria of a successful physical and psychological rehabilitation.

Conclusions. We can conclude that since selected psychological variables were found to have a high loading on psychological rehabilitation there it makes sense to control these variables.

IZVLEČEK

Ključne besede:

športne poškodbe, poškodbe kolena, anksioznost, spoprijemanje, motivacija, socialna opora, okrevanje

Izhodišča. Večina raziskav s področja športnih poškodb se nanaša na specifične značilnosti, ki sprožijo, napovedujejo ali preprečujejo športne poškodbe. Raziskava preučuje možnost napovedovanja uspešnosti rehabilitacije na osnovi psiholoških značilnosti poškodovanih športnikov, in sicer spoprijemanja z bolečino, vedenja v procesu rehabilitacije (SIRBS), motivacije za rehabilitacijo, tesnobe kot stanja in socialne opore.

Metode. V raziskavo je bilo vključenih 68 športnikov po operaciji kolena zaradi resne poškodbe, definirane na osnovi izbranega sistema (1). Rehabilitacijski proces je trajal en mesec ali šest mesecev. Udeleženci so bili psihološko obravnavani pred procesom rehabilitacije in po njem.

Rezultati. Rezultati so pokazali, da je uspešnost rehabilitacije večja, če se zmanjša anksioznost in poveča dojemljivost ter zaznata samoučinkovitost in katastrofiziranje. Le za 10 % športnikov lahko rečemo, da je bila pri njih rehabilitacija uspešna.

Zaključki. Na osnovi raziskave lahko rečemo, da se konstruktivna vedenja, povezana z rehabilitacijo, povezujejo s psihološko rehabilitacijo poškodovanih športnikov.

1 INTRODUCTION

The main goal of sport injury rehabilitation is to return an athlete to his/her prior levels of functioning, particularly through the physical rehabilitation of damaged areas. Studies show (2, 3), that psychological factors play an important role in the rehabilitation process and suggest the need for a more comprehensive treatment of the injured athletes. In addition, when all measurable indicators show that the injury is fully recovered, athletes still do not achieve the same results as before the injury. Physical and psychological rehabilitation after injury are not necessarily synchronous (4). The psychological burden of sports injuries is so large that it may interfere with rehabilitation and recovery or even prolong return to competitive sport, also in cases where the injury is fully rehabilitated. Physical injury is not only injury of a specific part of the body, but it is primarily an injury to the entire body and psyche or athlete's mentality (5).

When an athlete gets injured, great attention is placed on appropriate methods of physical rehabilitation and the selection of appropriate rehabilitation procedures. The psychological factors, which also affect the athletes, are often overlooked. Contemporary studies and models show (2, 6, 7) that psychological factors also have a major impact on the rehabilitation process of athletes. Recent studies (8, 9, 4, 10) emphasize a more holistic rehabilitation of injured athletes and focus more on the psychological consequences of injuries and rehabilitation.

Athlete rehabilitation that includes not only physical but also psychological and social aspects of the injury is called integrated rehabilitation (11). An approach that treats the whole person and not just an injury is called a biopsychosocial approach (12). With our study, we also attempted to confirm the significant influence of some psychosocial factors and thereby confirm the need for a comprehensive, integrated rehabilitation of an injured athlete.

Even though it has been found that people can endure stressful conditions such as short-term sleep deprivation and still function perfectly normally (13), it can only be for a short period. Injury recovery is a long lasting procedure and as such benefits from psychological intervention that can help individuals cope with the stress.

Researchers have developed a number of models that have attempted to illustrate the dynamic relationship between the athlete's psychological response to injury and adherence to rehabilitation. Udry (14) established a model of cognitive appraisal of an athlete's psychological adaptation to an injury, which extends Brewer's model (15) with support and confrontation. The central tenet of cognitive appraisal is that emotional and behavioral responses to sport injuries are influenced by cognitive appraisals. The integrated model of psychological response to sports injury and the rehabilitation process (7) also establishes pre-injury and post-injury factors that affect the psychological response to injuries. Athlete response dynamically changes over time. However, physical and psychosocial rehabilitation is the result of the whole process.

Psychological factors influence the risk of injury and the effectiveness of rehabilitation. The majority of the literature regarding sports injuries is concentrated on specific characteristics that trigger, predict or prevent sports injuries. Over the last 15 years, the research has also concentrated on psychological characteristics following the injury, psychological response to injury (16), coping with pain, social support of injured athletes (17, 14), and rehabilitation adherence (15, 18, 2, 16).

There are two lines of studies researching sport injuries (19, 15, 20). First, investigating psychological factors that enhance the risk of sport injury. Second, research concentrating on psychological factors following sports injury.

The authors have scientifically confirmed the impact of moderator variables that change the stress-injury relationship. These are: coping (21), social support (19, 22, 23), and trait anxiety (23). Smith et al. (22) argue that life stress, social support, and coping must be included in further research regarding sports injuries.

Research on Korean ballet dancers (1) stated that coping was the main predictor of injury occurrence. Even though life stress also impacts the incidence of sports injuries, the lack of coping resources is crucial.

