

# Mood states and adherence to rehabilitation for injured athletes

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## ABSTRACT

The frequency and, in some cases, the seriousness of athletic injuries has increased, alarming distinct types of sports professionals, who believe psychological factors to be relevant in research into improved rehabilitation. The objectives of the present study were to assess changes in mood state during the rehabilitation process (from start to finish) as well as the level of adherence by the injured athletes to the rehabilitation program. The study was carried out with five federated athletes, aged from 17 to 21 years, practising different sports. The inclusion criteria for the study were recent injury (occurring within two days prior to the first health center visit), new injury (no recurrences or reinjuries) and an injury that was medically diagnosed as moderate or serious. To evaluate mood state, the Spanish version of the POMS, which includes the following five dimensions, was used: tension, depression, anger, vigor, and fatigue. To register the adherence index, an evaluation sheet was designed, based on the consultation and the professional experience of the medical team collaborating in the study. This sheet evaluated treatment compliance, both in the clinic, as well as individually outside the clinic setting. The results indicate that the emotional factors progressed and gradually adopted an ICEBERG profile, a health model by Morgan, in which the dimensions of anger, depression, and fatigue decreased, vigor increased, and tension maintained high scores. The level of adherence to the rehabilitation program tended to be constant, despite showing a marked decrease at the end of the process. Application of these findings in the professional practice of health workers involved in the rehabilitation process of athletic injuries is suggested.

**KEY WORDS:** Emotional states. Rehabilitation adherence. Athletic injuries.

## RESUMEN

El aumento considerable de la frecuencia y, en algunos casos, de la gravedad de las lesiones ha alertado a los diferentes profesionales del ámbito deportivo, considerando a los factores psicológicos como aspecto relevante en la investigación para la mejor adecuación de propuestas de rehabilitación. Los objetivos del presente trabajo son valorar cómo los diferentes factores emocionales evolucionan desde el inicio hasta el final del período de recuperación, y analizar el nivel de adherencia de los deportistas lesionados a su programa de rehabilitación. El estudio se realizó con 5 deportistas federados en distintas disciplinas, de edades comprendidas entre los 17 y los 21 años. En relación al tipo de lesión, los criterios de inclusión para el estudio fueron: lesiones recientes (ocurridas en los dos días anteriores a la primera visita al centro sanitario), nuevas (no recaídas o reinidentes) y médicamente diagnosticadas como moderadas o graves. Para valorar el estado de ánimo se ha utilizado la versión española del POMS, que incluye 5 dimensiones: tensión, depresión, cólera, vigor y fatiga. Para el registro del índice de adherencia se diseñó una hoja de evaluación partiendo del asesoramiento y la experiencia profesional del equipo médico que colaboró en el estudio; esta hoja permite valorar el cumplimiento del tratamiento, tanto en la clínica como el realizado de forma autónoma por el lesionado fuera de la clínica. Los resultados indican que los factores emocionales evolucionan adoptando gradualmente un perfil ICEBERG (modelo de salud de Morgan), donde las dimensiones cólera, depresión y fatiga muestran una evolución descendente, vigor ascendente y tensión de mantenimiento con puntuaciones altas. El nivel de adherencia al programa de rehabilitación tiende a ser constante, descendiendo notablemente al final del proceso. Se sugiere la aplicabilidad de estos hechos en la práctica profesional del personal sanitario en los procesos de rehabilitación de lesiones deportivas.

**PALABRAS CLAVE:** Estados emocionales. Adherencia a la rehabilitación. Lesiones deportivas.

**Article history:** Received: 27 July 2008 / Accepted: 1 January 2009.

**How to quote this article:** Abenza Cano L, Olmedilla Zafra A, Ortega Toro E, Esparza Ros F. Estados de ánimo y adherencia a la rehabilitación de deportistas lesionados. *Apunts Med Esport.* 2009;161:29-37.

This study has in part been carried out thanks to assistance from 05691/PPC/07 (Séneca Foundation, Regional Agency of Science and Technology, Murcia.)

