



## Case Studies

## Effectiveness of a stress management pilot program aimed at reducing the incidence of sports injuries in young football (soccer) players

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## ABSTRACT

**Objectives:** Several attempts to reduce the incidence of sport injuries using psychosocial interventions produced fruitful, although inconclusive results. This paper presents the effectiveness and implementation issues of a pilot 3-month stress-management and muscle relaxation program aimed at reducing sport injury incidence.

**Design:** Pre-post treatment-non treatment group comparison.

**Program administration:** The program was administered by a trained psychologist on a once-a-week, 1-h session basis.

**Participants:** Seventy-four male soccer players from four National Youth league teams voluntarily participated. Teams were randomly assigned to either treatment/non-treatment group.

**Measures:** Injury protocol, Self-monitoring cards, Athletes' satisfaction and commitment survey, Coaches' interview.

**Results:** Group main effect and Time-Group interaction effect were both statistically significant,  $F(1,60) = 8.30$ ,  $p = 0.005$ ,  $\eta^2_p = 0.121$ , with the average number of injuries larger in the post-treatment phase of non-treatment group ( $p = 0.005$ ,  $\eta^2_p = 0.077$ ). There was a significant decrease in the average number of injuries for the intervention group before and after implementing the program ( $p < 0.001$ ,  $\eta^2_p = 0.309$ ).

**Conclusions:** A controlled implementation of a psychosocial program was effective in reducing youth soccer sport injuries, with a high level of satisfaction and commitment from the athletes, as well as high acceptance from the coaches.

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## 1. Introduction

Each year, European sports practitioners face over 8 million sports injuries (Bauer & Steiner, 2009). The estimated incidence rate of injuries per 1000 h of training plus competition ranges from 2.4 to 4.5, depending on the sport; however, there is high variability among studies (Pujals, Rubio, Márquez, Sanchez-Iglesias, & Ruiz, 2016). The widespread morbidity of this condition appears regardless of modality, category, gender or age. Due to the increase in professionalization, competitiveness and number of participants, the number of sports injuries in younger people is particularly

noticeable (Yang et al., 2012).

Sports injuries not only jeopardize an individual's career in sports, but also affect different aspects of the athlete's life (Evans, Wadey, Hanton, & Mitchell, 2012), including their physical and psychological health (Almeida, Olmedilla, Rubio, & Palou, 2014), in addition to the substantial economic burden the injuries represent (Cumps et al., 2008).

Despite underlying biomechanical aspects, sports injury is a multi-determined phenomenon involving a number of variables such as equipment, weather conditions, surface, training overload, previous injury history, etc. (Boden, Feagin Jr, & Garrett Jr, 2000). Furthermore, in recent years the psychological factors involved in an athlete becoming injured have been emphasized (Almeida et al., 2014; Johnson, Tranaeus, & Ivarsson, 2014). Variables such as perceived vulnerability (Deroche, Stephan, Brewer, & Le Scanff,

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2007), personality traits (Stephan, Deroche, Brewer, Caudroit, & Le Scanff, 2009), mood states (Rozen & Horne, 2007), coping resources (Hanson, McCullagh, & Tonymon, 1992), social support (Petrie, Deiters, & Harmison, 2014) and risk-taking behavior (Bovard, 2008) have been shown to be related to vulnerability to sports injuries.

A highly influential framework for analyzing the psychosocial antecedents of sports injuries is the Williams and Andersen's Stress and Injury Model (Andersen & Williams, 1988; Williams & Andersen, 1998). According to this model, stress is a key factor in the pathogenesis of injury. This model synthesized the link between different specific psychological variables and sports injuries that previous research had shown and has received robust empirical support (Johnson & Ivarsson, 2011). The authors also proposed that the underlying mechanisms involved in the stress-injury relationship were muscle tension and attention deficit. According to this model, the stress response increases generalized muscle tension, which can lead to a disruption in motor coordination and a reduction in flexibility, both of which increase fatigue. Furthermore, stress can narrow the visual field as well as increasing distractibility, both of which reduce the processing span of relevant peripheral information (Williams & Andersen, 1998).

With reference to muscle tension, it is well known that the introduction of a real or perceived stressor increases the activity of the sympathetic nervous system, while the parasympathetic nervous system decreases its activity (Berntson & Cacioppo, 2004). The imbalance in this mechanism is the basis of many medical and psychiatric disorders (Berntson & Cacioppo, 2004). Therefore, the introduction of methods that induce relaxation will increase the activity of the parasympathetic nervous system, and several studies have shown that these methods are effective strategies for reducing the stress response (Davis, Eshelman, & McKay, 2008). The most commonly used relaxation techniques are breathing retraining and progressive muscle relaxation (Bernstein, Carlson, & Schmit, 2007). These two techniques are thought to tackle two different aspects of arousal and emotional activation. Muscle relaxation reduces arousal through the skeletal muscle system. Diaphragmatic breathing increases heart rate variability (Moss, 2004), lower levels of which have been systematically related to different medical conditions in which stress plays a role (Berntson & Cacioppo, 2004).