Instrumental coping is the most commonly used strategy of coping during the rehabilitation (14). Athletes gather information regarding their injury, they seek medical advice, and therefore they try to reduce the stress. Athletes use those strategies more at the beginning of the rehabilitation and less at the end of the rehabilitation. At the beginning of the rehabilitation, athletes used more coping strategies as the stress is at its maximum level. As the stress in the rehabilitation slowly decreases, coping strategies also decline (24).

An athlete who can successfully manage the psychological stress of being injured is likely to be motivated and show good treatment adherence. On the other hand, an athlete who has difficulty adjusting to the injury is likely to experience motivational deficits and show problems with adherence. Failure to comply with the treatment protocol can slow recovery and interfere with the healing process. The long term consequence of non-adherence is that it can leave the injured area weakened and vulnerable to further injury (25, 4).

Brewer (26) reports that an athlete's motivation has the strongest impact on rehabilitation adherence. The most effective rehabilitation program can have only a limited impact if an athlete is not motivated. Motivation for rehabilitation includes behaviors such as engaging in appropriate physical activity, completing home rehabilitation exercises, coping with pain, coping with boredom, and coping with frustration during the rehabilitation process (27).

Rehabilitation adherence is an important factor of rehabilitation success. Beliefs or values are the foundation of our thoughts and so direct our emotions and rehabilitation behaviors (7). Athletes who do not trust the rehabilitation

program will recover slower, whereas athletes with strong beliefs in their program will complete the exercise regularly, and the rehabilitation will be faster (28).

Evidence of a positive relationship between adherence to sports injury rehabilitation programs and clinical outcome has been obtained in several studies (29, 8, 30-33). Adherence to rehabilitation program is important for achieving successful rehabilitation (27). Heil (20) emphasizes the importance of compliance in order to prevent possible complications in therapy and psychological adaptation.

The number of sports injuries is increasing (34). Athletes with similar injuries recover differently. We found no previous research measuring rehabilitation success that concentrated on several psychosocial factors during the whole process of rehabilitation. The present study represents a logical continuation of previous research.

Definitions of psychological rehabilitation found in various sources are very different and often inadequate. Moreover, the terms physical and psychological rehabilitation are frequently confused. We wondered whether we could arrive at a somewhat clearer definition of psychological rehabilitation.

The main aim of our research was the identification of factors that can be used to predict a successful psychological rehabilitation. On the basis of previous research, we assumed that successful psychological rehabilitation can be predicted on the basis of changes in specific psychosocial variables: anxiety (35), social support (36), coping with the pain (37, 38), rehabilitation beliefs (12), and motivation for rehabilitation (39, 40). We attempted to determine which psychosocial variables are the strongest predictors of successful psychological rehabilitation.

We also attempted to discover how many injured athletes recover successfully (physically and psychologically).

We thus posed the following hypotheses:

We predict approximately equal levels of influence of psychosocial variables (catastrophizing, directiveness, state anxiety, self-efficacy, susceptibility, value of rehabilitation, efficacy, perceived severity of injury, coach support, family support, motivation) on psychological rehabilitation (hypothesis 1).

Based on the expected changes in the psychosocial variables during the process of rehabilitation, we predict a successful psychological rehabilitation (hypothesis 2).

Changes (prior to rehabilitation and after rehabilitation) in psychosocial factors (catastrophizing, directiveness, state anxiety, self-efficacy, susceptibility, value of rehabilitation, efficacy, perceived severity of injury, coach support, family support, motivation) during the process of rehabilitation can predict a successful psychological rehabilitation.

We predict no statistically significant association between the variables of successful physical and psychological rehabilitation (hypothesis 3).

2 MATERIALS AND METHODS

2.1 Participants

Our sample comprised of 68 competitive athletes (47 male, 21 female) who were hospitalized and treated at the Orthopedic Clinic. There were no significant differences in categorization of male and female athletes (Hi sq.). The criteria for participating in the study were injury severity (athletes underwent arthroscopy or other more demanding surgical procedures, as it was found in past research that the amount of frustration corresponds to the seriousness of the injury (4)) and that all the athletes were still actively competing (20.6 % handball, 20.6 % soccer, 19.1 % basketball, 6 % volleyball, less than 3 % alpine skiing, hockey, judo, ski jumping, tennis, taekwondo, gymnastics, rugby, dance, ski boarding, karate, acrobatic skiing). 28 athletes (41.2 %) were categorized as "world class" and "international perspective class", and the other 40 athletes (58.8 %) were categorized as "national class", "youth class" or uncategorized athletes according to national norms for the categorization of athletes (Olympic Committee of Slovenia). The study did not include recreational athletes. Participants' age ranged from 16 to 40 (with a mean value of 23.4 years and a median value of 22 years).

Athlete participants suffered from one of the various knee injuries listed below (see Table 1). Four of the athletes were not aware of the type of injury they had suffered, while the other 64 athletes were familiar with their diagnosis.

