IMPACT OF POSTURE AND RECOVERY METHODS ON SPORTS INJURIES

IMPACTO DA POSTURA NO ESPORTE E MÉTODOS DE RECUPERAÇÃO NAS LESÕES ESPORTIVAS

IMPACTO DE LA POSTURA Y MÉTODOS DE RECUPERACIÓN EN LAS LESIONES DEPORTIVAS

Original Article
Artigo Original
Artículo Original

Tao Liu[1]
(Physical Education Professional)

1. Hanjiang Normal University, Physical Education Institute, Shiyan, Hubei, China.

Correspondence:
Tao Liu
Shiyan, Hubei, 442000, China
TaoLiu68@163.com

ABSTRACT

Introduction: Exercise methods with incorrect posture or inadequate repetitive movements may cause irreversible long-term body damage. There is a growing interest in ergonomics in martial arts, but taekwondo lacks studies. Objective: Evaluate the postural ergonomics impact on injuries and rehabilitation in taekwondo athletes. Methods: 13 taekwondo team members from a sports academy had their posture and injury characteristics evaluated. Research methods, experimental and mathematical statistics investigated the athletes' postural and body diagnosis, confronting the information with their injury history, pain, and injury duration. Results: Nine athletes suffered injuries and pain in the pelvic girdle and ankle joints; the odds are 69.23%, pelvic girdle and ankle joints have the highest frequency of injuries, followed by knee injuries (46.15%), and foot joints (30.77%). Injuries to the thigh, wrist, and shoulder joints were detected in 23.08% of athletes. Conclusions: The results of this study indicate postural dysfunctions can be corrected with motor function evaluation and early rehabilitation based on ergonomic sports posture. ***Evidence Level II; Therapeutic Studies - Investigating the result.***

Keywords: Athletic Injuries; Postural Balance; Martial Arts.

RESUMO

Introdução: Métodos de exercício com postura incorreta ou movimentos repetitivos inadequados podem causar danos corporais irreversíveis à longo prazo. Há um crescente interesse sobre a ergonomia nas artes marciais porém o taekwondo carece de estudos. Objetivo: Avaliar o impacto da ergonomia postural nas lesões e a reabilitação em atletas de taekwondo. Métodos: 13 membros da equipe de taekwondo de uma academia esportiva tiveram suas posturas e características de lesão avaliadas. Usando método de pesquisa, experimental e estatística matemática, investigou-se os dados de diagnóstico postural e corporal dos esportistas confrontando as informações com o histórico de lesões, dor e tempo de lesão. Resultados: Há 9 atletas que sofreram lesões e dores na cintura pélvica e articulações do tornozelo, as probabilidades são de 69,23%, as articulações da cintura pélvica e do tornozelo têm a maior frequência de lesões; seguida por lesões no joelho (46,15%), e as articulações dos pés (30,77%). Lesões nas coxas, articulações do pulso e ombros foram detectadas em 23,08% esportistas. Conclusões: Os resultados deste estudo mostram que as disfunções posturais podem ser corrigidas com avaliação da função motora e a reabilitação precoce baseados na postura ergonômica do esporte. ***Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.***

Descritores: *Traumatismos em Atletas; Equilíbrio Postural; Artes Marciais.*

RESUMEN

Introducción: Los métodos de ejercicio con posturas incorrectas o movimientos repetitivos inadecuados pueden causar daños corporales irreversibles a largo plazo. Existe un creciente interés por la ergonomía en las artes marciales, pero el taekwondo carece de estudios. Objetivo: Evaluar el impacto de la ergonomía postural en las lesiones y en la rehabilitación de los atletas de taekwondo. Métodos: Se evaluaron las posturas y las características de las lesiones de 13 miembros del equipo de taekwondo de una academia deportiva. Utilizando el método de investigación, experimental y estadística matemática, se investigaron los datos de diagnóstico postural y corporal de los atletas, confrontando la información con su historial de lesiones, el dolor y el tiempo de lesión. Resultados: Hay 9 atletas que sufrieron lesiones y dolor en las articulaciones de la cintura pélvica y el tobillo, las probabilidades son del 69,23%, las articulaciones de la cintura pélvica y el tobillo tienen la mayor frecuencia de lesiones; seguidas de las lesiones de rodilla (46,15%), y las articulaciones del pie (30,77%). Se detectaron lesiones en las articulaciones del muslo, la muñeca y el hombro en el 23,08% de los atletas. Conclusiones: Los resultados de este estudio muestran que las disfunciones posturales pueden corregirse con la evaluación de la función motora y la rehabilitación temprana basada en la postura deportiva ergonómica. **Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.**