With regard to attention deficits, acute stress has been associated with a broad range of impairments in cognitive function including prolonged attentional deficit (Olver, Pinney, Maruff, & Norman, 2015). Cognitive techniques aimed at improving problem-focused and emotion-focused coping skills (Lazarus & Folkman, 1984) have been shown to be effective in managing stress-related disorders (D'Zurilla & Nezu, 2010). One of the successful techniques is stress-inoculation training (SIT, Meichenbaum, 1985). This technique is based on the assumption that people experience stress due to a negative interpretation of the events they face, therefore, it aims to present situational demands as problems to be solved rather than a catastrophic condition to be suffered. One of the main components of SIT is self-instructional training (Meichenbaum, 1975), which guides peoples' behavior through self-talk, which gradually becomes self-generated and habitual. Self-instructional training has shown to be effective in the control of impulsive behavior (Durlak, Fuhrman, & Lampman, 1991) related to attention deficit (Spence, 2003).

The aforementioned techniques are included within the Cognitive-Behavioral Therapy (CBT) approach that refers to a class of interventions which have shown to be effective in reducing the stress response in clinical settings (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). Accordingly, psychological treatments could be useful in reducing sports injury. Nevertheless, only a few of the studies have been devised and conducted in such a way as to

empirically test the effectiveness of such treatments in reducing sport injuries. Johnson (2007) conducted a systematic review of nine empirical prevention intervention studies; seven primarily focused on reducing sports injuries. His results showed that all the prevention strategies at least partially supported the effectiveness of psychosocial interventions. However, Johnson (2007) also noted that many of them did not include a control, or other intervention groups, nor did they use statistical comparisons. In fact, most used qualitative methodologies. Moreover, there was a wide range of intervention objectives and techniques: from biofeedback, to relaxation, to attentional training. More recently, Johnson et al. (2014) analyzed the studies conducted since the previous paper was published. They reviewed three different papers and a PhD dissertation. All the studies they reviewed used a quantitative approach, and three of them had used a control group to compare the effects of psychosocial interventions. The results however, were far from conclusive: two showed significant differences between the control and intervention groups, but the other two did not show any statistically significant results, either when comparing the control and intervention groups or when comparing the athletes before and after the intervention.

Similarly, Olmedilla, Rubio, and Ortega (2015) performed a systematic review of 14 prevention intervention studies aimed primarily or secondarily, at reducing the risk of injury in a sports setting; some studies were included in previous reviews while others were not. The results also showed great disparities in the design, control groups, gender, categories, competitive levels, intervention objectives and techniques, and number of sessions. For instance, only 7 studies used control groups and a sample large enough to compare groups. The review showed 4 out of these 7 found significant differences. Therefore, it is difficult to determine the strength of the empirical support of a psychological intervention being useful for preventing sports injuries. The authors mentioned several factors that might lay at the root of the inconclusive results, such as the use of standardized interventions regardless of the reactivity to stress of each individual, the use of short-term interventions, the wide range of intervention objectives, and the lack of well-controlled designs (Olmedilla et al., 2015).

Tranaeus, Ivarsson, & Johnson, 2015 carried out a meta-analysis although with a rather reduced number of studies. The results showed a significant impact of the psychological interventions on reducing athletes' injury frequency (Hedges'  $g$  effect size = 0.81, odds ratio = 4.41), six of the seven studies included in the meta-analysis reported a substantial decrease in sports injuries. It was noticeable that most of the prevention intervention strategies used were cognitive-behavioral training programs using relaxation, imagery, and cognitive components targeting the main factors of Andersen & Williams's model.

To our knowledge, the most recent attempt to test the effectiveness of psychological interventions in reducing the occurrence of sports injuries has been Ivarsson, Johnson, Andersen, Fallby, and Altemyr (2015). These authors conducted a study using a mindfulness-based program targeting awareness, executive functions, and attentional processes. Despite the fact that there were no significant differences in injury rates between the group that received the program compared with the control group, a medium effect size (adjusted Cohen's  $d$  = -0.59) was found and 67% of athletes in the treatment group remained injury-free by comparison with 40% of the control group.

In summary, there is a theoretical framework targeting stress-management for reducing sports injuries (Williams & Andersen, 1998), and a collection of psychological techniques that have clearly shown their effectiveness in controlling, reducing, or increasing such aspects in clinical (Hofmann et al., 2012) and other

settings, such as sport (McArdle & Moore, 2012). There are also some observational studies that show positive results for preventing sports injuries (Tranaeus et al., 2015). However, there are some others that do not, despite the effectiveness of techniques like muscle relaxation or SIT. Regardless of the fact that there may be some other factors that might be responsible for these inconsistent results, i.e. the wide range of intervention objectives, different psychosocial techniques, and a lack of a well-controlled experimental design (Johnson et al., 2014; Olmedilla et al., 2015), several aspects regarding implementation should be addressed. As Finch (2006) wrote, “to prevent injuries, sport injury prevention measures need to be acceptable, adopted and complied with by athletes and sport bodies they are targeted at” (p. 5).