Table 1. Knee injuries by type.

Preglednica 1. Vrste poškodb kolena pri udeležencih raziskave.

Type of knee injury/ Vrsta poškodbe	Frequency/ Frekvenca	Percent %
Unknown (athletes were not familiar with their diagnosis prior to the operation)/ <i>Neznana poškodba (športniki pred posegom niso bili seznanjeni z diagnozo)</i>	4	5.9
Meniscus tear/ <i>Poškodba meniskusa</i>	13	19.1
Anterior/posterior cruciate ligament tear/ <i>Natrgani ante/posteriorni križni ligamenti</i>	49	72.1
Kneecap (patella) injury/ <i>Poškodba pogačice</i>	2	2.9
Total/ <i>Skupaj</i>	68	100.0

For 35 (51.5 %) of the athletes, this operation was their first operative procedure, while 33 athletes (48.5 %) had already suffered from one or more operative injuries. Variables were measured for each participant twice, both at the beginning of rehabilitation (before the operation) and following the completion of rehabilitation (after either four weeks or six months of rehabilitation, depending on the physician's appraisal of the severity of their injury). At the time of the first measurement (before the operation), the sample comprised of 68 competing athletes with a

knee injury (of which 47 athletes were male and 21 female). However, the second part of the study (after the completed rehabilitation following the knee operation) only included 52 athletes (36 of which were male and 16 female), as 16 athletes chose not to participate in the second measurement. Athletes participated in the study voluntarily. The study was conducted according to the principles of our Psychologist Association's Code of Ethics as well as the Personal Data Protection Act.

2.2 Instruments

STATE-TRAIT ANXIETY INVENTORY - STAI X1

STAI X1 (anx) (41) is one of the most widely used anxiety scales (42). The scale measures anxiety as a state. The state of anxiety is characterized by a temporary increase in the level of excitement, while moderate anxiety is considered as a normal reaction to stress. On a subjective level, anxiety is accompanied by unpleasant emotions and can be described as a tense feeling usually accompanied by worry. The term anxiety is generally used when individuals are unaware of the reasons for their tension. Increased anxiety can serve as a means of adjustment, unless the excitement level is too high. The inventory consists of 20 items and participants respond to items on a 4-point scale (almost never, sometimes, often, almost never). We chose to apply this inventory with corrected instructions in the sense that participants had to assess how they felt directly before the match, i.e. on the day of the competition. In our study, Cronbach's reliability coefficients for anxiety as a state were 0.81 at the time of the first measurements and 0.85 at the time of the second measurement.

SPORTS INVENTORY FOR COPING WITH PAIN - SIP 15

SIP 15 (Sports Inventory for Pain 15 item) (43) is a 15-item questionnaire measuring an athlete's psychological response or coping with pain. The questionnaire subscales measure the following three dimensions: Coping through Direct Action (7 items), Catastrophizing (5 items) and Somatic Awareness (3 items). Our study included the items measuring Coping through Direct Action and the items measuring Catastrophizing. The items for Somatic Awareness were excluded with the permission of the author, as they were not relevant for the subject of our study.

Participants respond to items on a 5-point Likert scale, with the anchors being *I disagree completely* and *I agree completely*. A more detailed description of the dimensions is as follows:

- Coping through Direct Action (dir) measures the positive dimension of athletes' coping with pain. Coping through Direct Action indicates the level of athletes' use of strategies for coping through direct action as well as the amount of direct attention athletes focus on pain, discomfort and injuries during competitions. A high score is characteristic of athletes who ignore pain or accept it as a part of competitive sports. Example:

- Catastrophizing (cat): this dimension serves to identify those athletes who are likely to give up due to an injury. Athletes with a highly expressed dimension of catastrophizing when experiencing pain tend to dwell on the pain, view it as intolerable and give in to unpleasant feelings of pain. A low score is conversely typical of athletes who are capable of lowering their level of catastrophic thinking and retaining an optimistic frame of mind despite experiencing pain in the process of rehabilitation;
- Personal Coping Resources (pcr). The result is obtained by deducting the score on Catastrophizing from the results on Coping through Direct Action. The composite result represents an indicator of an individual's coping ability.

SIP 15 is a reliable and valid instrument for measuring the strategies of coping with pain that athletes need to employ when recovering after an injury. In our study, the Cronbach alpha for coping through direct action amounted to 0.65 at the time of the first measurement and 0.73 at the time of the second measurement. Reliability scores for the dimension of catastrophizing at the time of the first measurement were somewhat lower (0.57), while they amounted to 0.72 at the time of the second measurement.

