EFFECTS OF EXERCISE TRAINING COMBINED WITH ACUPUNCTURE AND MOXIBUSTION ON FATIGUE

EFEITOS DO TREINAMENTO DE EXERCÍCIO COMBINADO À ACUPUNTURA E MOXABUSTÃO SOBRE A FADIGA

EFECTOS DEL ENTRENAMIENTO FÍSICO COMBINADO CON ACUPUNTURA Y MOXIBUSTIÓN SOBRE LA FATIGA

Original Article
Artigo Original
Artículo Original

Liang Jia[1]
(Physical Education Professional)
Xu Han[1]
(Physical Education Professional)

1. Henan University, School of Physical Education, Kaifeng, Henan, China.

Correspondence:
Xu Han
Kaifeng, Henan, China. 475000.
Hanxuhd@163.com

ABSTRACT

Introduction: Muscle fatigue bothers athletes, affecting training level and competitive performance, it also has a great impact on the physical health of athletes, predisposing them to accidents and an early termination of their career. Relieving sports fatigue is the focus of research in the field of sports health nowadays. Objective: Study the effect of acupuncture and moxibustion rehabilitation combined with physical training on sports fatigue. Methods: A controlled experiment was used. The experimental group used acupuncture and moxibustion combined with exercise training, while the control group used acupuncture and moxibustion. The same group of doctors performed the acupuncture and moxibustion treatment according to the actual situation of the patients, and they tested the changes in VAS pain score and PRI pain score. Results: The VAS pain score in the experimental group was 7.88 points before the procedure and 2.96 points after the sixth week of the procedure. The control group score was 7.67 before the start and 5.03 after training. The total PRI pain score in the experimental group was 6.52 points before training and 2.05 points in the sixth week of training. The control group scored 6.66 before the procedure and 3.89 in the sixth week. Conclusion: The combination of training and exercises can achieve a better rehabilitation effect compared to the isolated treatment of acupuncture and moxibustion. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical Education and Training; Muscle Fatigue; Acupuncture Therapy.

RESUMO

Introdução: A fadiga muscular incomoda os atletas, afetando o nível de treinamento e o desempenho competitivo, também tem um grande impacto sobre a saúde física dos atletas, predispondo a acidentes e a um término precoce da carreira. Aliviar a fadiga esportiva é o foco da pesquisa no campo da saúde esportiva nos dias de hoje. Objetivo: Estudar o efeito de reabilitação pela acupuntura e moxabustão combinada com o treinamento físico sobre a fadiga esportiva. Métodos: Foi utilizado um experimento controlado. O grupo experimental usou acupuntura e moxabustão combinadas com treinamento com exercícios, enquanto o grupo de controle usou acupuntura e moxabustão. O mesmo grupo de médicos realizou o tratamento de acupuntura e moxabustão de acordo com a situação real dos pacientes, e testaram as alterações do escore de dor VAS e do escore de dor PRI. Resultados: A pontuação de dor VAS no grupo experimental foi de 7,88 pontos antes do procedimento e 2,96 pontos após a sexta semana de procedimento. A pontuação do grupo de controle foi 7,67 antes do início e 5,03 após o treinamento. A pontuação total de dor PRI no grupo experimental foi 6,52 pontos antes do treinamento e 2,05 pontos na sexta semana de treinamento. A pontuação do grupo de controle foi de 6,66 antes do procedimento e 3,89 na sexta semana. Conclusão: A combinação do treinamento com exercícios pode alcançar um melhor efeito de reabilitação em comparação com o tratamento isolado de acupuntura e moxabustão. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Educação Física e Treinamento; Fadiga Muscular; Terapia por Acupuntura.*

RESUMEN

Introducción: La fatiga muscular molesta a los deportistas, ya que afecta al nivel de entrenamiento y al rendimiento competitivo, además de tener un gran impacto en la salud física de los atletas, predisponiendo a accidentes y al cese prematuro de la carrera. En la actualidad, el alivio de la fatiga deportiva es objeto de investigación en el campo de la salud deportiva. Objetivo: Estudiar el efecto de la rehabilitación mediante acupuntura y moxibustión combinada con entrenamiento físico sobre la fatiga deportiva. Métodos: Se utilizó un experimento controlado. El grupo experimental utilizó acupuntura y moxibustión combinadas con entrenamiento físico, mientras que el grupo de control utilizó acupuntura y moxibustión. El mismo grupo de médicos realizó el tratamiento de acupuntura y moxibustión de acuerdo con la situación real de los pacientes, y comprobó los cambios en la puntuación del dolor según VAS y la puntuación del dolor según PRI. Resultados: La puntuación VAS del dolor en el grupo experimental fue de 7,88 puntos antes del procedimiento y de 2,96 puntos después de la sexta semana del procedimiento. La puntuación del grupo de control fue de 7,67 antes del inicio y de 5,03 después del entrenamiento. La puntuación total del dolor PRI en el grupo