Extending the administration of psychological interventions in a sport setting will mean having to face several challenges, and intervention research could prove to be difficult (Anderson, Miles, Mahoney, & Robinson, 2002). As Finch (2006) mentioned with regard to sport injury prevention, measures are not going to be implemented by sport bodies until they are sure “[they] are acceptable to their participants, do not change the essential nature or appeal of the sport, and do not adversely affect participation or performance.” (p. 5).

Acceptance, adoption and compliance are related to treatment fidelity. Treatment fidelity refers to the degree to which a particular program delivers the set of interventions and procedures as intended (Bond, Evans, Salyers, Williams & Kim, 2000; Gearing et al., 2011). Treatment fidelity, which includes program design and instructions, administering agents training, delivery, receipt and enactment (Bellg et al., 2004) is not only essential for the effectiveness of the programs but also for conducting meaningful clinical trials of health, psychological and/or social interventions (Campbell et al., 2013; Gearing et al., 2011). Therefore, the present paper aims to test the effectiveness of a psychological intervention designed to improve stress management in reducing sports injuries in young soccer players, paying particular attention to implementation issues such as controlling compliance and promoting staff, coaches and athletes' acceptance.

Specifically, this paper addresses whether a CBT-based stress management program can increase its effectiveness based on 1) increasing its acceptance by coaches and players; 2) extending its adoption by including the program's modules as a part of the regular training routines; 3) improving compliance using an individually-based follow up of goals and achievements.

## 2. Method

### 2.1. Participants

Seventy-four male soccer players from four different teams competing in the National Youth League (17–19 years old; mean age = 17.5), all from the same Spanish region, participated in the study. The eligibility criteria included attending at least 60% of the treatment sessions and providing information about their injuries. Four participants in the treatment group were not considered for further analysis as they did not attend the minimum of number of sessions required by the study. Seven participants in the non-treatment group were also excluded from the study as they did not provide the weekly-based injury protocol. The final sample comprised 63 athletes, 35 in the treatment group and 28 in the non-treatment group.

#### 2.1.1. Program

The program is based on Stress Inoculation Therapy (Meichenbaum, 1985). This technique is based on the assumption that people who have unconscious bad coping habits, might make

stressful situations worse. SIT is aimed at learning to differentiate between changeable and unchangeable aspects of the stressful situation and promoting the skills which would allow the individual to cope with the stress. A key phase in this process is the conceptualization phase in which the participant is taught about the nature of stress and the role of appraisal in cognitive distortion. Furthermore, the program also shows the link between thought and emotions and how cognitive appraisals shape those emotions which influence behavior.

In order to improve stress-management skills, the program teaches progressive muscle relaxation, breathing, imagery, passive and differential muscle relaxation, as well as self-instructional and attention-focus training. These techniques target muscle tension and attention deficits supposedly at the root of the stress-injury relationships. Eventually, individuals learn how to apply the skills in natural settings. The method used aims to progressively expose the individual to stressful situations, gradually ‘inoculating’ the events that might trigger a stress response in order to increase the participants ‘resistance’, using the same theoretical principle as a vaccine (Meichenbaum, 1985).

The intervention consisted of a three-month, once-a-week, 1-h program, and included the following modules: 1. Linking thoughts and emotions; 2. Progressive muscle relaxation, breathing, imagery, passive and differential muscle relaxation; 3. Self-instructional and attention-focus training; and 4. Stress inoculation training. Appendix 1 gives an example of one of the exercises in the Progressive Muscle Relaxation module.

The program was administered at each team's premises in a group format, although the athletes were committed to complete the exercises between the sessions on an individual basis. Athletes filled in self-monitoring cards recording demanding situations, emotion and behavior, skills executed, and difficulties, if any. Each session began by reviewing the exercises completed and any problems encountered in the application of the learned skills.

### 2.2. Materials

#### 2.2.1. The injury protocol

The injury protocol devised by Olmedilla, Garcia-Montalvo, and Martinez-Sanchez (2006) was used to gather information regarding sports injuries. A sport injury was defined as any physical complaint sustained by an athlete during a competition or training directly related to the sport, which resulted in at least one day of restricted participation. Despite the current consensus about defining sports injuries irrespective of the time lost (Fuller et al., 2006), we decided to collect ‘time-loss’ injuries to reduce memory recall biases. The protocol recorded data about the injuries suffered, including the location, diagnosis, and severity according to the number of days of restricted participation. The protocol included a description of how the injury was sustained and the athlete's attribution of cause (own action, team mate's action, opposing player's action, environmental conditions, surface, or other), although these are not included in the current analysis because of the possibility of memory recall biases.

#### 2.2.2. Self-monitoring cards

Athletes who participated in the program were encouraged to fill in self-monitoring cards about the different skills in which they had trained e.g. muscle relaxation, stressful stimuli identification, negative thought stopping, etc. as well as the exposure exercises they had to face. Each card contained information regarding parameters such as time and setting of practice, intensity, difficulties and barriers, etc. Appendix 2 shows an example of the muscle relaxation self-monitoring card.