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## INTRODUCTION

The practicing of any physical sports activity, whatever the nature or competitive level, carries with it the risk of injury. Over recent years, the professionalization of sports, together with the increase in the number of professional and non-professional sportspeople (sports training, sport in schools, physical exercise, etc.), has led to a higher incidence of injuries, sometimes with fatal consequences.<sup>1-7</sup> As a result, sports psychology has intensified research and intervention into the field of sports injuries and rehabilitation.

The question is; what is the relationship between sports injury and psychology? When a sportsperson gets injured, he/she immediately feels pain and experiences motor skills dysfunction, which in turn alters mood. Furthermore, from a psychological perspective, the injury is interpreted in line with variables such as the severity of the injury, the person's status in the sport, the sports season, etc. To understand the relationships that exist between sports injuries and psychological factors, we can turn to the diverse literature on the subject that has been produced over the last 20 years. Such research can be summarised into two main theoretical models: a) the model which centres on the emotional reactions of the sportsperson,<sup>8,9</sup> and b) the Wiese-Bjornstal et al<sup>10</sup> model which integrates psychological response to the injury with the process of rehabilitation.

The models which focus on the emotional reactions of the sportsperson indicate that psychological responses to injury are mainly denial of the injury, anger (rage), negotiation (emotional ambivalence), depression caused by the feeling off loss (functional, sport, status), acceptance and reorganisation. However, these emotional reactions are not a series of set phases that every injured sportsperson experiences in that exact order.<sup>11,12</sup> The Heil<sup>8</sup> theory stems from this perspective and indicates that the sportsperson shows 3 types of response to the injury (anguish, negation and confrontation of the issue), and how they manifest their response (appearance of the response, intensity of it, and associated mood states) depends on personal and situational variables of the individual sportsperson. In the *theory of cognitive assessment*,<sup>9</sup> the behaviour of the sportsperson as a functional consequence when faced with injury is determined by his/her emotional response to it. This manifests as a response which is induced by the interaction of personality factors (self confidence, locus of control, anxiety, etc.) and situational factors (severity of the injury, the person's status in the sport, etc.)

To explain the injury-psychology relationship the most complete theory is perhaps that of Wiese-Bjornstal et al,<sup>10</sup>

which puts forward an *integrated model of psychological response and the rehabilitation process*, which integrates theories based on the process of stress, and others which focus on the process of pain. Cognitive assessment and pain-process models are not mutually exclusive, but instead, when applied to the injury, they can be subsumed by a wider and more integrating stress-model which shows the dynamic nature of the recovery process. Cognitive assessment can affect emotions, and emotions can effect behaviour which itself can affect the cognitive assessment, and so on. The psychological consequences are related to the entire injury experience and focus on the 3 model components: cognitive assessment, emotional response and behavioural response.

The level of adherence of the injured person to the rehabilitation programme is perhaps one of the most important variables for reaching optimum recovery. Various authors have written about the need to use conceptual models to explain adherence to rehabilitation programmes as a behavioural response by injured sportspeople.<sup>13,14</sup> According to Levy et al,<sup>15</sup> these theoretical frameworks, with regard to the behaviour of a sportsperson's adherence, will allow for the development of tighter intervention programmes or protocols so as to increase adherence levels (theory of personal investment, theory of self-protection, theory of attribution and other models such as the cognitive model, the health model or that of the planned response.)

In general, some basic considerations with regard to adherence to rehabilitation programmes are; a) sportspeople who do not adhere to the rehabilitation programme have a higher risk of suffering a relapse,<sup>8</sup> b) the levels of adherence tend to wane over the course of long rehabilitation programmes,<sup>16</sup> c) home-based rehabilitation programmes for sportspeople tend towards substantially lower levels of adherence,<sup>17</sup> and d) adherence levels are a significant problem amongst injured sportspeople.<sup>18,19</sup>

More recent research, most importantly that carried out by Brewer et al,<sup>20-24</sup> indicates that personal variables such as mood states, sports identity and motivation, and situational variables such as social support, are fundamental to adherence by a sportsperson during their recovery process. The research also suggests that work should be carried out which takes into consideration age, or a specified stage of life relating to age, and other sport-associated considerations (status, perspective, identity, etc.) when looking at adherence level and rehabilitation prognosis.