SPORTS INJURY REHABILITATION BELIEFS SCALE

Sports Injury Rehabilitation Beliefs Scale - SIRBS (28) measures the factors proposed by the Protection Motivation Theory (PMT), a theory on how individuals protect themselves. The SIRBS scale consists of 19 items and assesses injured athletes' rehabilitation behaviors. Participants respond to all items on a 7-point Likert scale, with the anchors being *I very strongly disagree* and *I strongly agree*. The scale is designed to assess the following four dimensions:

- perceived severity of an injury (severity) (5 items) measures the individual's assessment of the risk due to the severity of their injury;
- perceived susceptibility (5 items) measures the individual's assessment of the risk of a serious or permanent injury;
- perceived treatment efficacy (efficacy) (4 items) measures the individual's belief about the treatment program being able to remove the threat or the injury;
- self-efficacy (self-eff) (4 items) measures the individual's trust in their own ability to adhere to the recommended rehabilitation program;
- rehabilitation value (value) (1 item) measures the perceived importance of the value of rehabilitation.

Reliability coefficients at the time of the first measurement were 0.71, 0.82, 0.81, and 0.79 for severity, susceptibility, perceived treatment efficacy, and self-efficacy respectively. At the time of the second measurement, the lowest reliability coefficient was for severity (0.61), while the reliability coefficients for the other dimensions were 0.73 for susceptibility, 0.77 for the perceived treatment efficacy, and 0.87 for self-efficacy.

ATHLETES' SOCIAL SUPPORT

Our study included two items designed to measure the social support provided by the athlete's family (family) and the social support provided by both the coach and fellow competitors at the time of the injury (coach). The two items were as follows:

"When I am injured, my family offers me emotional support and support through conversation."

"Our coach and fellow competitors support me during the time of my injury."

Internal consistency coefficients (Cronbach alpha) were 0.43 at the time of the first measurement and 0.47 at the time of the second measurement. As the two coefficient values are low, we can conclude that the two items likely do not measure the same construct. We therefore decided to interpret the two items separately: the first item as a measure of the social support of the family and the second item as a measure of the social support of the coach and fellow competitors.

MOTIVATION FOR REHABILITATION

Two more items were constructed to measure athlete motivation (mot) for rehabilitation. The items were as follows:

"I am also willing to do the exercises at home if this contributes to faster rehabilitation."

"I am going to attend therapy regularly and put all of my effort into it."

Reliability coefficients amounted to 0.72 at the time of the first measurement and 0.61 at the time of the second measurement.

SUBJECTIVE KNEE EVALUATION QUESTIONNAIRE - 2000 IKDC

In our study, we further used the 2000 IKDC questionnaire (44) - a subjective knee evaluation questionnaire that measures the level of functioning of the knee or rather the presence of symptoms. The questionnaire helps assess the highest level of physical activity that athletes are able to perform without significant pain; it measures swelling of the knee, locking of the knee and instability of the knee. Items on 2000 IKDC assess the level of an individual's physical activity, the presence of any problems with the performance of everyday activities (walking up and down the stairs, squatting, running in a straight line, etc.), and the current functioning of the knee. The IKDC score (ikdc) is a measure of the functioning of the knee; a higher score means that the knee functions better and there are less symptoms. A score of 100 thus means that the person reports no more physical obstacles in daily or sports activities as well as complete absence of symptoms. 2000 IKDC is a self-report questionnaire. Reliability coefficients were found to be 0.82 at the time of the first measurement and 0.88 at the time of the second measurement.

2.3 Procedure

Each of the participants was tested individually and completed a battery of psychodiagnostic tests prior to the operative procedure (20) and after the completed rehabilitation (either after a month or six months of rehabilitation). Injured athletes who decided to participate in our study read and signed a consent form. Numerous researchers, such as Brewer (15), Heil (20), Johnson (44), and Udry (14), find the period soon after an injury to be a good time for obtaining data regarding the impact of an injury. Therefore, our participants completed a test series that comprised of the aforementioned questionnaires prior to the operative procedure. Following the operation, athletes received individual rehabilitation exercises to be performed at home at the time of rehabilitation, as is the standard procedure at the Orthopedic Clinic. Physical therapists provided the athletes with written instructions on how to perform the exercises. There were no further meetings between physical therapists and athletes at the time of rehabilitation.

Athlete rehabilitation took either 4 weeks or 6 months (depending on the type of injury and the type of the operative procedure). Rehabilitation is not necessarily completely finished in this period of time. From a histological perspective, rehabilitation can last longer than one year (a year and a half or more). On the other hand, some athletes succeed in rehabilitating psychologically and functionally in a shorter period of time. Functional testing, which would be necessary for accurate definition of measuring points, was not performed.

Two points of application of control measures were chosen for pragmatic reasons (organizational, financial). Usually, patients have control examinations after this period of rehabilitation. So it was decided to go with this protocol and not to include an additional measuring point since that would mean additional resources (organizational, financial, etc.). Additional or different choices of point of measurement would be more appropriate and accurate.

The sampling lasted for two years and six months. Since high competing level was an included criterion, there were problems with sample size. Therefore, it was decided to merge various types of participants (type of injury, type of sport, number of surgeries they underwent) due to too small sample sizes of athletes and therefore to adjust the aspirations of the research and attempt to find more general predictors of psychophysical rehabilitation.

