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# Sensitivity to pain and strategies of coping with stress in combat athletes

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**Authors' Contribution:**
**A** Study Design
**B** Data Collection
**C** Statistical Analysis
**D** Data Interpretation
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## abstract

**Background:** The aim of the study was to assess the perception of pain (threshold and tolerance to pain of the combat athletes in comparison to those not practicing any sport and checking whether there is a correlation between the pain perception and strategies for coping with stress in both studied groups.

**Material/Methods:** The study was conducted on 273 healthy men. The test group consisted of 203 athletes; the control group consisted of 70 students from the Faculty of Physical Culture, University of Szczecin. The test of the threshold and pain tolerance was performed using an algometer manufactured by Quirumed Company. To assess strategies of coping with stress, the Inventory Measuring Coping Skills – Mini-Cope was used.

**Results:** The test results of feeling pain at rest showed that the athletes achieved significantly higher threshold and pain tolerance compared to non-athletes. Combat athletes often deal with the problem in a proactive manner.

**Conclusions:** Compared to the control group, athletes have less sensitivity to pain. Compared with nonathletes, athletes are more likely to cope with stress in an active way and reveal stronger tendency to see positive sides of a problem.

**Key words:** pain perception, athletes, stress, coping strategies.

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## INTRODUCTION

Pain is a subjective and exceptional experience in the life of every individual. It is felt when the intensity of mechanical, thermal or chemical stimuli exceeds the individual, subjective pain threshold. In laboratory conditions, the time measured between this moment and the moment when a strong need to release oneself from the stimulus or stimuli which are no longer endurable is felt is called pain tolerance. Factors which significantly affect the pain perception include age, sex, previous experience of pain, anxiety, culture, ethnic background, personality and temperament [1]. Sensitivity to pain varies in different people. Distorted reactions to pain may pose a substantial risk in the process of rehabilitation and convalescence. Athletes are a group particularly exposed to pain caused by injuries. A number of authors claim that athletes are more tolerant of pain and have higher pain thresholds compared to non-training population [2, 3], which has been confirmed by numerous studies assessing the physiological, neurological, cultural and psychoanalytic causes of pain [4]. Researchers increasingly emphasize that athletes' conscious and unconscious attitudes, their motivations and anxiety levels (subjectively perceived risks) are elements which should be taken into consideration while investigating pain reactions.

Coping with pain is not only an integral part of sport training, but also a major skill to be developed by combat athletes. Due to systematic exposure to short intervals of intensive pain, athletes are forced to develop effective coping strategies. According to Kress and Statler [5], athletes perceive pain as an inherent part of sport competition, which should not be feared but overcome. Athletes who are more effective in coping with pain and pain management are better accustomed to pain than non-athletes. As for competitive sports, injuries result from athletic activities and comprise an integral part of the risks associated with these sports. This is why accepting pain is among the factors necessary for achieving success [6]. Contact sports athletes are among those who continue playing despite periods of pain, which at times can be extremely intensive. Iso-Ahola and Hatfield [7] claim that pain tolerance is the most important factor leading to success in endurance and contact sports.

Being an athlete is invariably linked with stress and requires one to develop effective coping strategies. Athletes often need to handle extremely high training loads, be ready for constant improvement of their results and push themselves to the limits of their capacity. This may result in chronic fatigue, stress and ultimately lead to injuries. As stressors may emerge before, during and after combat, it is extremely important to ensure that every athlete is equipped with effective stress management techniques. This is one of the main tasks of sport psychologists. It is of particular importance due to the fact that stress may often affect other psychological processes, such as concentration, arousal, affect and keen observation of the situation [8, 9].

The results of the quoted studies show that people with higher sensitivity to pain, low coping skills, little social support and higher levels of stress in everyday life are prone to injury more than those with fewer stressful events, positive individual traits (such as high motivation for achievements, psychological resilience, optimism) and a wide range of preventive strategies. Moreover, an injury is likely to be more severe and its consequences long-lasting in the former group.