The aims of this document are:

- To assess how different emotional factors develop from the beginning to the end of a recovery period.
- Analyse adherence levels of injured sportspeople to their rehabilitation programmes during the recovery period.

## MATERIALS AND METHOD

This study has been carried out on 5 injured sportspeople (table I) whose treatment was performed in the Martínez and Barrios Physiotherapy Centre in Murcia, Spain. The 5 subjects were professionals in various sport disciplines and were competing in youth or adult categories in the Murcia region at the time of incurring the injury. In relation to the type of injury, the inclusion criteria for the study were: recent injuries (occurred in the 2 days prior to the first visit to the health centre), new (not reoccurring injuries or relapses), and medically diagnosed as moderate or serious. This means an injury with an estimated recovery period of at least 15 days of treatment.

The study focused on the analysis of 2 psychological variables during the rehabilitation period, namely the mood state and the adherence to the rehabilitation programme. To evaluate these states and changes in the mood of the injured sportsperson, the abbreviated Spanish version of 29 items by Fuentes, García-Merita, Melía and Balaguer from the Profile of Mood State (POMS) by McNair, Lorr and Droppleman<sup>25</sup> was used. This version of POMS includes a Likert scale with values from 0 (none) to 4 (high) to assess 5 dimensions: tension, depression, anger, vigour and fatigue. This measurement tool is the most widely used for evaluating this variable in the sports world and it is the most quoted in scientific literature. It has also been proven to work as a useful tool for measuring mood state and its relation to sport, sport injuries and recovery periods.<sup>26</sup>

Adherence is defined as the injured person's degree of achievement of the rehabilitation programme as prescribed by the medical team. To measure this, an evaluation sheet was designed to follow adherence to the rehabilitation programme starting from the initial assessment and professional opinion of the medical team (a doctor who specialised in sports medicine and two physiotherapists) who participated in the study. This sheet contains 9 items to assess the achievement of the treatment administered in the clinic (assistance, punctuality, collaboration etc.) and 5 items to measure the treatment carried out independently by the injured person, away from the clinic (filling out of the control chart, correctly answering the control questions, interest etc.) Each one of the 14 items on the sheet is rated from 0 to 9 by the sports physiotherapist (annex I.)

On their first visit to the centre, the injured sportspeople were informed of the main aim of the study and invited to participate on a voluntary basis. An assessment of the state of the injury was carried out and the optimum recovery time was estimated. The severity of the injury and the duration of the rehabilitation period were established using this data and consequently the inclusion criteria of the particular sportsperson into the study were decided.

The 5 sportspeople who chose to participate in this study signed a consent form and agreed to fill in the POMS questionnaire for 15 consecutive days, every night before going to bed. They were given a folder which included 15 POMS questionnaires and forms to fill in their personal, sporting and injury details. The medical personnel completed a rehabilitation programme adherence assessment form after each of the therapeutic sessions provided in the centre. The injured sportsperson was also reminded in each session that that night he/she should complete the questionnaire to minimise the risk of losing assessment continuity.

**Table I** Characteristics of the subjects in the study

Subjects	Age	Gender	Sport	Years practicing the sport	Category	Type of injury	Severity	Recovery period
Subject 1	21	Male	Football	12	Regional League	Acromioclavicular Subluxation	Moderate	15 days
Subject 2	18	Male	Handball	10	Junior	Patellar tendinosis	Serious	15-20 days
Subject 3	17	Female	Handball	7	2nd Regional league	Relapsing luxation of the left kneecap	Serious	90-100 days
Subject 4	18	Male	Triathlon	12	Senior	Contracture of the soleo muscle	Moderate	15 days
Subject 5	19	Male	Athletics	8	Hope	Chondropathy of the right knee	Serious	20-25 days

### Data analysis

With the aim of charting the development of the variables (tension, depression, anger, vigour, fatigue and adherence) over the course of the study, variation analysis was used with repeated measurements, with a total of 15 measurements carried out. A confidence level of 95% was used. To better understand the data, it was divided into 3 groups; start of the rehabilitation period, middle period and end period, each one indicating the average value of 5 measurements and involving prior standardisation of the data.