CC BY NC

experimental fue de 6,52 puntos antes del entrenamiento y de 2,05 puntos en la sexta semana de entrenamiento. La puntuación del grupo de control era de 6,66 antes del procedimiento y de 3,89 a la sexta semana. Conclusión: La combinación de entrenamiento con ejercicios puede lograr un mejor efecto rehabilitador en comparación con el tratamiento aislado de acupuntura y moxibustión. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Educación y Entrenamiento Físico; Fatiga Muscular; Terapia por Acupuntura.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0745 Article received on 11/30/2022 accepted on 12/14/2022

INTRODUCTION

Strain is an unavoidable problem in people's daily life. Whether it is caused by long-term exercise or long-term labor, it will have a negative impact on the patient's physical health and mood.[1] Therefore, relieving strain is a common concern of doctors and coaches. For athletes, their success requires long-term hard training, which often exceeds the load that the joints and muscles of the body can bear, and will lead to sports strain in the long run.[2] Sports strain will make athletes feel uncomfortable, affect their training effect and competitive level, and have a great impact on athletes' physical health, leading them to end their career ahead of time.[3] More seriously, it will also cause adverse interference to athletes' life in the future. Therefore, alleviating sports strain is the focus of research in sports health circles today. The results of previous studies show that massage physiotherapy is a commonly used strategy to alleviate exercise fatigue and reduce exercise strain.[4] Literature suggests that physical therapy and massage of athletes and acupuncture treatment of severe parts can effectively improve the strain of athletes. There are also literature studies that proper stretching and relaxation activities after sports can improve muscle fatigue and joint fatigue of athletes, and achieve the goal of reducing sports strain.[5] This article wants to discuss the effect of systematic rehabilitation program on athletes' sports strain. The scheme selection combines acupuncture and sports training from various aspects, hoping to obtain more effective results than a single rehabilitation method.[6]

METHOD

Experimental design

This paper first recruited students with sports strain from college sports majors, and obtained 32 research subjects. According to the form of random sampling, they were divided into an experimental group and a control group, with 16 students in each group. The study and all the participants were reviewed and approved by Ethics Committee of Henan University(NO.HENUSY20ZF076). During the whole training process, each student was required to complete the sports training on time, and seriously accept the treatment of doctors. If more serious diseases occurred or they could not participate in the whole experiment due to personal reasons, It is necessary to eliminate such data. After six weeks of training, one student in the experimental group and one student in the control group withdrew from the study due to their own reasons, so the final 15 students in the experimental group and 15 students in the control group had little difference in their basic conditions, reducing the interference of unrelated variables on the experimental results.

This paper adopts the method of controlled experiment.

The experimental group adopted the form of acupuncture and moxibustion combined with sports training. The professional doctors treated the patients with acupuncture and moxibustion according to their actual conditions, and the sports training was designed by the sports researchers.

The control group was treated with acupuncture and moxibustion by the same group of doctors according to the actual situation of the patients.

Scoring rules

As the exercise strain of the selected subjects in this experiment is discomfort in daily life, it will have a certain impact on sports training, but it does not need to be over treated in the medical perspective. Therefore, when judging the rehabilitation effect, we chose the index of pain for research, mainly including VAS pain score and PRI pain score.

VAS pain score is a score of visual simulation pain, which is evaluated by athletes themselves. Draw a 10 cm horizontal line on a piece of paper, with the left end being 0 and the right end being 10. The higher the score, the more pain. The athlete makes a mark on the horizontal line according to his current pain situation and gets the position of this mark proportionally. The distance from 0 is the pain degree.

The PRI pain score is divided into two aspects - pain perception rating and pain emotion rating.

Table 1 shows the scoring criteria for PRI pain perception rating. There are many types of pain. In our daily life, we often use sensory words such as "like being pricked by a needle" or "sore" to describe the pain. Therefore, Table 1 lists 11 descriptions of pain, and each description has four grades: 0 indicates no pain in this respect; 1 point indicates slight pain in this aspect; A score of 2 indicates moderate pain; 3 points means that this part of the pain is very obvious. The athletes describe and score their own pain, and the final score is the PRI pain perception rating.