This is why our research aimed to evaluate pain threshold and pain tolerance in athletes and non-athletes and to determine a possible correlation between pain perception and strategies of coping with problematic situations in the two studied groups.

## MATERIAL AND METHODS

### PARTICIPANTS

The study was conducted on 273 healthy men, aged 18–43. The test group consisted of 203 athletes aged 18–43 (24.80 ±6.7), who had engaged in combat sports, including boxing (n = 101), MMA – Mixed Martial Arts (n = 17) and karate (n = 85) for at least 5 years. The control group consisted of 70 students aged 18–25 (21.13 ±1.8) from the Faculty of Physical Culture, University of Szczecin, who did not competitively engage in any sport. Body measurements of all participants were taken using an anthropometer for height and electronic scales (Radwag, Poland) for weight measurements with an accuracy of 1 cm and 0.1 gram, respectively.

### THE ASSESSMENT OF SENSITIVITY TO PAIN

Measurements of pressure sensitivity of tissues were taken using an algometer manufactured by Quirumed. The device is a pressure gauge, ranging from 0 to 10 kg, with an attached disc-shaped rubber tip of exactly 1cm$^2$.

Algometer measurements were taken on an interval scale to a decimal point. The measuring capacity of the device was limited to 10 kg. Once the value was reached, the algometer continued to increase the pressure but it was not possible to note its exact value. If a participant tolerated pressure greater than 10 kg, the test was stopped and the result was coded as 10.1, the highest possible assumed value for tolerated pressure.

Prior to measuring pressure sensitivity, all the participants were informed in the same manner about the study procedure and were given instructions on how to behave during the test. Three test trials were conducted before the actual measurement so that the participants were able to distinguish between the feeling of pressure and pain and could react in the right moment to stop further pressure measurement.

The participants were tested in a sitting position, with their right arm, flexed at the elbow, resting freely on the table. The measurements were taken on the back of the hand between the thumb and the index finger.

The researcher palpably assessed the contact point, then placed the algometer perpendicular to the point and gradually applied pressure to the tissue at a rate of approximately 100g/s. The results were visible only to the researcher.

When pain occurred, the participant said ‘stop’ and the pain threshold measurement was taken. The measurement continued until the participant could no longer tolerate the stimulus and signaled the end of measurement. This was the point of measuring pain tolerance.

All the measurements were carried out by the same researcher in the morning hours, in the same conditions. The athletes had been informed about the nature of the experiment and their right to withdraw from it at any time without giving a reason. Written consent to take part in the research had been obtained from all the participants. The study was approved by the Bioethics Committee of the Regional Medical Council in Szczecin (NR 09/KB/V/2013).

### THE BRIEF COPE INVENTORY*

* Ch.S.Carver, Polish adaptation: Inwentarz do Pomiaru Radzenia Sobie ze Stresem – Mini-Cope by Z. Juczyński and N. Ogińska-Bulik.

The inventory consists of 28 items which fall into 7 categories related to the following strategies of coping with stress: active coping (including planning and positive reframing), helplessness (behavioral disengagement, self-blame, psychoactive substance use), seeking support (emotional and instrumental), avoidance behaviors (self-distraction, unproductive venting, behavioral disengagement), turning to religion, acceptance and sense of humor. Respondents reply to each statement using a four-point scale, where 0 = “hardly ever”, 3 = “nearly always”.

The questionnaire collects data on the use of 14 specific coping strategies related to thoughts and behaviors in a stressful situation [10].

### STATISTICAL ANALYSIS

statistical analysis was conducted using the Mann-Whitney U test for non-parametric data and the results were presented as mean and standard deviation. The threshold for statistical significance was set at $p < 0.05$.

## RESULTS

Table 1 presents anthropometric features of the athletes studied and the control group. No statistically significant differences were observed between the groups concerning body weight and BMI (body mass index). Statistically significant differences were observed only with regard to age ($p < 0.010$) and height ($p < 0.001$).

