

## ARTICLE

## Variation in the Response to Pain Between Athletes and Non-Athletes

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Published: 01 September 2011

Ibnosina J Med BS 2011,3(5):165-171

Received: 07 November 2010

Accepted: 31 December 2010

This article is available from: <http://www.ijmbs.org>

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### Abstract

Athletes have been found to endure more pain than non-athletes. This may be due to more frequent use of adaptive pain responses by athletes. In this study, we aimed to identify the pain responses, which are most frequently employed by athletes and compare them with a non-athletic control group. Ninety male athletes from different sports categories (contact, limited-contact and non-contact) and thirty healthy male non-athletes were selected for this study. Results showed that athletes used adaptive pain responses (social support, activity) more frequently (0.001, 0.004 respectively) and maladaptive pain responses (avoidance), less frequently (0.001) than non-athletes. Further studies are required to investigate optimal timing and methods for these techniques to better understand the influence of these pain responses on pain control.

**Keywords:** athletes, non-athletes, coping, pain response, adaptive, maladaptive.

### Introduction

Pain is often associated with the athletic experience (1). Living with minor or major injuries and playing and practicing with pain seem to be more acceptable to sportspersons than no-sportspersons (2). Due to the high probability of experiencing pain, continued participation in a sport or physical activity thus requires an individual to have an ability to cope effectively with injury and pain (3). The consequences of ineffective coping are considerable. The definition of coping given by Lazarus & Folkman (4) defines coping as any cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person. Not coping effectively with acute and chronic pain may result in increased feelings of fear, anxiety, worry and risk for depression (5,6), substance abuse (5) as well as increased pain intensity and pain related disability (7). In regard to athletes in particular, researchers have found

that there are additional costs of not coping effectively with pain. Smith, Scott & Wiese (8) found that injured athletes experienced elevated levels of depression, frustration, and anger that paralleled their perceived rate of recovery. Since the above mentioned findings suggest that pain related disability and pain severity are linked to coping, it can be concluded that athletes who cope effectively with their pain should be able to return to active participation in their sport sooner than athletes with less effective coping. Athletes who cope with pain effectively should also be less at a risk for the negative consequences associated with refraining from sport participation (3).

The definition of coping implies that a multistep process is involved in coping consisting of appraisal and coping efforts. Due to the important role that coping plays in the eventual outcome of exposure to a stressor, such as injury, much research has focused on identifying the adaptive/effective and maladaptive/ineffective coping strategies. Adaptive coping strategies are those that allow the individual to reduce the stress due to the stressor, in this case, pain and resume his/her previous level of functioning. The strategies have been grouped into various categories according to their effectiveness. In avoidance oriented coping, the individual would try to distract him or herself from the experience of pain by ignoring pain (9), wishful thinking, restricting activities and guarding. These strategies have been found to be mostly maladaptive.

Active coping strategies include behavior, like exercising and attempting to ignore the pain. Researchers have found that active coping strategies are generally associated with better psychological and physical functioning (10).

The cognitive group of coping strategies would include any strategies that are aimed at controlling the pain mentally; e.g. employing problem solving techniques or diverting attention (2). Behavioral techniques include strategies that are aimed at controlling the pain via certain actions such as seeking social support (11). In spite of the high incidence of pain in sports and its consequences, there has been a surprising scarcity of research focusing on how athletes cope with exercise or injury related pain (3). However some evidence suggests that athletes may cope differently with pain than non-athletes (3). This evidence stems from research that has found that athletes are able to withstand more experimentally induced pain (e.g. cold pressor or ischemic pain) than non athletes implying an increased tolerance for pain (12-16). Ryan & Kovacic (14) also found that contact sport athletes tolerated acute pain significantly

longer than did non-contact athletes. Out of the several explanations proposed by the researchers for differences found in pain tolerance between athletes and non athletes, one is that athletes appraise their pain differently (13) and consequently they employ more adaptive coping strategies (17). It has been proposed that the study of pain reactions requires a dynamic reconceptualization to advance the evaluation of athletes' conscious and unconscious attitudes, feelings, and motivations (18).