### 2.2.3. Athletes' satisfaction, improvement and commitment survey

Athletes included in the treatment group were asked to complete an ad-hoc, seven-point Likert scale survey, including three of the broad effectiveness outcomes to evaluate a sport psychology program (Anderson et al., 2002): a) quality of support; b) psychological skills and well-being; and c) athletes' response to the support. The survey was based on Partington and Orlick's (1987) seminal work and previous intervention program effectiveness evaluation questionnaires (Olmedilla, Ortega, Boladeras, Ortín & Bazaco, 2013). The survey included three different blocks of items which are rated from 'Not at all' to 'Absolutely': 1. Satisfaction regarding program delivery, perceived utility of the face to face sessions, the utility of the cards used, and the quality of the communication with the psychologists; 2. Perceptions about the psychological techniques learned: relaxation; visualization, and goal setting; 3. Perceptions of their improvement in the skills taught and their generalization in training/competition situations. Finally, the survey measured their overall satisfaction with the program with an item asking so.

### 2.2.4. Coaches' satisfaction interview

The coaches were asked in a semi-structured interview about the extent that the program administration had interfered with their training plan, and whether they had appreciated any positive/negative effects in their soccer players' performance. They were also asked about their willingness to promote such experiences in the future. The questions asked included: 'Would you promote a repetition of this experience in the near future?', 'Do you think that the psychological training has been useful for your athletes?'

### 2.3. Procedure

After obtaining the approval of the Institutional Review Board and the support of the regional Soccer Association, a number of junior soccer teams were contacted. They were asked if they would like to participate in the study and receive psychological skills training. Four teams were willing to participate. The players from these teams were asked to give their informed consent for the researchers to gather and analyze injury data.

Two teams were randomly included in the non-treatment group, which would only receive a one-day general talk about the role of psychological skills in performance. Two other teams were allocated to the treatment group, which was to receive an intervention program administered for three months on a once a week, 1 h basis. The program was administered at the beginning of the training session and included all players present at the session. Attending at least 60% of the program sessions was established as eligibility criterion.

In order to increase treatment effectiveness, a clinical psychologist with experience in sport psychology was recruited to administer the program to the two teams assigned to the treatment group. Treatment fidelity was improved by researchers and the clinical psychologist jointly analyzing the different modules before administration. The clinical psychologist was also responsible for providing the general talk to the non-treatment teams at the beginning of the study.

The study was carried out between December and June. As a preliminary step, the injury protocol was used retrospectively for collecting data on the number of injuries suffered in the previous season, as well as in the months from the preseason to the assessment, i.e. October to December, through an individual semi-structured interview conducted by an expert psychologist. The interview used temporal and situational clues to foster the most accurate memories regarding injuries sustained. The intervention program was then administered from December to February.

Individual sport injury incidence was then followed-up using the same protocol administered on a weekly basis for six months from January until June. At the beginning of each session, athletes were provided with the handouts and written exercises for the training. At the end of each session they were also provided with the self-monitoring cards in order to record the inter-session exercises. At the end of the program the athletes were surveyed regarding satisfaction, improvement, and commitment and coaches were interviewed about utility and acceptance.

### 2.4. Data analysis

Firstly, in order to make the different injury rates comparable, the average number of individual injuries per month related to pre- and post-intervention periods was computed. Secondly, as the subjects were not randomly assigned to treatment groups, the difference between the means of the two groups was tested in the pre-test to assess the equivalence of the groups. Then, an ANCOVA test was used to assess the main effects and interaction effects, using the pre-treatment scores as a covariate. According to Huck and McLean (1975) ANCOVA is a more appropriate and powerful model than a split-plot ANOVA to analyze data from a pre-post design with a between-subjects treatment factor, using pre-treatment scores as a covariate; when a significant simple effect was found, its effect size was assessed using the Pearson product-moment correlation squared ( $r^2$ ) derived from the estimate of  $\delta$  as proposed by Cohen (1988). The means of the athletes' responses to the Satisfaction, Improvement and Commitment survey were computed. A qualitative analysis of the coaches' responses was carried out. Interview records were analyzed independently by two researchers who rated to what extent the coaches considered the experience useful and replicable.

## 3. Results

The average number of sports injuries per month, before and after the treatment in total, and in each group, is shown in Table 1. This table shows that players suffered almost one injury every three months before implementing the treatment. These figures declined after implementing the treatment in the total sample.

There were no significant differences between the two groups regarding the average number of injuries before the treatment,  $t(61) = -0.460$ ,  $p = 0.647$ , making them equivalent for comparison. The ANCOVA model (see Fig. 1) revealed no significant main effect regarding time,  $F(1, 60) = 0.28$ ,  $p = 0.600$ ,  $\eta^2_p = 0.005$ . Nevertheless, the group main effect and the time-group interaction effect were statistically significant:  $F(1,60) = 8.30$ ,  $p = 0.005$ ,  $\eta^2_p = 0.121$ . Both effects were the same as a result of using the pre-treatment as a covariate.