During the second phase of the research, participants were further contacted by phone and informed about the second part of our study, as it had been agreed upon earlier. A battery of psychological questionnaires was then sent to them. At the same time, athletes also received clear instructions and an extra envelope with a stamp and the address of the recipient written on it.

We followed the Principles of the Code of Ethics of our Psychologist Association as well as the Personal Data Protection Act during all stages of our research. Research was conducted according to the Helsinki declaration.

Scores on the questionnaires were calculated and analyzed with the SPSS13 program. With the help of the factor analysis, we attempted to arrive at a definition of psychological rehabilitation, while regression analysis was used to identify the factors that can be used to predict successful psychological rehabilitation.

3 RESULTS

In our study, we strove to identify a latent variable of psychological rehabilitation that would explain the correlation between psychosocial variables. Since we were interested in the share of variance explained by psychosocial variables, we decided to apply factor analysis. Factor analysis was also chosen in order to enable weighting of variables.

Table 2. Principle component method: explained variance of psychological rehabilitation.
Preglednica 2. Pojasnjena varianca uspešnosti psihološke rehabilitacije.

Component/ Komponenta	Total eigenvalues/ Lastne vrednosti		
		% of variance	cumulative %
1	3.44	31.32	31.32
2	1.74	15.84	47.15
3	1.23	11.16	58.32
4	1.11	10.12	68.44
5	.91	8.25	76.68
6	.70	6.38	83.06
7	.62	5.63	88.69
8	.49	4.44	93.13
9	.32	2.92	96.05
10	.27	2.43	98.47
11	.17	1.53	100.00

Table 2 contains results pertaining to the explained variance, showing that a multiple factor solution would in fact be even more appropriate than a one factor solution. Four factors could account for 68 % of psychological rehabilitation. However, the aim of our study was to find a one factor solution, and we thus opted for this despite the somewhat lower share of explained variance.

Table 3. Component matrix for psychological rehabilitation, 1 factor solution.
Preglednica 3. Komponentna matrika psihološke rehabilitacije, enofaktorska rešitev.

	Factor 1
Self-efficacy/ <i>Samoučinkovitost</i>	.81
Susceptibility/ <i>Dojemljivost</i>	.79
Value of rehab/ <i>Vrednost rehabilitacija</i>	.66
Motivation/ <i>Motivacija</i>	.64
Efficacy/ <i>Učinkovitost</i>	.56
Perceived gravity of injury	.55
Cat	.53
Coach/ <i>Trener</i>	.52
Family/ <i>Družina</i>	.33
Anxiety/ <i>Tesnoba</i>	-.17
Directiveness/ <i>Direktivnost</i>	.01

As can be seen from the table above, the variables with the highest loadings (one factor solution) were self-efficacy, susceptibility for rehabilitation, value of rehabilitation and motivation. These were followed by the perceived treatment efficacy, perceived gravity of injury, catastrophizing and perceived support provided by the coach and fellow competitors. Support of the family was slightly lower. The factor in question was further loaded negatively with anxiety as a state (the higher an athlete's anxiety, the lower the value of our factor). Similarly, directiveness did not explain much of the factor (see Table 3). The aforementioned factor variable represents the athletes' psychological rehabilitation following the completed physical rehabilitation.

When predicting the significance of psychosocial change, results of both the first and the second measurement should be considered. Therefore, we considered both the first measurement of the athletes' responses to injury with the psychological and social variables at the beginning of rehabilitation and at the time of the second measurement, i.e. at the end of rehabilitation. Our analyses thus yielded new psychosocial variables (obtained by calculating the difference between psychosocial variables at the time of the first and the second measurement) to capture the changes in psychosocial variables throughout the process of rehabilitation.

Table 4. The significance of changes in psychosocial variables during the process of rehabilitation and their power to predict successful psychological rehabilitation.
Preglednica 4. Spremembe psiholoških spremenljivk v procesu rehabilitacije in njihova napovedna vrednost uspešnosti psihološke rehabilitacije.

Multiple correlation coefficient: stepwise		F test	
R	R ²	value	statistical significance
.86	.74	26.54	.000

Level of risk 0.01 (2-way testing)/
Raven tveganja 0.01 (dvosmerno testiranje razlik)
Predictors/*Prediktorji*: self-efficacy/*samoučinkovitost*, value/*vrednost*, cat, susceptibility/*dojemljivost*, anxiety/*tesnoba*
Dependent variable/*Odvisna spremenljivka*: psychological rehabilitation/*psihološka rehabilitacija*.

As can be seen from Table 4, we were able to predict the success of athletes' psychological rehabilitation based on the changes in the measured psychosocial variables through the process of rehabilitation. The value of the multiple correlation coefficients in Table 4 indicates that the changes in psychosocial variables in the rehabilitation process explain 74 % of variance in psychological rehabilitation at the end of treatment.

Table 5. The changes in psychosocial variables during the process of rehabilitation and their power to predict the success of athletes' psychological rehabilitation.

Preglednica 5. Spremembe psiholoških spremenljivk v procesu rehabilitacije in napovedna vrednost uspeha psihološke rehabilitacije.

