COMMON SPORTS INJURIES AND PREVENTION IN TABLE TENNIS PLAYERS

LESÕES ESPORTIVAS COMUNS E PREVENÇÃO EM PRATICANTES DE TÊNIS DE MESA

LESIONES DEPORTIVAS COMUNES Y PREVENCIÓN EN PRACTICANTES DE TENIS DE MESA

ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

Haiyang Xing[1]
(Physical Education Professional)
Lixi Guo[2]
(Physical Education Professional)

1. Guangxi Vocational Institute of Technology, Public Teaching Department, Chongzuo, Guangxi, China.
2. Chongzuo Preschool Education College, Department of Physical Education and Health Education, Chongzuo, Guangxi, China.

Correspondence:
Lixi Guo
Chongzuo, Guangxi, China. 532200.
guolx235@126.com

ABSTRACT

Introduction: Table tennis requires rapid mobility and a complex set of movement structures, often resulting in sports injuries in its players during training. These unforeseen events can negatively affect sports instruction and training. Objective: Analyze the common sports injuries of Chinese male table tennis players and present corresponding preventive measures. Methods: 50 Chinese male table tennis players had their injury causes explored. The causes of these injuries and prevention methods were investigated using up-to-date scientific literature, questionnaires, interviews, and statistics. Results: The main regions were the shoulder joint, wrist joint, knee joint, ankle joint, and wrist joint. Exercise fatigue and lack of muscle strength are important factors leading to injuries in table tennis. Conclusion: Table tennis players should properly organize body movements to improve preparation and finishing work before training. The coach should formulate different physical training plans according to the different technical playing styles of the athletes involved. ***Level of evidence II; Therapeutic studies - investigating treatment outcomes.***

Keywords: *Racquet Sports; Athletes; Injuries, Athletic; Preventive Health Services.*

RESUMO

Introdução: O tênis de mesa exige rápida mobilidade, e um conjunto complexo de estruturas de movimento resultando frequentemente em lesões esportivas nos seus jogadores durante o treinamento. Esses imprevistos podem afetar negativamente o ensino e o treinamento esportivo. Objetivo: Analisar as lesões esportivas comuns aos jogadores de tênis de mesa chineses do sexo masculino e apresentar as medidas preventivas correspondentes. Métodos: 50 jogadores de tênis de mesa chineses do sexo masculino tiveram suas causas lesionais exploradas. As causas dessas lesões e métodos de prevenção foram investigados utilizando a literatura científica atualizada, questionários, entrevistas e estatísticas. Resultados: As principais regiões foram a articulação do ombro, articulação do pulso, articulação do joelho, articulação do tornozelo e articulação do pulso. A fadiga no exercício e a falta de força muscular são fatores importantes que levam a lesões no tênis de mesa. Conclusão: Os jogadores de tênis de mesa devem organizar adequadamente o movimento corporal para melhorar o trabalho de preparação e finalização antes do treinamento. O treinador deve formular diferentes planos de treinamento físico de acordo com os diferentes estilos técnicos de jogo dos atletas envolvidos. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Esportes com Raquete; Atletas; Lesões dos Atletas; Serviços Preventivos de Saúde.*

RESUMEN

Introducción: El tenis de mesa requiere una rápida movilidad, y un complejo conjunto de estructuras de movimiento que a menudo dan lugar a lesiones deportivas en sus jugadores durante el entrenamiento. Estos imprevistos pueden afectar negativamente a la enseñanza y al entrenamiento deportivo. Objetivo: Analizar las lesiones deportivas comunes de los jugadores de tenis de mesa chinos y presentar las medidas preventivas correspondientes. Métodos: Se estudiaron las causas de las lesiones de 50 jugadores de tenis de mesa chinos. Las causas de estas lesiones y los métodos de prevención se investigaron utilizando literatura científica actualizada, cuestionarios, entrevistas y estadísticas. Resultados: Las principales regiones fueron la articulación del hombro, la articulación de la muñeca, la articulación de la rodilla, la articulación del tobillo y la articulación de la muñeca. La fatiga del ejercicio y la falta de fuerza muscular son factores importantes que conducen a las lesiones en el tenis de mesa. Conclusión: Los jugadores de tenis de mesa deben organizar adecuadamente el movimiento del cuerpo para mejorar la preparación y el trabajo de acabado antes del entrenamiento. El entrenador debe formular diferentes planes de entrenamiento físico en función de los diferentes estilos técnicos de juego de los deportistas implicados. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Deportes de Raqueta; Atletas; Lesiones en Atletas; Servicios Preventivos de Salud.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0636 Article received on 01/11/2022 accepted on 11/11/2022

INTRODUCTION

Table tennis has become a symbol of sports spirit and competitive level in China. There is a limit to the endurance of athletes. If the physical fitness of athletes continues to decrease, some severe sports injuries will occur.[1] This can have an enormous negative impact on athletes' daily training and competition. This article is to investigate and analyze the current situation of Chinese men's table tennis players' sports injuries in such a large environment. In this way, a better understanding of the sports injury status of male table tennis players can be obtained.[2] Based on this, coaches can formulate corresponding preventive measures to prevent athletes from being injured effectively. This can better improve the training level and training effect.