Table 1. Anthropometric features of thestudied athletes and the control

| | Athletes n = 203 | | Control group n = 70 | | p-value |
|---|---|---|---|---|---|
| | M | SD | M | SD | |
| Age | 24.80 | 6.70 | 21.13 | 1.86 | 0.011* |
| Height | 178.49 | 7.01 | 182.36 | 8.13 | 0.001* |
| Body weight | 77.79 | 13.11 | 78.49 | 10.54 | 0.777 |
| BMI | 24.37 | 3.36 | 23.54 | 2.21 | 0.084 |

*statistically significant difference

The results of the study on pain threshold and tolerance with the use of an algometer are presented in Table 2. In the case of pain threshold, the results of athletes were significantly higher compared to the control group: $\bar{x} = 9.15$ kg/cm$^2$ and 6.18 kg/cm$^2$, respectively ($p < 0.001$). Higher thresholds of sensitivity to pain in athletes significantly affected the results of the pain tolerance test, where athletes also scored significantly higher, $\bar{x} = 10.00$ kg/cm$^2$, compared to non-athletes $\bar{x} = 9.46$ kg/cm$^2$ ($p < 0.001$).

Table 2. Pain tolerance and pain threshold measured with an algometer

| | Athletes n = 203 | Control group n = 70 | p-value |
|---|---|---|---|
| | M ±SD | M ±SD | |
| Pain Threshold (kg/cm2) | 9.15 ±1.655 | 6.18 ±2.279 | < 0.001* |
| Pain Tolerance (kg/cm2) | 10.00 ±0.426 | 9.46 ±1.229 | < 0.001* |

*statistically significant difference

In order to determine differences in the choice of coping strategies in athletes and students who did not competitively engage in any sport, we compared the mean scores for each strategy (Table 3). The analysis showed statistically significant differences in the choice of 3 strategies of coping with stress. The strategies used significantly more frequently by athletes included: active coping ($p = 0.005$) and positive reframing ($p = 0.046$), which both are task-oriented coping methods, and turning to religion ($p < 0.001$). No significant differences between the two groups were observed regarding other coping strategies.

Table 3. Strategies of coping with stress

| | Athletes n = 203 M ±SD | Control group n = 70 M ±SD | p-value |
|---|---|---|---|
| Active coping | 2.24 ±0.616 | 2.04 ±0.464 | 0.005* |
| Planning | 2.08 ±0.561 | 2.13 ±0.509 | 0.732 |
| Positive reframing | 1.84 ±0.693 | 1.70 ±0.645 | 0.046* |
| Acceptance | 1.93 ±0.689 | 1.81 ±0.572 | 0.105 |
| Sense of humor | 1.31 ±0.849 | 1.16 ±0.845 | 0.157 |
| Turning to religion | 0.53 ±0.847 | 1.00 ±1.010 | < 0.001* |
| Emotional support | 1.62 ±0.784 | 1.76 ±0.711 | 0.241 |
| Instrumental support | 1.60 ±0.655 | 1.70 ±0.709 | 0.172 |
| Self-distraction | 1.62 ±0.777 | 1.59 ±0.691 | 0.497 |
| Denial | 0.69 ±0.756 | 0.49 ±0.699 | 0.057 |
| Venting | 1.20 ±0.779 | 1.14 ±0.921 | 0.673 |
| Substance use | 0.37 ±0.736 | 0.31 ±0.526 | 0.649 |
| Behavioral disengagement | 0.57 ±0.862 | 0.39 ±0.621 | 0.290 |
| Self-blame | 1.14 ±0.831 | 1.07 ±0.840 | 0.581 |

*statistically significant difference

## DISCUSSION

Bearing in mind individual differences and complex mechanisms observed thus far by researchers, investigating pain in sport should not be confined to the sensory aspect and clinical assessment of pain consequences. Although the number of studies on physiological and psychological aspects of pain in athletes has increased significantly in recent years, focus has been placed mainly on pain measurements during exercise. Coping with pain is not only an integral part of sport training, but also one of the major skills to be developed by combat athletes.