### RESULTS

Upon individually analysing the 5 dimensions of emotion as assessed by POMS (tension, depression, anger, vigour and fatigue), table II shows that there are no statistically significant differences in the development of any of the variables over time.

However, table II shows that the beginning, middle and end values, show a persistence in the negative *tension* dimension and a marked tendency to decrease for the negative dimensions of *depression* and *fatigue*, whilst for the negative dimension of *anger*, there is an increase up to half way through the rehabilitation period. Also, the positive *vigour* dimension seems to show an increase in its general development over the course of the study, and is much more noticeable towards the middle of the rehabilitation period.

On the other hand, with regard the development of the *adherence* variable, no statistically significant differences are noted in table II either ( $F_{2,3} = 0.999$ ;  $p = 0.465$ .) This data indicates that there are no differences in the development of the different measurements over the course of the study. However, table II has high values at the beginning and middle periods, descending noticeably during the final phase of the rehabilitation period.

In figure 1, the data indicates that the injured sportspeople gradually adopted the ICEBERG emotional profile over the course of the recovery period, which is a characteristic of the Morgan mental health model.<sup>27</sup>

### DISCUSSION

The main aim of this study was to analyse the emotional response of the injured sportspeople during their recovery period. The results obtained indicated that the injured sportspeople gradually adopted the ICEBERG emotional

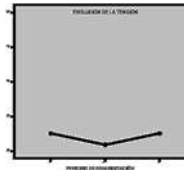
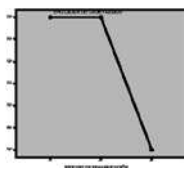
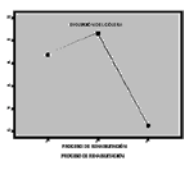
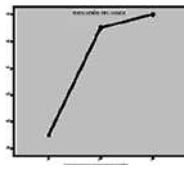
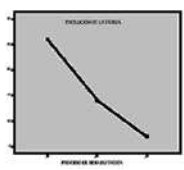
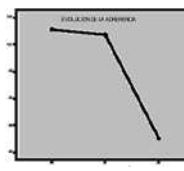
profile over the course of the rehabilitation period, as described by Morgan,<sup>27</sup> where emotional values were integrated with a mental health model which was efficient in the prediction of sporting success. These results coincide with those obtained by other authors in studies with repeated measurements.<sup>28-31</sup>

In addition, during the descriptive analysis of the data obtained, the negative *tension* dimension persisted; there was a marked decrease in the negative dimensions of *depression*, *fatigue* and *anger*, although this last dimension increased towards the middle part of the rehabilitation period, perhaps as a consequence of a possible stagnation in the recovery from injury. The positive dimension of *vigour* however, seemed to show an increase in its general development over the course of the study, becoming much more noticeable towards the middle of the rehabilitation period, and much less marked at the end of the period, perhaps due to the fears and concerns about imminent return to the sport and to competition. According to this data, the development of the emotional response during the recovery period can be explained in the following way: the sportsperson shows a progressive decrease in their state of mind, and a progressive increase in their positive state of mind, particularly with regard to the *vigour* factor.

Many authors agree that sportsmen and women experience adverse mood states as an immediate consequence of injury<sup>29-34</sup> and over the course of the recovery period.<sup>35-41</sup> Many repeated measurement studies document that the state of mind after an injury changes with time,<sup>28,32,42-45</sup> although there are discrepancies. On the one hand, some authors maintain that changes in the alteration of state of mind are parallel to the perceptions that the injured sportsperson holds about recovery, these being a cognitive assessment that becomes positive as time progresses;<sup>32-44</sup> whilst others<sup>42,45</sup> maintain that said changes over the course of time follow a “U” shaped model. As a result, emotional response to injury is not a static phenomenon, and effectiveness of the rehabilitation treatment can improve with the use of formal or informal assessments of the alterations in state of mind of the sportsperson during the rehabilitation period. This is in line with what has been suggested by various authors who emphasise the need to include other elements of a psychological and psychosocial nature.<sup>46</sup>