METHOD

Research objects

This paper takes 50 male table tennis players as subjects. Table 1 is the fundamental data about the players.[3] There were no significant differences between the athletes in terms of primary data.

Table 1. Profile of male table tennis players.

Index	Options	N	Percentage (%)
Sport class	Master sportsman	**3**	**6.00**
	National level athlete	14	28.00
	National second-level athlete	33	66.00
Training years	1-3 years	11	22.00
	4-6 years	18	36.00
	7-9 years	15	30.00
	10 years and above	6	12.00
Competition level	National level	27	54.00
	Provincial	23	46.00
Educational level	Primary school	3	6.00
	Junior high school	15	30.00
	High school	7	14.00
	The University	7	14.00
	Other	18	36.00

Research method

Documentation method

This article mainly downloads relevant academic papers from websites such as CNKI. In this paper, the related kinds of literature are sorted, sorted, and screened.[4] This lays a solid theoretical basis for future research work.

Questionnaire survey

In this paper, a questionnaire is compiled by consulting the relevant data and combining the specific situation of the table tennis match. The questionnaire analyzes the number of injuries, injuries, and causes among Chinese table tennis players.[5] There were 50 questionnaires in this study, and the response rate was 100%. The number of valid surveys is 50, and the effective rate is 100%.

Interview

This article conducts field research on these players. This article understands their injury status by tracking their entire training process.[6] This article also interviewed the head coach of the table tennis team for detailed first-hand information.

Model simulation and prediction of vulnerable areas of the human body

This article describes the violent action factors that cause injury to various parts of the human body. It is expressed explicitly as

$$M = \{m_1, m_2, \cdots, m_n\} \tag{1}$$

A collection of all places where local injuries to the human body may occur is given in the text.

$$N = \{n_1, n_2, \cdots, n_m\} \tag{2}$$

Various factors can be divided into subgroups according to the fuzzy impact factors of violent actions.[7] We set each subgroup factor within each type of factor to be equal.

$$m_i = \{m_{i1}, m_{i2}, \cdots, m_{ig}\} \tag{3}$$

g represents the number of influence factors in each type of influence factor satisfy $M = \bigcup_{i=1}^{n} m_i$. $m_i \cap m_j = \Phi$ is satisfied when $i \neq j$ is satisfied (Φ is represented as the empty set).

In this paper, it is assumed that the confidence level of the j physical injury point caused by the i intense exercise influencing factor is expressed as $\gamma_{ij} = n_j(m_j)$. λ_{ij} represents the degree of membership of m_i to m_j:

$$0 \le \gamma_{ij} < 1 (i = 1, 2, \cdots, n; j = 1, 2, \cdots, m) \tag{4}$$

This paper uses the formula (4) to obtain the size of the probability of human damage, and the size of the fuzzy set in the judgment N is:

$$P = \begin{pmatrix} P_1 \\ P_2 \\ \mathrm{M} \\ P_n \end{pmatrix} = \begin{pmatrix} \gamma_{11} & \gamma_{12} & \mathrm{L} & \gamma_{1m} \\ \gamma r_{21} & \gamma_{22} & \mathrm{L} & \gamma_{2m} \\ & \mathrm{M} & \mathrm{M} & \mathrm{M} \\ \gamma_{n1} & \gamma_{n2} & \mathrm{L} & \gamma_{nm} \end{pmatrix} \tag{5}$$

The functional relationship $f: M \to f(N)$ between M, N:

$$m_i \to f(n_i) = \frac{\gamma_{i1}}{n_1} + \frac{\gamma_{i2}}{n_2} + \cdots + \frac{\gamma_{im}}{n_m} \tag{6}$$

The location and resulting factors of injury during intense physical activity are represented by Equation (6). The strength of the degree will vary with the intense exercise. Assume that a comprehensive evaluation and forecasting model B for evaluation space (M, N, P) is established

$$B = A \circ R = (b_1, b_2, \cdots, b_n) = (a_1, a_2, \cdots, a_n) \tag{7}$$

Data Statistical Methods

The data collected from the questionnaires were entered into excel for statistical analysis. There is no need for a code of ethics for this study.[8]

ETHICAL COMPLIANCE

Research experiments conducted in this article with animals or humans were approved by the Ethical Committee and responsible authorities of Guangxi Vocational Institute of Technology and Chongzuo Preschool Education College following all guidelines, regulations, legal, and ethical standards as required for humans or animals.