The simple effects analysis showed that the differences between the groups were significant in the post-treatment phase ( $p = 0.005$ ,  $r^2 = 0.077$ ), showing that the average number of injuries was larger in the non-treatment group. In addition, there was no evidence of

**Table 1**

Sport injury monthly average (number of sports injuries reported during the pre- and post-intervention periods divided by the number of months included in each period) means and SDs pre- and post-intervention.

Group	n	Pre-intervention		Post-intervention	
		M	SD	M	SD
Treatment	35	0.30	0.21	0.11	0.20
Non-treatment	28	0.28	0.21	0.24	0.24
Total	63	0.29	0.21	0.17	0.22



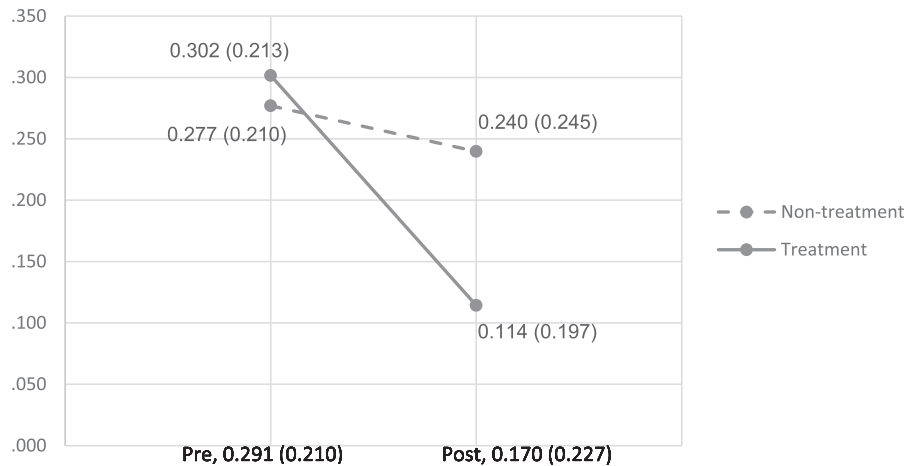


Fig. 1. Sport injury monthly average marginal means (SDs), pre- and post-intervention, treatment and non-treatment groups.

any significant differences between pre- and post-treatment for the control group ( $p = 0.229$ ), but there was a significant decrease in the average number of injuries in the treatment group ( $p < 0.001$ ,  $r^2 = 0.309$ ).

The average global satisfaction with the program was 6.1 out of 7. The athletes particularly liked the progressive muscle relaxation and the self-instructional modules and gave them an average score of 6.8 and 6.6, respectively. A qualitative analysis of the coaches' interviews showed that their satisfaction was also high. The two coaches of the intervention group mentioned that the program did not interfere with their ordinary training activities. They also mentioned the positive effects on athlete performance, and noted that players were more focused and less anxious when coping with high-stake matches. The coaches of the two teams involved in the treatment group emphatically expressed their willingness to take part in similar future experiences.

#### 4. Discussion

The results showed that a program consisting of muscle relaxation, breathing retraining, and stress inoculation with self-instruction was able to reduce the frequency of injuries in junior soccer players. This was true for both the comparison between the pre- and post-treatment group injury averages and the comparison between treatment and non-treatment groups after the administration of the program. Thus, a psychological intervention aimed at increasing athletes' stress management skills and, particularly, reducing muscle tension and attentional distractibility usually provoked by stressful conditions was effective, making them less vulnerable to sports injuries.

Sports injury is a multi factor phenomenon involving many different internal and external mechanisms (Boden, Feagin, & Garrett, 2000). There is direct and indirect evidence to uphold the relationship between stress and injuries, and the role of both mechanisms in this relationship (Rogers & Landers, 2005; Williams & Andersen, 1997). The results obtained were consistent with the Williams and Andersen (1998) model which established muscle tension and attentional deficits underlying the relationship between stress and injuries.

Despite the robust evidence regarding the effectiveness of psychological intervention techniques for improving stress management and controlling, reducing, or increasing the different outcomes involved, previous attempts to reduce the incidence of sports injuries using psychosocial interventions were not always successful, and their results were inconsistent (Johnson, 2007;

Johnson et al., 2014; Olmedilla et al., 2015). Several concerns have been raised regarding these studies, such as the individual differences in athletes' stress reactivity, the wide spectrum of psychological techniques used and the short duration of the interventions (Johnson et al., 2014). However, other factors can also be considered, such as the experience and training of the psychologist who administers the intervention, dose-response relationships, and the interface with regular training activities. The case we have presented here shows that a psychological program focused on the key aspects posed by the Williams and Andersen model, implemented by a trained psychologist and embraced by the staff, could be useful for reducing sport injury vulnerability. This experience has shown that acceptance and adoption are key components of the effectiveness of the program. If the coaches are willing to promote such activities, and the athletes are committed to the exercises and satisfied with their improvement, the program is more likely to succeed. Therefore, successful psychological interventions must be focused not only on theoretically and empirically sound techniques but also on implementation issues which might or might not derail program accomplishment.

Nevertheless, the study has presented several limitations that should be noted. Firstly, even though the teams were randomly assigned to the treatment/non-treatment conditions, they were not randomly selected. Therefore, the particular characteristics of the teams involved which might account for them being more vulnerable to sport injuries could not be controlled.