The above mentioned facts bring to light, that the use of coping techniques can influence the variables of perception and endurance to pain and they can aid the process of physical and psychological rehabilitation of athletes and non athletes and their performance (19). A great number of studies in the literature address psychological techniques for pain control in patients with chronic and acute pain but there is scarcity of such studies in the athletic population addressing possible differences in the use of these techniques. The study of these differences becomes relevant as the marked differences between athletes and non-athletes in pain control and endurance are appreciated. Moreover pain in athletes is quite frequent and its better management of pain may promote significant performance enhancement and faster recovery from injuries (20). The purpose of this study was to assess firstly the predominant types of different responses to pain that are employed by different categories of athletes (contact, limited contact and non contact) and secondly whether athletes and non athletes differ in their response to pain.

## **Subjects and Methods**

### ***Experimental Hypothesis***

It was hypothesized that athletes would differ in the various pain response variables from non-athletes and that they would score higher for the more adaptive techniques of pain response. It was also hypothesized that amongst the athletes, those participating in contact sports would score higher for the adaptive pain responses (adaptive responses will be more dominant than the maladaptive responses) in comparison to non athletes, than the limited contact and non contact athletes

### ***Characteristics of Participants***

Participants were 90 national/state level professional male athletes from the sports teams of Punjab Armed Police, Jalandhar and 30 non-athletes. The age of participants ranged from 20 to 28 years. The athletes were from one of the following categories of sports (Gregory & Lynn, 2007):

Contact sports (n=30; football, boxing), limited contact sports (n=30; volleyball, handball), non-contact sports (n=30; power lifting). The participants were selected by random sampling.

### Instruments

For the study, we used a questionnaire concerning reaction to pain, provided by the Vienna Testing System Apparatus (Schufried, Austria). In this questionnaire, a list of 29 questions is presented. Each question pertains to one out of four variables measuring the response to pain. The variables assessed are, avoidance, cognitive control, social support and activity. For each question the subject should inform how often s/he used the particular response when experiencing pain. There were 5 possible scores being '1' (does not apply at all) and '5' (applies to a great extent). The Questionnaire on Reaction to Pain is a multidimensional instrument for evaluating the behavior of persons experiencing pain. The results can provide

help for the assessment of indications for psychological pain therapy as well as for a treatment plan. The alpha coefficients (internal consistency according to Cronbach) were calculated for the four subtests. Depending on the scale and sample, they lie between  $r_{tt}=.68$  and  $r_{tt}=.84$ . Several studies show statistically significant correlations with pain adjective scales. In addition, relationships to irrational attitudes, to self-communication and to situative physical and emotional reaction tendencies were also established.

### Procedures

Participants were tested individually. Informed consent was obtained from the participants. All participants were assured of confidentiality and informed of their right to withdraw consent. The questionnaire concerning reaction to pain, was administered in a controlled environment without distractions. The study was approved by the Institutional Ethical Committee, Faculty of Sports Medicine and Physiotherapy, Guru Nanak Dev University,

**Table 1.** Table 1 shows mean raw scores and standard deviations for the pain response variables in athletes and non-athletes and Student's t test for differences between averages.

(\*- significant differences  $p<0.01$ /\*\*-significant differences  $p<0.001$ )

| Variables groups  | Athletes    | Non-athletes | 't'   | Sig     |
|-------------------|-------------|--------------|-------|---------|
| Avoidance         | 26.5 ± 5.06 | 30.1 ± 4.2   | 3.511 | 0.000** |
| Cognitive Control | 27.7 ± 5.5  | 29.03 ± 5.3  | 1.151 | 0.2     |
| Social Support    | 21.8 ± 4.2  | 18.9 ± 4.9   | 3.13  | 0.001*  |
| Activity          | 25.1 ± 3.4  | 22.9 ± 3.6   | 3.02  | 0.004*  |

**Table 2.** The mean raw scores and standard deviations for the 4 pain response variables in 3 different categories of athletes based on the extent of contact.

| Variables groups  | Contact athletes | Limited contact athletes | Non contact athletes |
|-------------------|------------------|--------------------------|----------------------|
| Avoidance         | 25.7±7.1         | 26.3±3.6                 | 27.5±3.5             |
| Cognitive Control | 26.9±5.4         | 27.5±5.6                 | 28.6±5.5             |
| Social Support    | 21.8±4.4         | 21.9±4.0                 | 21.8±4.2             |
| Activity          | 25.7± 3.5        | 25.0±3.5                 | 24.5±3.2             |