Measuring pain sensitivity with a manual algometer at rest has demonstrated that pain threshold and pain tolerance results were significantly higher in athletes compared to non-athletes. These observations have been confirmed by other studies [2, 11, 12]. According to Azevedo and Samulski [13], athletes who developed effective strategies of coping with stress tolerate much higher levels of pain in comparison with non-athletes. In our study, the results obtained

by the selected group of combat athletes clearly demonstrated differences in pain thresholds and pain tolerance between this group and non-athletes. High pain tolerance among athletes proves that they are better adjusted to pain and their defensive reactions might be more effective not only during exhaustive exercise but also in various everyday situations. In consequence, higher pain tolerance in athletes might distort the perceived scale of an injury or damage. It may also considerably limit regeneration of damaged tissues, leading to permanent physical [14] and mental overload as a result of a long-lasting stressful situation. Such situations are inherent in sport activity, and coping with them is a way of reacting to stress. Results of numerous studies on athletes confirm that pain tolerance is strongly modulated by psychological and psychosocial factors [15, 16]. It can be assumed that effective coping with stress improves pain management. In turn, experience in pain management gained by athletes significantly decreases their sensitivity to pain in comparison to non-athletes [6]. As emphasized by House et al. [17], the coping process is the interplay of individual and situational factors. People who want to reduce or eliminate the risk related to a stressful situation treat the problem as a task and try to solve it. Another type of reaction is observed in people who focus on their own emotions, seek moral support, sympathy or understanding. People who tend to cope by avoidance in confrontation with a stressful event, try to turn their attention away from actions and emotions related to the problem. For that reason, they are more likely to distract themselves, cease to act, deny problems or choose negative health behaviors, such as taking psychoactive substances [18]. While assessing the effectiveness of coping, one needs to take into account two of its functions: instrumental function of controlling the stressor in order to reduce or eliminate its stressful properties, and emotional function which aims to regulate emotions [19].

The studied combat athletes were more likely to cope with problems in an active way. The tendency to see positive sides of a problem and reframe the situation in a positive way was also more frequently observed in this group. Moreover, athletes turned to religion significantly more often than people who did not competitively engage in any sport.

Athletes use a range of strategies to cope with various situations: problem-oriented strategies (active coping) and those aiming to reduce tension and negative emotions (positive reframing). Scheier and Carver considered positive reframing to be the most effective strategy. It involves modifying the perceived evaluation of an event in order to see and emphasize its good sides and consequently minimize the feeling of loss or failure. Such an approach definitely improves the emotional state [20]. Many researchers believe that active coping is an equally effective strategy – a problem should be solved in order to reduce the risk [21, 22].

A number of authors point to the fact that the question how to effectively cope in stressful conditions cannot be answered in a simple way. The effectiveness of coping depends on a wide range of strategies and flexibility in applying them [23].

The study confirmed an association between sensitivity to pain and strategies of coping with stress (pain). It demonstrated that people who use strategies which are problem-oriented and related to the instrumental function of coping

(active coping, positive reframing) are better adjusted to a stressful situation (pain stimuli). The combat athletes studied were more likely to deal with problems in an active way. The group also revealed a stronger tendency to see positive sides of a problem and reframe the situation in a positive way. Moreover, the athletes investigated turned to religion significantly more often than people who did not competitively engage in any sport, which is also related to seeking emotional and instrumental support.

## CONCLUSIONS

Combat athletes demonstrate significantly higher levels of pain tolerance and higher pain thresholds compared to people who do not competitively engage in any sport.

Compared with non-athletes, athletes are more likely to cope with stress in an active way and reveal stronger tendency to see positive sides of a problem.

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