With the second variable analysed, the aim was to assess the general development of the degree of adherence by the injured sportspeople to their rehabilitation programme. In this instance, the results obtained reflect that this variable tends to be constant up to the middle of the rehabilitation period, notably descending towards the end of the period. Also, a study carried out by Ramírez<sup>26</sup> on 20 sportspeople with moderate degrees of

**Table II** Development of the emotional variables and degree of adherence over the course of the rehabilitation process: beginning (day 1), middle (day 8) and end (day 13)

Variable	Start of the rehabilitation period (day 1)	Intermediate stage of the rehabilitation period (day 8)	End of the del período rehabilitation period (day 13)	Value p	Graph
Tension	32.50 ± 14.25	30.83 ± 10.03	32.50 ± 11.56	p = 0.972	
Depression	13.00 ± 7.58	13.00 ± 18.91	10.00 ± 5.00	p = 0.832	
Anger	18.75 ± 9.63	20.63 ± 21.94	12.50 ± 7.97	p = 0.568	
Vigour	39.00 ± 22.19	47.00 ± 14.83	48.00 ± 13.51	p = 0.556	
Fatigue	26.00 ± 31.90	14.00 ± 20.74	7.00 ± 9.75	p = 0.123	
Adherence	102.8 ± 9.98	101.80 ± 9.73	82.60 ± 46.23	p = 0.465	

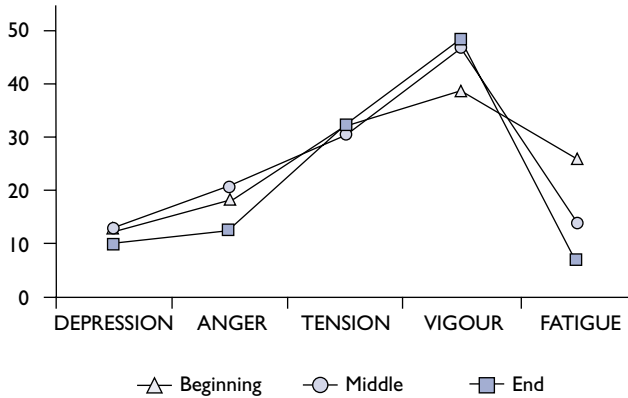
injury, in which their levels of adherence to the rehabilitation programme were analysed, found that the levels of adherence decreased over the course of the recovery period. In agreement with Shelbourne and Foulk's indications,<sup>47</sup> some sportspeople tended to be impatient with regard to the length of recovery time and were not rigorous in carrying out the rehabilitation

protocols prescribed to them. But this impatience to return to their sport is understandable when we think of some of the costs incurred by an injury on the sportspeople, such as, for example, loss of their sporting or social status.

With regard to the scope of application of psychological intervention, it should be pointed out that according to the

**Figure 1**

Development of the ICEBERG emotional profile by the injured sportsperson during the recovery period.



results of this work, the sportsperson undergoing rehabilitation starts out with a negative frame of mind, which gets progressively more positive as recovery draws closer. On the other hand, adherence of the sportsperson to the programme descends as the recovery programme moves on. Based on this, among other things, intervention programmes should be oriented towards improving the state of mind of the injured sportsperson (above all during the beginning rehabilitation phase), integrating psychological techniques or strategies for controlling the emotional responses associated with injury, developing motivation and self confidence with regard to rehabilitation programmes, and optimising the outputs of the rehabilitation tasks. Techniques which help the sportsperson to be adapted to his/her new situation (accepting the situation, controlling their expectations, problem solving strategies) and perceive that he/she controls the process will also help to control the emotional state. Establishing appropriate objectives for the rehabilitation process such as the sportsperson increasing their knowledge about their injury, the associated costs and benefits of their treatment and the work-plans needed to reach their proposed goals will all contribute to increasing their motivation, maximising their feeling of control over the process, increasing their self-confidence with regard to treatment, improving their state of mind, improving their adherence to the rehabilitation programme and consequently, leading to their recovery being quicker and more effective.