Secondly, the study gathered injury information for the pre-treatment period retrospectively. Although an expert psychologist conducted individual interviews to survey the previous history of injuries, giving temporal and situational sampling clues, the effects of memory might produce an underestimation of the number of injuries sustained during the previous season, particularly those that did not affect the player's match participation. However, the high average injury rate did not appear to be largely affected. The decision not to consider the different severity levels recorded was influenced by the athletes' inaccuracies in recalling the time elapsed before returning to training or competition.

Thirdly, although the athletes in the treatment group participated enthusiastically, some were not always able to attend training and consequently missed the psychological session. The researchers established an eligibility criterion of attending at least 60% of the sessions. The sample bias included in this selection was not known. Likewise, there were a number of players in the non-treatment group who did not comply with the injury protocol task and so were ruled out of the study. However, the differences in

compliance with either attending the sessions, completing the exercises, and recording injuries of the athletes in both groups illustrates the efficacy of the program in promoting adherence.

Finally, the length of the periods that were compared was not equal. Arithmetical transformation to render the periods comparable could solve the problem regarding these calculations, but a period of six months was not considered long enough to determine the lasting effectiveness of the program. When testing the effectiveness of interventions such as this the season before implementing the program must also be considered. However, the problem that many of the members of youth sports teams change rather quickly make this desideratum difficult to reach.

This study was carried out with a reduced number of male soccer players aged between 17 and 19 years. It is therefore difficult to say to what extent this kind of intervention could be generalized to other groups. However, any team sport could receive this group-based intervention. Gender differences in sport injury incidence might also affect a program's effectiveness (Powell & Barber-Foss, 2000; Prodromos et al., 2007), although the program itself is not gender specific and could be delivered to either males or females. Finally, age differences could also affect the outcome, as a result of both age and injury history, and the willingness of older people to receive an hour long intervention session. Therefore, future research is needed to analyze the role of these variables.

## 5. Conclusions

The results of this pilot study suggest that a program aimed at controlling the stress response can reduce the incidence of sports injuries in young athletes. The design of an empirically-based treatment program and its implementation on a systematic basis by a clinically trained psychologist, who is also an expert sport psychologist, paying particular attention to acceptance and adoption makes the program effective, and promotes its acceptance by coaches and staff alike. The positive results foster the expansion of the program to other youth soccer clubs as well as other sport clubs.

## Ethical Approval

Ethical approval was obtained from the Universidad Autonoma de Madrid.

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## Conflict of Interest

None declared

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## Appendix 1

### Progressive Muscle relaxation script

“Today we're going to work on different muscle groups. You'll be asked to focus firstly on tension and afterwards on relaxation of the different groups. You should apply tension on the indicated group of muscles and just only on this group of muscles for about 5 s. When you are asked to do so, inhale air and squeeze the group of muscles. Focus on the sensations from this part of your body. Then, you will be asked to release the tension while exhaling the air and focus on the new sensations from this part of the body. It's very important you distinguish between tension and relaxation”.

### Hands and arms (Hands)

“Keeping your eyes closed, inhale air and make a tight fist with your right hand. Be aware of the tension of your hand (5 s). Now exhale the air at the same time let all the tightness go out. Perceive how your hand becomes relaxed, how comfortable the feelings are compared to what you felt when you squeeze your hand (1 min). Let's repeat the exercise”.

## Appendix 2

Day	Starting time	Ending time	Tension before practice (0-10)	Tension after practice (0-10)	Comments (incidents, muscle groups particularly reluctant to relaxation, etc.)
Mon__					
Tues__					
Wed__					
Thur__					
Frid__					
Sat__					
Sun__					