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### Data analysis

For the analysis of pain response variables comparison between athletes and non-athletes, the descriptive analysis was initially used (average and standard deviation) for the behavior of each variable to be studied. The student's T test was applied in order to verify differences between the group's averages. For the comparison of different athletes' categories and non-athletes, one-way analysis of variance (ANOVA) with Tukey HSD post hoc was applied to analyze difference between the averages of variables between each category. Statistical program used was the SPSS version 17.

### Results

| Table 3: Collective results of one-way analysis of variance (ANOVA). |                |                |     |             |       |      |
|--|----------------|----------------|-----|-------------|-------|------|
| Variables groups   |                | Sum of squares | Df  | Mean square | F     | Sig  |
| AVOIDANCE  | Between groups | 343.892        | 3   | 114.631     | 4.808 | .003 |
|  | Within groups  | 2765.700       | 116 | 23.842      |       |      |
|  | Total          | 3109.592       | 119 |             |       |      |
| Cognitive Control  | Between groups | 94.225         | 3   | 31.408      | 1.039 | .378 |
|  | Within groups  | 3507.767       | 116 | 30.239      |       |      |
|  | Total          | 3601.992       | 119 |             |       |      |
| Social Support   | Between groups | 199.667        | 3   | 66.556      | 3.362 | .021 |
|  | Within groups  | 2296.200       | 116 | 19.795      |       |      |
|  | Total          | 2495.867       | 119 |             |       |      |
| Activity   | Between groups | 127.500        | 3   | 42.500      | 3.439 | .019 |
|  | Within groups  | 1433.667       | 116 | 12.359      |       |      |
|  | Total          | 1561.167       | 119 |             |       |      |

The mean raw scores and standard deviations for the pain response variables in athletes and non-athletes and Student's t test for differences between averages are given in Table 1. The t test found significant differences in avoidance, social support and activity between athletes and non-athletes. (P values were 0.000, 0.001 and 0.004 respectively). Athletes were found to report significantly higher activity and social support (mean=25.1±3.4, mean = 21.8±4.2, respectively) than non-athletes (mean=22.9±3.6, mean=18.9 ± 4.9, respectively). Athletes presented significantly lower scores on avoidance (mean=26.5±5.06) than non-athletes (mean=

30.1± 4.2). However, there was no difference in cognitive control scores between the 2 groups.

The mean raw scores and standard deviations for the 4 pain response variables in different categories of athletes are given in Table 2. The results of ANOVA and post hoc analysis show significant differences amongst categories of athletes for the pain response variables. Amongst the athletes, the least scores for coping were seen in the contact athletes and the highest were seen in the non-contact athletes. The contact and non-contact athletes showed significantly lower scores than non-athletes for avoidance, but non-contact athletes did not differ significantly for the variable of avoidance. For social support all categories of athletes scored significantly higher than non-athletes and

for activity only contact athletes scored significantly higher than non-athletes.

Thus, among all the groups, the adaptive technique of social support was used the least. And avoidance was the highest used pain response technique used by non-athletes. Contact and limited contact athletes used avoidance and activity with equal frequency whereas non-contact athletes and non-athletes used avoidance more frequently as a pain response.

### Discussion

**Table 4.** Post-hoc analysis of variance between groups---contact sport athletes, limited contact sport athletes, non contact sport athletes and non -athletes.(\*- significant differences  $p < 0.05$ /\*\*-significant differences  $p < 0.01$ /\*\*\*-significant differences  $p < 0.001$ ).