In general, we should adopt measures which help the injured sportsperson to develop a realistic and positive attitude towards rehabilitation to help guarantee success in the recovery process, keeping in mind that this attitude needs a strong base of motivation and self-confidence.

Finally, and keeping in mind the limitations of this study, future research into the psychological reactions to the injuries and to the rehabilitation process should be carried out in longitudinal studies, using larger samples which allow for the use of comparative designs, taking into account factors such as the severity of the injury, age, the type of sport practices and the perceived degree of pain suffered.

We should examine the direction of the relationship between the psychological response (emotions, cognitions and behaviour) and physical recovery (pain, functionality, range of movement, motor pattern, etc.) Does faster physical recovery drive the sportsperson to improve self-perception and state of mind, or is it the other way around? What role does adherence to the rehabilitation programme have within this relationship? As demonstrated in other research,<sup>24</sup> adherence to the programme has a positive effect on recovery from anterior cruciate ligament injury, but we do not know if the same thing would occur with a different type of injury or different sections of the population (different ages, gender, sport practiced, etc.) In addition, as Moran<sup>48</sup> suggests, the return to sport after an injury and the psychosocial factors which affect the experience of a sportsperson is an under-investigated area within the field of sports injuries. In this regards, Podlog and Eklund<sup>49</sup> remind us that the motivation for returning to the sport and the fear of a relapse are key factors in the final stages of recovery.

## CONCLUSIONS

With regard to the analysis of the development of the different states of mind of the injured sportsperson, the following conclusions can be made:

- An injured sportsperson gradually adopts the ICEBERG emotional profile over the course of the rehabilitation period.
- The *tension* dimension is maintained quite high throughout the process.
- The dimensions of *depression* and *fatigue* descend throughout the rehabilitation process.
- The *anger* dimension, as with the previous dimensions, descends throughout, although towards it does increase towards the middle of the process.
- The *vigour* dimension increases throughout. It is much more noticeable towards the middle of the process and less so towards the end.



Lastly, with regard to the adherence of the injured sportsperson to the rehabilitation programme, we can conclude the following:

- The degree of adherence of the injured sportsperson to the rehabilitation programme tends to be maintained at

the same level from the beginning of the process towards the middle of it, scoring highly.

- From the middle of the rehabilitation programme, adherence starts to decrease slightly.