	Standardized Beta coefficient/ Standardizirani Beta koeficienti	t - test	
		Value/ Vrednost	Statistical significance/ Statistična značilnost
(constant/ konstanta)		3.10	.003
self-efficacy/ samoučinkovitost	-.25	-2.79	.008
value/vrednost	-.46	-5.88	.000
cat/ dojemljivost	-.33	-4.27	.000
Susceptibility/ dojemljivost	-.28	-3.36	.002
Anxiety/tesnoba	.24	3.15	.003

Level of risk 0.01 (2-way testing)/
raven tveganja 0.01 (dvosmerno testiranje razlik)

The results in Table 5 reveal that the changes in selected psychosocial variables can be used to predict the success of psychological rehabilitation (predictors are statistically significant). An increase in the perceived value of rehabilitation through the process of rehabilitation can be seen to have the highest predicting value. A decrease in anxiety as well as an increase in susceptibility, self-efficacy, and the level of catastrophizing can further be used to predict successful psychological rehabilitation within a statistical level of significance.

Table 6. Athletes' rehabilitation success.

Preglednica 6. Število športnikov glede na uspešnost fizične/psihične rehabilitacije.

		Physical rehabilitation/ Psihološka rehabilitacija		Total/Skupaj	
		Less successful/ Manj uspešna	Successful/ Uspešna		
Psychological rehabilitation/ Psihološka rehabilitacija	Less successful/Manj uspešna	20	22	42	80.70 %
	Successful/Uspešna	5	5 (9.6 %)	10	19.20 %
	Total/Skupaj	25	27	52	100.00 %
		48.10 %	51.90 %	100.00 %	100.00 %

Note: less successful psychological rehabilitation - athletes, whose score was below the 50th percentile at the time of the second measurement.

The results in Table 6 reveal that less than 10 % of all athletes return to the sports arena both physically and psychologically well rehabilitated.

Table 7. Association between success of physical and psychological rehabilitation.

Preglednica 7. Povezanost uspešnosti psihološke in fizične rehabilitacije.

	Value/ Vrednost	Df/ Ss	Statistical significance/ Statistična značilnost
Pearson's Chi-squared/ Hi-kvadrat	.02	1	.89

As can be seen from Table 7, a chi-square test showed no statistically significant association between the variables of successful physical and psychological rehabilitation.

4 DISCUSSION

One of the aims of our study was to arrive at a single factor that could explain the entire space of psychological rehabilitation at the end of rehabilitation based on the psychosocial variables measured at the end of rehabilitation. Admittedly, data was obtained on a small sample and is thus less reliable, which is why our results should be interpreted carefully. Results of the factor analysis can be viewed as an attempt to define the space of psychological rehabilitation following an injury. The values of psychological rehabilitation are mere estimates and explain the psychological space at the end of rehabilitation only to a certain extent.

The one-factorial solution for structuring the space of psychosocial variables at the time of the second measurement is an attempt to explain an athlete's psychological rehabilitation after the process of rehabilitation has been completed. The latent variable, i.e. psychological rehabilitation, is heavily loaded with constructive rehabilitation behavior; it is important to assess an athlete's coping (self-efficacy, efficacy) as well as their risk rate (the risk of another injury and the perceived gravity of an injury) and the value of rehabilitation (see

Table 3). Our first hypothesis stated that the variable of psychological rehabilitation would be equally loaded with all selected psychosocial variables (coping with pain, rehabilitation behaviors, motivation, and social support), which did not prove to be the case.

An important factor influencing the success of rehabilitation is the athletes' trust in the success of the treatment program, as mentioned by various authors (18, 8, 30, 31, 32). Athletes' beliefs regarding rehabilitation influence the efficacy of rehabilitation itself. Those athletes who find the rehabilitation program important will perform prescribed exercises more effectively and will be more positive about the exercises, which will in effect lead to faster rehabilitation (28). Our results support previous findings as the latent variable of psychological rehabilitation was found to have high loadings on variables describing adaptive rehabilitation behavior. The more the athletes consider themselves to be at risk of another injury, the more serious they assess their injury to be, and the higher the perceived risk of another injury, the more successful the rehabilitation outcome (18) and the more successful the psychological rehabilitation after an injury.

The factor score regarding psychological rehabilitation was found to be the highest in the case of self-efficacy. Results show that psychologically well-rehabilitated athletes typically trust their own abilities as well as the appropriateness of the chosen rehabilitation treatment. When returning to the competitive sports arena, the athletes are bound to encounter a number of both high and low points and, in addition to this, will recover faster in some areas and slower in others (27). When starting to train again, athletes' self-confidence is frequently lower than before (46) and so is their self-efficacy (47). Injured athletes likely deal with the hindering of their abilities better when they believe in the efficacy of the treatment and have high self-efficacy. Self-efficacy is probably crucial in providing the boost of energy, motivation, and self-confidence needed for an athlete to persist in the training process. High scores on perceived efficacy of the treatment and self-efficacy do not necessarily lead to a successful psychological rehabilitation, however. On the contrary, athletes who develop unrealistically high expectations after a successful physical rehabilitation may in fact return to competition with their expectations running too high, which may result in a damaged self-confidence (48). Successfully psychologically rehabilitated athletes are aware of the danger of overestimating their own abilities when starting to compete again and are therefore more realistic and more aware of the possibility of another injury (49), which is why their own return to training is gradual, persistent, and in line with their current abilities. Athletes whose rehabilitation also includes a successful psychological rehabilitation are thus aware of the areas where they are at risk (risk assessment higher, seriousness of the injury assessed higher) when re-entering sports training and act accordingly. Results also reveal that when athletes perceive the risk of another injury to be high, this can indeed be taken as a sign of successful psychological rehabilitation. Psychologically successfully rehabilitated athletes are further aware of the decrease