RESULTS

Injured parts of male table tennis players

As shown in Table 2, 50 male table tennis players ranked first with back injuries (27 cases, 54.00%). All technical movements in table tennis are combined with the lower back. Athletes rely on the waist to catch the ball from the backhand to the straight shot, hit, and pull the ring. When playing table tennis, players should keep their bodies lean.[9] The supraspinous ligaments in the back can be tight. The sacrospinalis muscle is permanently tense. Many athletes do not adequately relax their lower back after doing this. This can easily lead to local fatigue and "overworked damage." In addition, in the table tennis game, players are holding the racket with one hand and exerting force with the other hand. This leads to back pain symptoms. The second wrist injury was 22 cases. The incidence rate was 44.00%. For table tennis players, the shoulder is a frequently injured part. Shoulder injuries include subacromial impingement, rotator cuff injury, frozen shoulder, biceps tendon injury, shoulder instability, muscle strain, etc. The number of shoulder trauma was 21 cases, accounting for 42.00%. Athletes who limit shoulder movement often experience problems such as increased external rotation and decreased internal rotation of the upper body. This is because the increased rotation in the table tennis technique increases muscle contractility.[10] This enhances the movement and strength of the athlete. If not corrected in time, it will lead to changes in the shape of the human body. In professional training, male table tennis players have high requirements on the strength, flexibility, agility and flexibility of the waist and upper arms.

Types of injuries in table tennis matches

In male table tennis players, 50 cases of closed injury occurred. And 2 cases were open wounds. Closure injuries refer to tissue damage caused by impacts, falls, squeezing, etc. However, the epidermis and mucous membranes at the wound site were well preserved. We call it a closed injury.[11] The most common are contusions, sprains, crush injuries, etc. An open wound is an open wound as opposed to a closed wound. It is caused by the connection of muscles, bones, etc., in the trauma area to the external environment. Simply put, blood can flow from the wound. (Table 3)

Table 2. Common injury locations of male table tennis players.

Injured area	Injuries	Percentage
Shoulder	21	42.00
Waist	27	54.00
Knee	12	24.00
Ankle	8	16.00
Finger	3	6.00
Wrist	22	44.00
Other	2	4.00

Table 3. Location of closed injuries in male table tennis players.

Type of injury	Muscle strain	Lumbar muscle strain	Tenosynovitis	Heel (ankle) contusion
N	14	15	8	13
Percentage (%)	28.00	30.00	16.00	26.00

In China's table tennis competition, the players mainly suffer from lumbar muscle strain and muscle strain. It accounts for 30.00% and 28.00% of the national table tennis players. This shows that the injuries suffered by professional table tennis players in the game have a particular rule related to its characteristics.[12] If the waist is rotated for a long time, it will cause significant damage. Because most of the services in table tennis are based on the shoulder as the axis, there is a high requirement for the arm's flexibility. Athletes with poor shoulder flexibility are more prone to muscle damage in the upper limbs. There is also a small group of players with tendonitis. The wrist's laxity causes tendonitis due to the racket's prolonged use.

Rehabilitation training of Chinese men's table tennis players after injury

This paper analyzes the rehabilitation status of Chinese vocational and technical personnel after an injury. The results showed that the number of people who reduced exercise was 16, and the proportion reached 32.00%. (Table 4) Therefore, the physical fitness of professional players guarantees their existence.[13] The performance and competition indicators of the competition are also mandatory for them to exercise with illness. Coaches should focus on intensive rehabilitation and scientific rehabilitation to prevent re-injury.

Effects of injuries on male table tennis players

As shown in Table 5, dyskinesia and overloading were the leading injury factors. The reason why this happens is that professional players are too physically exhausted during high-intensity training. Athletes' physical exhaustion in a short time leads to physical exhaustion. In addition, players with a poor mental state will lead to mental instability under a high load.[14] This leads to excessive physical exertion and leads to mental laxity. The main factors that cause injuries to athletes are subjective. Therefore, in

Table 4. Rehabilitation training for male table tennis players after injury.

Training situation	Training as usual	Weight training	Partial suspension	Suspension of training
Injuries	10	16	12	12
Percentage (%)	20.00	32.00	24.00	24.00

Table 5. Causes of Sports Injuries.

Cause	Number of injured	Percentage (%)	Sort
Insufficient preparation activities	14	28.00	4
Improper technical actions	15	30.00	3
Poor mental state	9	18.00	6
Site Environmental Impact	11	22.00	5
Excessive fatigue and training	24	48.00	1
Poor special quality	18	36.00	2
Poor self-protection awareness	8	16.00	7

the usual training and teaching, attention should be paid to reducing technical errors and strengthening physical exercise. Athletes need to enhance their protection capabilities to reduce the probability of injury.