Table 2 shows the scoring criteria of PRI pain emotion rating. Pain always brings people different emotional experiences, such as pain that makes people exhausted, or pain that makes people feel sick, and pain such as hitting, which will be associated with being punished and make people afraid. Therefore, four common emotions in pain are listed in

Table 1. Scoring criteria for PRI pain perception rating.

Title No	Describe	Painless	Slight pain	Moderate pain	Excruciating pain
1	Throbbing pain	0 point	1 point	2 points	3 points
2	Penetrating pain	0 point	1 point	2 points	3 points
3	Puncture pain	0 point	1 point	2 points	3 points
4	Sharp pain	0 point	1 point	2 points	3 points
5	Cramp like pain	0 point	1 point	2 points	3 points
6	Bite pain	0 point	1 point	2 points	3 points
7	Burning pain	0 point	1 point	2 points	3 points
8	Soreness	0 point	1 point	2 points	3 points
9	A heavy pain	0 point	1 point	2 points	3 points
10	Tenderness	0 point	1 point	2 points	3 points
11	Splitting pain	0 point	1 point	2 points	3 points

Table 2. Scoring criteria for PRI pain emotion rating.

Title No	Describe	Painless	Slight pain	Moderate pain	Excruciating pain
1	Depletion sample	0 point	1 point	2 points	3 points
2	Sick and trapped	0 point	1 point	2 points	3 points
3	Phobia	0 point	1 point	2 points	3 points
4	Punished sample	0 point	1 point	2 points	3 points

Table 2, and the pain degree represented by these emotions is scored respectively. The scoring criteria are consistent with the above sensory rating criteria. The final score is the PRI pain emotion rating.

The total score is PRI pain score by accumulating the pain sensation rating score and the pain emotion rating score.

RESULTS

Changes in VAS pain score

Figure 1 shows the change of VAS pain score during the treatment. The VAS pain score of the experimental group before training was 7.88, 7.08 in the first week, 6.35 in the second week, 5.6 in the third week, 4.74 in the fourth week, 3.86 in the fifth week and 2.96 in the sixth week. The VAS pain score of the control group before training was 7.67, 7.31 in the first week, 6.93 in the second week, 6.59 in the third week, 6.12 in the fourth week, 5.53 in the fifth week and 5.03 in the sixth week. From the overall trend of change, the athletes' pain level was relieved during the six week treatment process, indicating that a single acupuncture treatment and acupuncture combined with sports training can relieve the athletes' strain pain. From the point of pain value, before the experiment, there was little difference between the experimental group and the control group, both of which were 7 to 8 points, within the range of moderate to severe pain, indicating that the strain of the athletes in the two groups was actually serious, and effective rehabilitation treatment was needed. At the fourth week, the score of the experimental group was 4.74 points, which was 5 points lower than the moderate pain line. At this time, it had been better, and the final score was 2.96 points. If the score was less than three points, it was no pain or mild pain, indicating that the pain relief effect of the athletes in the experimental group was obvious. The score of the control group in the sixth week at the end of the experiment was 5.03, which was on the 5-point line. At this time, it was still moderate pain. Through comparison, it can be seen that the pain of the experimental group has been significantly relieved at the end of the experiment, and it is in a state of mild pain. Only continuous rehabilitation training is needed to achieve a better effect. The control group was still in a state of moderate pain at the end of the experiment, indicating that the acupuncture treatment effect was not obvious enough at this time, and it would take a longer time for the treatment to make the pain better alleviated. This shows that the combination of acupuncture and sports training can better improve the efficiency of pain relief.

Change of PRI pain score

Figure 2 shows the changes of PRI pain perception score during the treatment. Before the start of training, the PRI pain perception score of the experimental group was 8.57 points, 7.78 points in the first week, 7.04 points in the second week, 6.33 points in the third week, 5.49 points in the fourth week, 4.53 points in the fifth week and 3.6 points in the sixth week. The PRI pain perception score of the control group before training was 8.44, 8.14 in the first week, 7.75 in the second week, 7.36 in the third week, 6.78 in the fourth week, 6.37 in the fifth week and 5.93 in the sixth week. The data results showed that the PRI pain perception scores of the experimental group and the control group were in a declining trend throughout the experiment, and the pain was relieved, and the pain relief efficiency of the experimental group was better than that of the control group.