in their general physical fitness due to the hiatus in their training process.

If psychological rehabilitation is successful, athletes will complete rehabilitation with high motivation. Motivation is crucial for maintaining a high level of activation and dedication throughout the process of rehabilitation. Athletes who maintain a high level of motivation throughout the rehabilitation process conceivably put more effort into the process of rehabilitation. At the end of rehabilitation, athletes with higher motivation further believe in their ability to successfully return to the competing world and will achieve this through establishing and defining new goals. Both strategies of motivation and goal-setting are indeed crucial in maintaining a high level of motivation throughout the process of rehabilitation. Psychologically successfully rehabilitated athletes are typically good at goal setting and sustaining as well as maintaining appropriate motivation. Athletes who lack goal-setting skills could thus definitely benefit from training in those skills and strategies of goal-setting contributing to successful psychological rehabilitation following an injury.

At the end of rehabilitation, social support is a further characteristic of psychologically rehabilitated athletes, i.e. support from the athlete's coach and to a lesser extent the social support of their family as well. When athletes start to compete again, their motivation is typically not at its highest, and they usually want to make up for the lost time too quickly. The social support of the coach in this transitional period can prevent the return from being too hasty. Moreover, it can lower the chance of athletes overestimating their own abilities, and at the same time it can minimize the negative effects of this stressful transitional period.

Previous research seems to indicate that high dedication likewise influences the success of rehabilitation; it can thus be said that the results of Brewer's study (26) are indeed similar to ours. Brewer's study (26) reported athletes' dedication to rehabilitation could be predicted based on the variables of self-motivation, high pain tolerance, and social support. Perhaps this is due to the fact that the characteristics of psychologically rehabilitated athletes are similar to those of athletes dedicated to their rehabilitation program.

The main aim of medical treatment is to treat the injury and improve the athlete's abilities. Heil (20) believes that pain usually decreases at the end of rehabilitation even though it may at first increase (20). Nevertheless, the results of our study are somewhat unexpected as higher levels of catastrophizing (pondering and giving in to feelings of pain) were found to significantly explain the latent variables of athletes' psychological rehabilitation. Catastrophic thinking about pain is definitely not characteristic of athletes who are mentally well-prepared for returning to competition. Brewer (26) similarly found constructive coping with pain to be highly important throughout the process of rehabilitation; the author reported findings about high pain tolerance being able to predict an athlete's dedication to the treatment program. Our study results, however, do not support this.

In an athlete, pain can cause doubts regarding their own abilities and their ability to recover from an injury (20), which can result in fearing another injury and in a narrowed attention. A successful training process also entails successful coping with pain, while dwelling upon pain can increase the likelihood of another injury (19). The aforementioned results may be linked to our attempts to assess the success of injured athletes' psychological rehabilitation. Admittedly, this is merely an attempt to define the space of psychological rehabilitation and should be tested by using a similar method on a larger sample.

The latent variable of psychological rehabilitation has a small negative loading with anxiety as a state. The more expressed the anxiety in an athlete, the less expressed the latent factor. One of the main goals of rehabilitation is for an athlete to regain their state of functioning prior to the injury. In comparison to less successful athletes, more successful athletes typically have a higher frustration tolerance, a higher level of psychoticism, self-confidence, and a lower level of anxiety in stressful situations (50). Although a low level of anxiety is certainly a trait of a psychologically rehabilitated athlete, the variable explained only a small portion of the entire space of psychological rehabilitation in our study. The factor is further loaded with directiveness to a very small extent. As pain is a part of competitive sports, it is very important for a successful athlete to cope with it in an appropriate manner. A constructive attitude towards pain is also a (minor) part of an injured athlete's psychological rehabilitation.