## References

- Almeida, P. L., Olmedilla, A., Rubio, V. J., & Palou, P. (2014). Psychology in the realm of sport injury. *Revista de Psicología del Deporte*, 23(2), 395–400.
- Andersen, M. B., & Williams, J. M. (1988). A model of stress and athletic injury: Prediction and prevention. *Journal of Sport and Exercise Psychology*, 10, 294–306.
- Anderson, A., Miles, A., Mahoney, C., & Robinson, P. (2002). Evaluating the effectiveness of applied sport psychology practice: Making the case for a case study approach. *Sport Psychologist*, 16, 433–454.
- Bauer, R., & Steiner, M. (2009). *Injuries in the European Union, statistics summary 2005–2007*. Vienna: Kuratorium für Verkehrssicherheit (Austrian Road Safety Board).
- Bell, A., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., et al. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the Behavior Change Consortium. *Health Psychology*, 23, 443–451.
- Bernstein, D. A., Carlson, C. R., & Schmit, J. E. (2007). Progressive relaxation. Abbreviated methods. In P. M. Lehrer, R. L. Woolfolk, & W. E. Sime (Eds.), *Principles and practice of stress management* (pp. 88–122). New York: Guilford Press.
- Bernstom, G. G., & Cacioppo, J. T. (2004). Heart rate variability: Stress and psychiatric conditions. In M. Malik, & A. J. Camm (Eds.), *Dynamic electrocardiography* (pp. 57–64). New York: Blackwell/Futura.
- Boden, B. P., Feagin, J. A., Jr., & Garrett, W. E., Jr. (2000). Mechanisms of anterior cruciate ligament injury. *Orthopedics*, 23, 573. <http://dx.doi.org/10.3928/0147-7447-20000601-15>.
- Bond, G. R., Evans, L., Salyers, M. P., Williams, J., & Kim, H. W. (2000). Measurement of fidelity in psychiatric rehabilitation. *Mental Health Services Research*, 2(2), 75–87.
- Bovard, R. S. (2008). Risk behaviors in high school and college sport. *Current Sports Medicine Reports*, 7, 359–366. <http://dx.doi.org/10.1249/JSR.0b013e31818f0bed>.
- Campbell, B. K., Buti, A., Fussell, H. E., Srikanth, P., McCarty, D., & Guydish, J. R. (2013). Therapist predictors of treatment delivery fidelity in a community-based trial of 12-step facilitation. *The American Journal of Drug and Alcohol Abuse*, 39, 304–311. <http://dx.doi.org/10.3109/00952990.2013.799175>.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York: Academic Press.
- Cumps, E., Verhagen, E., Annemans, L., et al. (2008). Injury rate and socioeconomic costs resulting from sports injuries in Flanders: Data derived from sports insurance statistics 2003. *British Journal of Sports Medicine*, 42, 767–772. <http://dx.doi.org/10.1136/bjism.2007.037937>.
- Davis, M., Eshelman, E. R., & McKay, M. (2008). *The relaxation and stress reduction workbook*. Oakland: New Harbinger Publications.
- Deroche, T., Stephan, Y., Brewer, B. W., & Le Scannf, C. (2007). Predictors of perceived susceptibility to sport-related injury. *Personality and Individual Differences*, 43, 2218–2228. <http://dx.doi.org/10.1016/j.paid.2007.06.031>.
- Durlak, J. A., Fuhrman, T., & Lampman, C. (1991). Effectiveness of cognitive-behavior therapy for mal-adapting children: A meta-analysis. *Psychological Bulletin*, 110(2), 204. <http://dx.doi.org/10.1037/0033-2909.110.2.204>.
- D'Zurilla, T. J., & Nezu, A. M. (2010). Problem-solving therapy. In K. S. Dobson (Ed.), *Handbook of cognitive-behavioral therapies* (pp. 197–225). New York: Guilford Press.
- Evans, L., Wadey, R., Hanton, S., & Mitchell, I. (2012). Stressors experienced by injured athletes. *Journal of Sports Sciences*, 30, 917–927. <http://dx.doi.org/10.1080/02640414.2012.682078>.
- Finch, C. (2006). A new framework for research leading to sports injury prevention. *Journal of Science and Medicine in Sport*, 9(1), 3–9.
- Fuller, C. W., Ekstrand, J., Junge, A., et al. (2006). Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Scandinavian Journal of Medicine & Science in Sports*, 16, 83–92. <http://dx.doi.org/10.1111/j.1600-0838.2006.00528.x>.
- Gearing, R. E., El-Bassel, N., Ghesquiere, A., Baldwin, S., Gillies, J., & Ngeow, E. (2011). Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. *Clinical Psychology Review*, 31(3), 79–88. <http://dx.doi.org/10.1016/j.cpr.2010.09.007>.
- Hanson, S. J., McCullagh, P., & Tonymon, P. (1992). The relationship of personality characteristics, life stress, and coping resources to athletic injury. *Journal of Sport and Exercise Psychology*, 14, 262–272.
- Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., & Fang, A. (2012). The efficacy of cognitive behavioral therapy: A review of meta-analyses. *Cognitive Therapy and Research*, 36, 427–440. <http://dx.doi.org/10.1007/s10608-012-9476-1>.
- Huck, S. W., & McLean, R. A. (1975). Using a repeated measure ANOVA to analyze the data from a pretest-posttest design: A potentially confusing task. *Psychological Bulletin*, 82, 511–518. <http://dx.doi.org/10.1037/h0076767>.
- Ivarsson, A., Johnson, U., Andersen, M. B., Fallby, J., & Altemyr, M. (2015). It pays to pay attention: A mindfulness-based program for injury prevention with soccer players. *Journal of Applied Sport Psychology*, 27, 319–334. <http://dx.doi.org/10.1080/10413200.2015.1008072>.