DISCUSSION

(1) Athletes need to distribute the local activity load of the human body reasonably. Athletes must avoid local injuries on the shoulders, waist, knees, and other parts due to excessive weight-bearing. Single-grip rackets are likely to cause an athlete's body imbalance. Athletes should pay attention to the coordination of both sides during physical exercise. (2) Considering that exercise fatigue and physiological function are important factors that cause injuries in table tennis, it is necessary to make correct and timely exercise plans during high-intensity or high-intensity exercise. This prevents exercise fatigue and reduces the chance of injury. (3) Coaches should formulate corresponding physical exercise plans according to competition methods and types. (4) Appropriate preparatory movements are an essential means of preventing injuries to athletes. After exercising, athletes can promote blood flow in essential areas such as the waist, shoulders, and knees through hot compresses and massage. Coaches need to train athletes' self-protection ability to improve their physique in an all-around way. (5) The medical team should strengthen medical and health management. At the same time, the medical team conducts regular health checks on the team members. The medical team needs to keep abreast of the athlete's injury status. This paper proposes establishing a " three-in-one " management system for athletes, coaches, and medical staff. This can prevent athletes from getting injured at the source.

SUMMARY

The injured parts of table tennis players are mainly the waist, wrist, shoulder, and ankle. Athletes mainly suffer from waist and leg injuries, followed by muscle tension. The factors that lead to sports injuries in athletes are as follows: high-level athletes have shorter recovery time in high-level training. This can easily lead to fatigue in the athlete. The Chinese Table Tennis Association should carry out physical exercise scientifically. Athletes need the training to improve professional physical fitness and focus on pre-competition preparation. Coaches must regularly monitor athletes' physical function to prevent sports injuries.

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. Haiyang Xing: writing and data analysis; Lixi Guo: article review and intellectual concept of the article.

REFERENCES

1. Hofer U. Antiviral ping-pong in mosquitoes. Nat Rev Microbiol. 2020;18(10):542-3.
2. Popov VE, Mai RB. Depressed skull fractures in newborns. Case report of ping-pong fracture and literature review. Zh Vopr Neirokhirurgii Im NN Burdenk. 2022;86(1):96-102.
3. Rezvanitabar A, Jung G, Yaras YS, Degertekin FL, Ghovanloo M. A Power-Efficient Bridge Readout Circuit for Implantable, Wearable, and IoT Applications. IEEE Sens J. 2020;20(17):9955-62.
4. Sato K, Siomi MC. The piRNA pathway in Drosophila ovarian germ and somatic cells. Proc Jpn Acad B Phys Biol Sci. 2020;96(1):32-42.
5. Zhou Y, Fang Y, Dai C, Wang Y. PiRNA pathway in the cardiovascular system: a novel regulator of cardiac differentiation, repair and regeneration. J Mol Med. 2021;99(12):1681-90.
6. Sieber N, Lingenfelder C, Götz M, Heine P, Lichtner L, Hessling M. Vitrectome with Integrated LED Illumination: Development and Testing. Curr Dir Biomed Eng. 2021;7(2):851-4.
7. Ryan G. 125 Not Out: A History of the Manawatū Cricket Association, 1895–1920 by Murray Brown and Alec Astle. N Z J Hist. 2022;56(1):170-1.
8. Longinovic NM. A Portrait of the Artistic Process: Federico León's Las ideas. Lat Am Theatre Rev. 2020;53(2):57-80.
9. Xin S. Clinical Observation of Fenestrated Decompression in the Treatment of Odontogenic Jaw Cyst. Clin Med (Lond). 2022;3(2):45-50.
10. Jajang J, Purwanto S, Nanda FA, Novriansyah N. Management of Facilities and Infrastructure of Physical Education in State Junior High School. J of E Research and Evaluation. 2021;5(2):258-64.
11. Wang K, Wang T, Gao XQ, Chen XZ, Wang F, Zhou LY. Emerging functions of piwi- interacting RNAs in diseases. J Cell Mol Med. 2021;25(11):4893-901.
12. Jiang H, Stanford TR, Rowland BA, Stein BE. Association Cortex Is Essential to Reverse Hemianopia by Multisensory Training. Cereb Cortex. 2021;31(11):5015-23.
13. Horikoshi R, Nakajima S, Hosokawa S, Kobayashi Y, Kageyama H. Illustrating catalysis with a handmade molecular model set: catalytic oxidation of carbon monoxide over a platinum surface. CTI. 2021;3(4):431-9.
14. Tortorici S, Biondi A, Pérez- Hedo M, Larbat R, Zappalà L. Plant defences for enhanced integrated pest management in tomato. Ann Appl Biol. 2022;180(3):328-37.