## References

1. Abernethy L, McAuley D. Impact of school sports injury. *Br J Sports Med.* 2003;37:354-5.
2. Boyce WT, Sobolewski S. Recurrent injuries in school children. *Am J Dis Child.* 1989;143:338-42.
3. Kraus JF, Conroy C. Mortality and morbidity from injuries in sports and recreation. *An Rev Pub Health.* 1984;5:163-92.
4. Maffulli N, Bundoc RC, Chan KM, Cheng JCY. Paediatric sports injuries in Hong Kong: A seven year survey. *Br J Sports Med.* 1996;30:218-21.
5. Meeuwisse WH, Sellmer R, Hagel BE. Rates and risks of injury during intercollegiate basketball. *Am J Sports Med.* 2003;31:379-85.
6. Uitenbroek D. Sport, exercise, and other causes of injuries: Results of a population survey. *Res Quart Ex Sport.* 1996;67:380-5.
7. Yaffe M. Sport injuries: Psychological aspects. *Br J Sports Med.* 1983;29:224-32.
8. Heil J. *Psychology of sport injury.* Champaign, Illinois: Human Kinetics; 1993.
9. Brewer BW. Review and critique of models of psychological adjustment to athletic injury. *J App Sport Psycho.* 1994;6:87-100.
10. Wiese-Bjornstal DM, Smith AM, Shaffer SM, Morrey MA. An integrated model of response to sport injury: Psychological and sociological dynamics. *J App Sport Psycho.* 1998;10:46-69.
11. Buceta JM. *Psicología y lesiones deportivas: prevención y recuperación.* Madrid: Dinykinson; 1996.
12. Rotella RJ, Heyman SR. Stress, injury and the psychological rehabilitation of athletes. En: Williams JM, editor. *Applied sport psychology: Personal growth to peak performance.* Palo Alto, California: Mayfield; 1986. p. 343-64.
13. Biddle SJH, Nigg CR. Theories of exercise behavior. *Int J Sport Psycho.* 2000;31:290-304.
14. Weiss MR. Psychological aspects of sport-injury rehabilitation: A developmental perspective. *J Ath Training.* 2003;38:172-5.
15. Levy AR, Polman RCJ, Clough PJ, McNaughton LR. Adherence to sport injury rehabilitation programs: a conceptual review. *Res Sports Med.* 2006;14:142-69.
16. Udry E. Examining mood, coping and social supporting the context of athletic injuries. Tesis doctoral no publicada. University of North Carolina-Greensboro: 1995.
17. Taylor CB, May S. Threat and coping appraisal as determinants of compliance with sports injury rehabilitation: An application of protection motivation theory. *J Sports Sci.* 1996;14:471-82.
18. Ford IW, Gordon S. Perspectives of sport trainers and athletic therapists on the psychological content of their practice and training. *J Sport Rehab.* 1997;7:17-29.
19. Larson GA, Starkey C, Zaichkowsky LD. Psychological aspects of athletic injuries as perceived by athletics trainers. *Sport Psycho.* 1996;10:37-47.
20. Brewer BW. Developmental differences in psychological aspects of sport-injury rehabilitation. *Ath Training.* 2003;38:152-3.
21. Brewer BW, Avondoglio JB, Cornelius AE, Van-Raalte JL, Brickner JC, Petitpas AJ, et al. Construct validity and interrater agreement of the Sport Injury Rehabilitation Adherence Scale. *J Sport Rehab.* 2002;11:170-8.
22. Brewer BW, Cornelius AE, Van Raalte JL, Petitpas AJ, Sklar JH, Pohlman MH, et al. Age-related differences in predictors of adherence to rehabilitation after anterior cruciate ligament reconstruction. *Ath Training.* 2003;38:158-62.
23. Brewer BW, Cornelius AE, Van Raalte JL, Petitpas AJ, Sklar JH, Pohlman MH, et al. Protection motivation theory and adherence to sport injury rehabilitation revisited. *Sport Psycho.* 2003;17:95-103.
24. Brewer BW, Cornelius AE, Van Raalte JL, Brickner JC, Tennen H, Sklar JH, et al. Comparison of concurrent and retrospective pain ratings during rehabilitation following anterior cruciate ligament reconstruction. *J Sport Exe Psycho.* 2004;26:610-5.
25. McNair D, Lorr M, Droppleman L. *Profile of Mood States (Manual).* San Diego: EDITS; 1971.
26. Ramírez A. *Lesiones deportivas: Un análisis psicológico de su recuperación.* Tesis doctoral. Universidad del País Vasco; 2000.
27. Morgan WP. Test of champions: The iceberg profile. *Psycho Today.* 1980;39:92-108.
28. Alzate R, Ramírez A, Artaza JL. The effect of psychological response on recovery of sport injury. *Res Sports Med.* 2004;15:15-31.