- Johnson, U. (2007). Psychosocial antecedents of sport injury, prevention, and intervention: An overview of theoretical approaches and empirical findings. *International Journal of Sport and Exercise Psychology*, 5, 352–369.
- Johnson, U., & Ivarsson, A. (2011). Psychological predictors of sport injuries among junior soccer players. *Scandinavian Journal of Medicine & Science in Sports*, 21, 129–136. <http://dx.doi.org/10.1111/j.1600-0838.2009.01057.x>.
- Johnson, U., Traanaeus, U., & Ivarsson, A. (2014). Current status and future challenges in psychological research of sport injury prediction and prevention: A methodological perspective. *Revista de Psicología del Deporte*, 23, 401–409.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- McArdle, S., & Moore, P. (2012). Applying evidence-based principles from CBT to sport psychology. *The Sport Psychologist*, 26, 299–310.
- Meichenbaum, D. (1975). Self-instructional methods. In F. H. Kanfer, & A. P. Goldstein (Eds.), *Helping people change* (pp. 357–391). Elmsford: Pergamon Press.
- Meichenbaum, D. (1985). *Stress inoculation training*. Elmsford: Pergamon Press.
- Moss, D. (2004). Heart rate variability (HRV) biofeedback. *Psychophysiology Today*, 1, 4–11.
- Olmedilla, A., Garcia-Montalvo, C., & Martinez-Sanchez, F. (2006). Factores psicológicos y vulnerabilidad a las lesiones deportivas: Un estudio en futbolistas [psychological factors and sport injury vulnerability: A study in football]. *Revista de Psicología del Deporte*, 15, 37–52.
- Olmedilla, A., Ortega, E., Boladeras, A., Ortín, F. J., & Bazaco, M. J. (2013). Entrenamiento en estrategias y técnicas psicológicas y percepción de ayuda en futbolistas juveniles. *Sportk, Revista Euroamericana de Ciencias del Deporte*, 2, 51–58.
- Olmedilla, A., Rubio, V. J., & Ortega, E. (2015). Predicting and preventing sport injuries: The role of stress. In G. Hopkins (Ed.), *Sports injuries* (pp. 87–104). New York: Nova Publisher Inc.
- Olver, J. S., Pinney, M., Maruff, P., & Norman, T. R. (2015). Impairments of spatial working memory and attention following acute psychosocial stress. *Stress and Health*, 31, 115–123. <http://dx.doi.org/10.1002/smi.2533>.
- Partington, J., & Orlick, T. (1987). The sport psychology consultant evaluation form. *The Sport Psychologist*, 1, 309–317.
- Petrie, T. A., Deiters, J., & Harmison, R. J. (2014). Mental toughness, social support, and athletic identity: Moderators of the life stress–injury relationship in collegiate football players. *Sport, Exercise, and Performance Psychology*, 3, 13–27. <http://dx.doi.org/10.1037/a0032698>.
- Powell, J. W., & Barber-Foss, K. D. (2000). Sex-related injury patterns among selected high school sports. *The American Journal of Sports Medicine*, 28, 385–391.
- Prodromos, C. C., Han, Y., Rogowski, J., et al. (2007). A meta-analysis of the incidence of anterior cruciate ligament tears as a function of gender, sport, and a knee injury–reduction regimen. *Arthroscopy*, 23, 1320–1325. <http://dx.doi.org/10.1016/j.arthro.2007.07.003>.
- Pujals, C., Rubio, V. J., Márquez, M. O., Sánchez-Iglesias, I., & Ruiz, R. (2016). Comparative sport injury epidemiological study on a Spanish sample of 25 different sports. *Revista de Psicología del Deporte*, 25, 271–279.
- Rogers, T. J., & Landers, D. M. (2005). Mediating effects of peripheral vision in the life event stress/athletic injury relationship. *Journal of Sport and Exercise Psychology*, 27, 271–288.
- Rozen, W. M., & Horne, D. J. L. (2007). The association of psychological factors with injury incidence and outcome in the Australian Football League. *Individual Differences Research*, 5, 73–80.
- Spence, S. H. (2003). Social skills training with children and young people: Theory, evidence and practice. *Child and Adolescent Mental Health*, 8, 84–96. <http://dx.doi.org/10.1111/1475-3588.00051>.
- Stephan, Y., Deroche, T., Brewer, B. W., Caudroit, J., & Le Scannf, C. (2009). Predictors of perceived susceptibility to sport-related injury among competitive runners: The role of previous experience, neuroticism, and passion for running. *Applied Psychology*, 58, 672–687. <http://dx.doi.org/10.1111/j.1464-0597.2008.00373.x>.
- Traanaeus, U., Ivarsson, A., & Johnson, U. (2015). Evaluation of the effects of psychological prevention interventions on sport injuries: A meta-analysis. *Science & Sport*, 30, 305–313. <http://dx.doi.org/10.1016/j.scispo.2015.04.009>.
- Williams, J. M., & Andersen, M. B. (1997). Psychosocial influences on central and peripheral vision and reaction time during demanding tasks. *Behavioral Medicine*, 26, 160–167. <http://dx.doi.org/10.1080/08964289.1997.10543549>.
- Williams, J. M., & Andersen, M. B. (1998). Psychosocial antecedents of sport injury: Review and critique of the stress and injury model. *Journal of Applied Sport Psychology*, 10, 5–25. <http://dx.doi.org/10.1080/10413209808406375>.
- Yang, J., Tibbetts, A. S., Covassin, T., Cheng, G., Nayar, S., & Heiden, E. (2012). Epidemiology of overuse and acute injuries among competitive collegiate athletes. *Journal of Athletic Training*, 47, 198–204.

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