| Variable          | Pair             | P        |
|-------------------|------------------|----------|
| Avoidance         | con – lim con    | 0.97     |
|                   | con - non con    | 0.51     |
|                   | con - non ath    | 0.004*** |
|                   | lim con-non con  | 0.79     |
|                   | lim con –non ath | 0.01**   |
|                   | non con-non ath  | 0.15     |
| Cognitive Control | con – lim con    | 0.97     |
|                   | con - non con    | 0.52     |
|                   | con - non ath    | 0.45     |
|                   | lim con-non con  | 0.78     |
|                   | lim con –non ath | 0.71     |
|                   | non con-non ath  | 0.99     |
| Social Support    | con – lim con    | 1.0      |
|                   | con - non con    | 1.0      |
|                   | con - non ath    | 0.05*    |
|                   | lim con-non con  | 1.0      |
|                   | lim con –non ath | 0.04*    |
|                   | non con-non ath  | 0.05*    |
| Activity          | con – lim con    | 0.86     |
|                   | con - non con    | 0.52     |
|                   | con - non ath    | 0.01*    |
|                   | lim con-non con  | 0.93     |
|                   | lim con –non ath | 0.1      |
|                   | non con-non ath  | 0.3      |

The present investigation aimed to identify whether athletes and non-athletes differed with respect to the different pain responses exhibited. Since averaging results over a heterogeneous population of sporting individuals may lead to loss of meaningful information, an attempt was made to define distinct dimensions within the sporting population amongst the armed police. Therefore the study was conducted keeping in mind the differentiation of sports into contact, limited- contact and non-contact.

The study demonstrated significant differences among athletes and non-athletes in relation to the use of some pain response variables. The previously stated hypothesis that athletes would score lower (employ less) for the maladaptive pain response variables and higher (employ more) for the adaptive variables was supported by this study. These results

were thus contrary to the findings of Azevado & Samulski, (20), who reported no significant differences between athletes and non-athletes with respect to the use of various psychological techniques for pain control. No other studies could be identified which compare these populations. Thus the possible explanation for athletes to better endure pain (12-16) due to less frequent use of maladaptive strategies (17) gains support from the results of this study. It is also suggested that significantly higher use of social support by the athletes is due to the fact that athletes in general have been reported to be more extroverted in comparison to non-athletes. This trait of their personality inclines them towards seeking social support when in pain. Social support deserves a special mention as it relates closely to the results of past research which have demonstrated that the most significant difference in the personality profile

of the athletes and non athletes is that athletes are more extroverted (21, 11, 22). This highlights the importance of including the effect of personality in studies involved in understanding the psychology of pain in athletes. Since the purpose of this investigation was to study the frequency of use of different pain response variables, therefore it was not possible to assess other variables that may influence pain tolerance and control. The study findings are in agreement with Straub, Scott, David & Alyson (18), who proposed that contact sport experience helps athletes manage pain and is thus an influential variable in causing differences in pain apperception and thus pain response techniques among athletes. This finding accounts for the low scores of avoidance in contact athletes and high scores in non-contact athletes.

Based on the differences in frequency of pain response variables found between athletes and non-athletes, it can be proposed that the use by athletes of adaptive techniques for pain control is a consequence of their athletic training or methodology. This idea reinforces the need for a training methodology of these techniques as an important component of the process of the athlete's shaping and training (20). Kress (23) concluded from his study that physically and mentally prepared cyclists experienced less pain than their counterparts lacking such preparation, thus further pointing out the need to study the psychological aspect of pain amongst athletes. From the review of literature, it was clear that the study of psychological techniques for pain control is still very incipient in the field of sports. This makes it difficult to compare results with other studies. Moreover the few studies that have focused on studying the pain response techniques in athletes did not compare them to any non-athletic control group. This study aimed to identify the pain responses in athletes and additionally compare them to a non athletic control sample. This comparison showed many significant differences between the athletic and non-athletic population, but more studies similar to this one will be needed to confirm these findings. Azevedo & Samulski (20) and advocate the use of longitudinal studies, investigating the progression of the frequency of use of these techniques after a systematic training. Studies examining longitudinal effects as opposed to the single evaluation in this study would be of great interest, as they would allow for a more appropriate assessment of the influence of learned pain response techniques on parameters of pain intensity and perception of pain control.

The purpose of this study was to assess possible differences

in the frequency of use of pain response techniques in athletes and non-athletes. The literature shows that, in addition to using these techniques more or less often, the assessment of when and how individuals use them is necessary for a better understanding of the influence of these responses on pain control. Further studies assessing these factors will elucidate the differences among these populations.

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