As shown in Figure 3, PRI pain emotion score changes during the treatment. The PRI pain emotion score of the experimental group before the start of training was 6.52, 5.77 in the first week, 4.99 in the second week, 4.25 in the third week, 3.52 in the fourth week, 2.81 in the fifth week and 2.05 in the sixth week. The PRI pain emotion score of the control group before training was 6.66 points, the emotion score of the first week was 6.28 points, the emotion score of the second week was 5.91 points, the emotion score of the third week was 5.42 points, the emotion score of the fourth week was 4.93 points, the emotion score of the fifth week was 4.38 points, and the emotion score of the sixth week after training was 3.89 points. The data results show that, in terms of emotional perception of pain, the impact of pain on emotion of the two groups of athletes decreased gradually after the experiment began, and the pain was relieved, and the relief efficiency of the experimental group was higher.

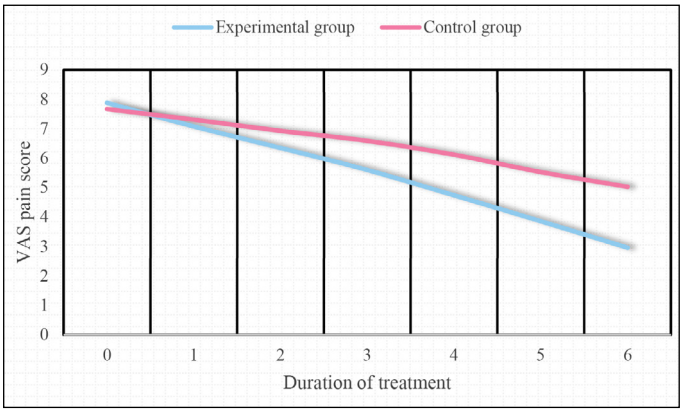

Figure 1. Changes of VAS pain score during treatment.

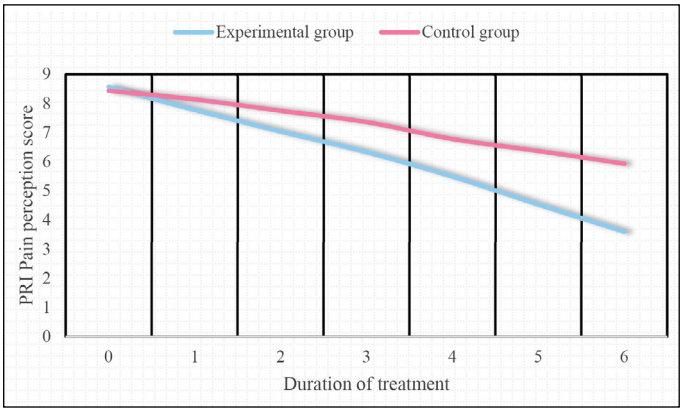

Figure 2. Changes of PRI pain perception score during treatment.

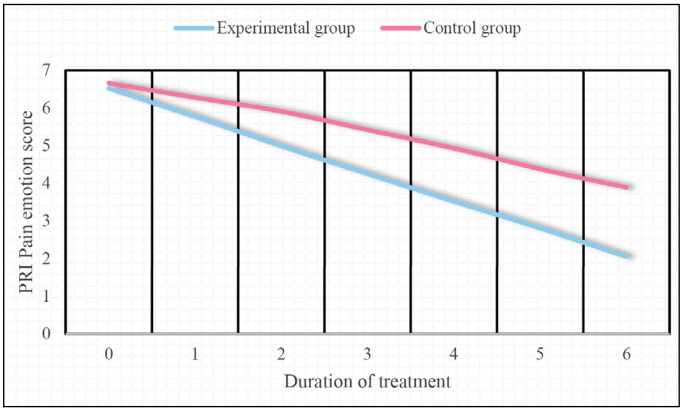

Figure 3. Changes of PRI pain emotion score during treatment.

As shown in Figure 4, the total score change of PRI pain during the treatment process. The total score of PRI pain in the experimental group was 6.52 before the start of training, 5.77 in the first week, 4.99 in the second week, 4.25 in the third week, 3.52 in the fourth week, 2.81 in the fifth week and 2.05 in the sixth week. Before the training, the total score of PRI pain in the control group was 6.66, 6.28 in the first week, 5.91 in the second week, 5.42 in the third week, 4.93 in the fourth week, 4.38 in the fifth week and 3.89 in the sixth week. The total score in Figure 4 is the