29. Chang CS, Grossman HY. Psychological effects of running loss on consistent runners. *Per Mot Skills*. 1988;66:875-83.
30. Pearson L, Jones G. Emotional effects of sports injuries: Implications for Physiotherapists. *Phys*. 1992;78:762-70.
31. Ramírez A, Alzate R, Lázaro I. Efectos psicológicos de la lesión deportiva. *Mot*. 2002;9:209-24.
32. Smith AM, Scott, SG, O'Fallon WM, Young ML. Emotional responses of athletes to injury. *Mayo Clin Proc*. 1990;65:38-50.
33. Hamilton LH, Hamilton WG, Meltzer JD, Marshall P, Molnar M. Personality, stress, and injuries in professional ballet dancers. *Am J Sports Med*. 1989;17:263-7.
34. Smith AM, Stuart MJ, Wiese-Bjornstal DM, Millner EK, O'Fallon WM, Crowson CS. Competitive athletes: preinjury and postinjury mood state and self-esteem. *Mayo Clin Proc*. 1993;68:939-47.
35. Brewer BW, Linder DE, Phelps CM. Situational correlates of emotional adjustment to athletic injury. *Clin J Sport Med*. 1995;5:241-5.
36. Dawes H, Roach NK. Emotional responses of athletes to injury and treatment. *Phys*. 1997;83:243-7.
37. Macchi R, Crossman J. After the fall: reflections of injured classical ballet dancers. *J Sport Behav*. 1996;19:221-34.
38. May JR, Sieb GE. Athletics injuries: Psychosocial factors in the onset, sequelae, rehabilitation, and prevention. New York, NY: PMA Publishing; 1987. p. 157-85.
39. Pearson RE, Petitpas AJ. Transitions of athletes: developmental and preventive perspectives. *J Coun Devel*. 1990;69:7-10.
40. Quackenbush N, Crossman J. Injured athletes: a study of emotional responses. *J Sport Behav*. 1994;17:178-87.
41. Quinn AM, Fallon BJ. The changes in psychological characteristics and reactions of elite athletes from injury onset until full recovery. *J App Sport Phycho*. 1999;11:210-29.
42. La Mott EE. The anterior cruciate ligament injured athlete: The psychological process. Tesis doctoral no publicada. University of Minnesota; 1994.
43. Leddy MH, Lambert MJ, Ogles BM. Psychological consequences of athletic injury among high level competition. *Res Quart Ex Sport*. 1994;65:349-54.
44. McDonald SA, Hardy CJ. Affective responses patter of injured athlete: An exploratory analysis. *Sport Psycho*. 1990;4:261-74.
45. Morrey MA. A longitudinal examination of emotional response, cognitive doping, and physical recovery among athletes undergoing anterior cruciate ligament reconstructive surgery. Tesis doctoral no publicada. University of Minnesota, Minneapolis; 1997.
46. Sánchez Guerrero E, Pineda C, Díaz E, Guillén F, Fernández F, Montoso E. Revisión de las áreas de interés psicossomático en el deporte de equipo. *Arch Med Dep*. 2000;76:184-5.
47. Shelbourne KD, Foulk DA. Timing of surgery in acute anterior cruciate ligament teas on the return of quadriceps muscle strength after reconstruction using an autogenous patellar graft. *Am J Sports Med*. 1995;23:686-9.
48. Moran AP. Sport and exercise psychology: A critical introduction. London: Routledge; 2004.
49. Podlog L, Eklund RC. The psychosocial aspects of a return to sport following serious injury: A review of a literature from self-determination perspective. *Psycho Sport Ex*. Doi: 10.1016/j.psychsport.2006.07.008.



**Appendix I** Assessment of the sportsperson's adherence to the rehabilitation programme

<b>Clinical Treatments</b>	<b>Session No. ( )</b>					<b>Date ( )</b>				
Assistance	0	1	2	3	4	5	6	7	8	9
Punctuality	0	1	2	3	4	5	6	7	8	9
Pain	0	1	2	3	4	5	6	7	8	9
Functionality	0	1	2	3	4	5	6	7	8	9
Interest	0	1	2	3	4	5	6	7	8	9
Collaboration	0	1	2	3	4	5	6	7	8	9
Implication	0	1	2	3	4	5	6	7	8	9
Active treatment	0	1	2	3	4	5	6	7	8	9
Passive treatment	0	1	2	3	4	5	6	7	8	9
<b>Self Treatment</b>	<b>Session No. ( )</b>					<b>Date ( )</b>				
Filling out the control sheet	0	1	2	3	4	5	6	7	8	9
Correctly answering control questions	0	1	2	3	4	5	6	7	8	9
Interest	0	1	2	3	4	5	6	7	8	9
Implication	0	1	2	3	4	5	6	7	8	9
Degree of achieving tasks	0	1	2	3	4	5	6	7	8	9