Changes in emotions, thoughts, and behaviors can similarly significantly influence the psychological rehabilitation of an athlete who has suffered an injury. Results show (see Table 4) that changes in psychosocial variables throughout the rehabilitation process explain 74 % of the variance in psychological rehabilitation at the end of treatment. This confirms our second hypothesis. Somewhat unexpectedly, the results regarding the increase in catastrophizing (see Table 5) were shown to predict successful psychological rehabilitation. Perhaps increased catastrophic thinking and athletes being too preoccupied with pain as well as giving in to feelings of pain at least in the early phases of returning to practice can also be seen as a safety net that protects athletes from straining too hard or overestimating their own abilities. Catastrophic thinking can have a positive influence in the initial periods of the training process, as it may lead to more careful and gradual physical activity (27). This raises the question of how preoccupation with pain influences athletes when they begin to train with high intensity and are forced to cope with pain in a constructive manner. It can be predicted that catastrophizing in the period of returning to competitions, when an athlete is expected to be in an optimal physical and psychological state, can indeed hinder fulfilling competitive responsibilities. We believe that a higher level of catastrophic thinking when returning to competition can increase the risk of another injury. The latent variable of psychological rehabilitation in our study, however, cannot be seen to equal the level of mental readiness when re-entering the competitive arena. Can the two constructs of psychological rehabilitation be seen as two separate

constructs? Is our latent variable then at all representative of truly successful psychological rehabilitation?

Our study aimed at identifying the main factors of more successful rehabilitation, and the reported predicting values of psychosocial variables should be viewed in light of this aim. We therefore call for caution when interpreting the results of our study, which require further experimental testing. Above all, we wonder whether psychological rehabilitation as defined in our study is indeed indicative of a psychologically successfully rehabilitated athlete.

We are thus compelled to question our definition of injured athletes' psychological rehabilitation. We acknowledge that the said definition is merely an estimate and an approximation of the true state of mental readiness at the end of rehabilitation.

In our study, psychological rehabilitation as the latent variable was supposed to identify athletes who complete the process of rehabilitation psychologically successfully rehabilitated. However, future research should examine the psychological rehabilitation of athletes at a somewhat later stage, perhaps a few weeks after the athletes' return to training or at the time when they start to compete again. That is when athletes can also practically test whether the rehabilitation was indeed appropriate and whether the injury is rehabilitated. The transition from training to competition usually represents a great physical and psychological strain for athletes. In this period, athletes have to make the transition from physically relatively undemanding physical therapy to physically challenging performance. When returning to competition, athletes often experience an increase in competitive anxiety, falling behind on their team, their performance being poorer than before the injury (51), which results in lower self-confidence (52, 24). We believe that our latent variable failed to measure the athletes' feelings, thoughts, and behavior in the period of returning to competition. This could be another area for future research of injured athletes' psychological rehabilitation.

5 CONCLUSION

Based on our results, it can be concluded that the physical and psychological rehabilitation of injured athletes often do not run parallel. It can be seen that a higher risk of another injury throughout the process of rehabilitation positively correlates with psychological rehabilitation, at the same time hindering the success of an injured athlete's physical rehabilitation. We further need to consider the possibility that psychological rehabilitation as a manifest variable in our study is not representative of those athletes whose self-confidence and strength remain the same when they return to sports.

Our study also tested for potential associations between athletes' physical and psychological rehabilitation. Results of the chi-squared test show no such associations (see Table 6 and 7). Athletes who recover well psychologically are not necessarily physically well prepared. The results in Table 6 are alarming, indicating that only 10 % of

athletes are both physically and psychologically well-prepared when returning to the sports arena. Based on these results, we can confirm the third hypothesis about the incongruence of injured athletes' physical and psychological rehabilitation.

An athlete's rehabilitation can be regarded as successful only if it entails a successful rehabilitation of the specific injury as well as general physical and psychological health (54). Our study leads us to conclude that the majority of injured athletes are not sufficiently prepared at the time of their return to the sports arena. Although most severely injured athletes recover well, not all athletes return to competitive sports successfully. In our study, 81 % of physically rehabilitated athletes were not psychologically well-prepared at the time of their comeback to sports. Returning to sports for those athletes will likely involve fear of another injury, fear of failure (55), and low self-confidence (56), which increases the likelihood of an athlete experiencing difficulties when returning to competitive sports.

The results of our study are even more alarming in light of the fact that the study participants' motivation for rehabilitation was relatively high. This raises the question about the success of the psychological rehabilitation of those athletes who only participated in the study at the time of the first measurement and were already less motivated for rehabilitation at the beginning of the study. Is our system for rehabilitation of sports injuries truly successful enough?

In our country (Slovenia), sports transformation and related processes are rather specific due to the small number of athletes, and researchers therefore need to include a large share of successful top athletes from a small pool of potential top athletes, which requires a considerably more systematic approach to research and work in general. The findings of the present study are crucial for understanding, promoting and maintaining the production of top sports results in our country.

We can also assume that many of our findings related not only to (top) athletes but also to other numerous populations who are in the process of rehabilitation after injury. Orthopedic problems are strongly related to psychological variables in general, since they should be addressed appropriately.

We believe that a systematic approach, including the psychological assessment of injured athletes and others in addition to appropriate physical rehabilitation, could contribute to a more effective rehabilitation process.

The limitations of the study are related to sample sizes and consequently to merging different types of samples and to questions regarding accurate definitions of measuring points. It would be ideal to perform functional analyses of injured athletes or to add additional measuring points. That remains open for further research.

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