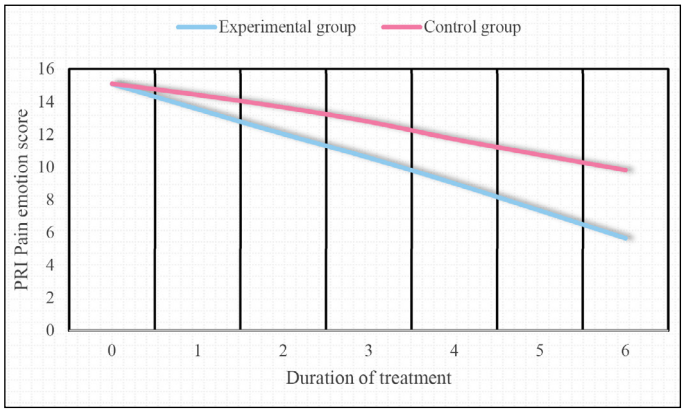

Figure 4. Changes of total PRI pain score during treatment.

superposition of the sensory score and emotional score in Figure 2 and Figure 3, and it is also the comprehensive change of pain relief. It can be seen from the figure that the experimental group and the control group showed a trend of pain relief during the experiment, and the effect of pain relief in the experimental group was better.

DISCUSSION

In the movement training of sports strain, the training method of core muscles is selected. Before the experiment, the author communicated with the college subjects. Through conversation, it was found that the main strain was joint strain, especially knee joint and waist. Therefore, when choosing action training methods, we need to focus on strengthening the core strength of the waist. In addition, strengthening the training of core muscles can also promote the physical stability of athletes, which can reduce the strain of knee joints to a certain extent and achieve better relief effect. In addition, the core muscle group training includes not only the common large muscles, but also some deep level small muscle group training, which runs through the whole body structure of the human body. Therefore, training the core muscle group can systematically mobilize the core muscle and nervous system of the human body to enhance stability and strength.

In view of the above problems, this paper chose to combine acupuncture and sports training to form a combined rehabilitation training program. Acupuncture and moxibustion can more specifically relieve pain, and sports training rules can enable athletes to relieve pain and improve muscle level anytime and anywhere according to their own actual conditions. The combination of the two can achieve the goal of relieving pain through regular treatment and random exercise, It can also exercise the core muscle group ability of athletes, improve their physical stability, and maintain their competitive level. Therefore, the combination selected in this paper makes the rehabilitation training program more advantageous.

CONCLUSION

Sports strain has always been a problem puzzling athletes. Under the influence of this problem, sports training has been limited. It is necessary to maintain a balance between hard training and sports strain. However, through the investigation of athletes, it can be seen that the proportion of sports strain among high-level athletes is very large. Many athletes even need medical assistance before they can play, which greatly limits the play of athletes. Therefore, the mitigation of sports strain can effectively adjust the physical condition of athletes, improve their competitive level, and make athletes play better in the field. In this paper, two common rehabilitation methods of sports strain, namely acupuncture treatment and sports training, are integrated to explore the effects of systematic recovery methods on the rehabilitation of athletes' strain. The research results show that compared with a single acupuncture treatment, the combination of acupuncture treatment and sports training can quickly relieve the pain caused by sports strain of athletes, improve the quality of daily life of athletes, and achieve a good rehabilitation effect.

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Liang Jia and Xu Han: writing and execution.

REFERENCES

1. Takada M, Nishida K, Kataoka-Kato A, Gondo Y, Ishikawa H, Suda K, et al. Probiotic Lactobacillus casei strain Shirota relieves stress - associated symptoms by modulating the gut–brain interaction in human and animal models. Neurogastroenterol Motil. 2016;28(7):1027-36.
2. Ji S, Zhao W, Li Z, McAllister W. Head impact accelerations for brain strain-related responses in contact sports: a model-based investigation. Biomech Model Mechanobiol. 2014;13(5):1121-36.
3. Ji S, Zhao W, Ford JC, Beckwith G, Bolander RP, Greenwald RM, et al. Group-wise evaluation and comparison of white matter fiber strain and maximum principal strain in sports-related concussion. J Neurotrauma. 2015;32(7):441-54.
4. Green B, Pizzari T. Calf muscle strain injuries in sport: a systematic review of risk factors for injury. Br J Sports Med. 2017;51(16):1189-94.
5. Green B, Bourne MN, Pizzari T. Isokinetic strength assessment offers limited predictive validity for detecting risk of future hamstring strain in sport: a systematic review and meta-analysis. Br J Sports Med. 2018;52(5):329-36.
6. Pietsch S, Pizzari T. Risk Factors for Quadriceps Muscle Strain Injuries in Sport: A Systematic Review. J Orthop Sports Phys Ther. 2022;52(6):389-400.