Descriptores: *Traumatismos en Atletas; Equilibrio Postural; Artes Marciales.*

DOI: http://dx.doi.org/10.1590/1517-8692202228062022_0059 Article received on 01/06/2022 accepted on 02/18/2022

INTRODUCTION

Incorrect or inappropriate exercise postures and exercise methods, the damage to the body is mainly manifested in daily behavior, will cause some harm to the body. The normal posture of the human body is mainly supported by bones, and the maintenance of soft tissues such as muscles and ligaments. No matter from the perspective of physiology or pathology, bones, skeletal muscles and joints are organically connected by a large number of connective tissues, form a large and efficient movement structure and movement function system.[1] In this combination, the human body is under the control of the nervous system, always function as a whole, allow the body to show complex, changeable and diverse forms of exercise.[2] In recent years, people have begun to pay attention to the relationship between posture and chronic injury or sports injury. Research on posture and injury has gradually enriched, but there is not much posture analysis for the use of Taekwond, therefore, the author uses the "kinematic chain theory", in order to study the posture characteristics of Taekwondo athletes, and the mechanism of action between sports injuries, analyze the posture characteristics of Taekwondo athletes, proposed establishment for sports injury prevention; Analyze the sports injuries that have occurred, prevent athletes from producing new abnormal postures. Using global posture analysis, in order to evaluate the overall posture of Taekwondo athletes.[4,5]

METHOD

Research objects

The author took 13 members of the Taekwondo team of a sports college as the research object, 5 male players and 8 female players; 5 national first-level athletes, 8 national second-level athletes; There are 7 athletes in the Taekwondo team, 6 athletes from the city's taekwondo team in the prefecture-level city; Among them, 3 persons were 21 years old, 5 persons were 20 years old, 4 persons were 19 years old, and 1 person was 18 years old.

METHOD

Investigation method

Using the human body posture and stability analysis and diagnosis system, attached injury registration form, before the formal experiment, the testers will enter relevant information for the athletes, including athlete's injury history, pain history and related injury pain time, dominant side hand, etc. In this research, according to research needs, in this part of the content, we mainly investigate the athlete's injury site.[6]

Experimental method

This research uses the human body posture and stability analysis and diagnosis system, collect posture and stability data of 13 members of a Taekwondo team in a sports college, perform measurement analysis, draw the characteristics of the athlete's posture.

Mathematical Statistics

Using excel software and SPSS19.0, first, the results of the athlete's injury investigation and the overall posture analysis results, etc., perform descriptive statistical analysis, then analyze the correlation between athletes' sports injuries and abnormal postures, deduce the high frequency abnormal posture and the corresponding injury site, whether there is a certain relevance.

RESULTS

Distribution characteristics of sports injuries of Taekwondo athletes

Among the injury sites counted, there are 9 athletes who have suffered injuries and pains in the waist and ankle joints, the probabilities are both 69.23%, the waist and ankle joints have the highest frequency of injuries; Followed by knee injuries, 6 people have suffered damages that should have occurred, the probability of damage is 46.15%, then the toe joints, 4 people have suffered from the injury in this area, among the 13 athletes counted, the probability is about 30.77%; Then there are injuries to the thighs, wrist joints and shoulders, with a frequency of 3, among the 13 athletes counted, the probability is 23.08%; The last less frequent occurrences are injuries to the abdomen, fingers, cervical spine, and head, the frequency is both 2, among the 13 athletes counted, the probability is 15.38%. (Figure 1). Athletes are recovering from an injury, waist injury is difficult to fully recover, all will have varying degrees of soreness after exercise fatigue; And the injury at the ankle joint, it is repetitive, after an injury recovers, it is easy to cause another damage; The recovery of other parts is good.

The overall posture characteristics of Taekwondo athletes with ankle joint injury

For 9 Taekwondo athletes with ankle injuries, perform overall posture evaluation data statistics, the overall posture data shows, 66.66% of athletes lean forward and turn right, 100% of athletes have abnormal plantar pressure distribution, abnormal postures such as shifting the center of gravity to the left; Foot posture indicator display, 44.43% of athletes have foot valgus, 33.33% of athletes have foot varus and other abnormal postures; Knee joint posture indicators show, 88.88% of athletes have knee hyperextension, 44.43% of athletes have abnormal postures such as knee valgus; The pelvic posture indicator shows,55.54% of athletes have pelvic rotation, 44.43% of athletes have anterior pelvic tilt, accompanied by a certain degree of pelvic lateral displacement and torsion and other abnormal postures; The shoulder posture indicator shows, 44.43% of athletes have right shoulder and spleen lift. (Table 1).

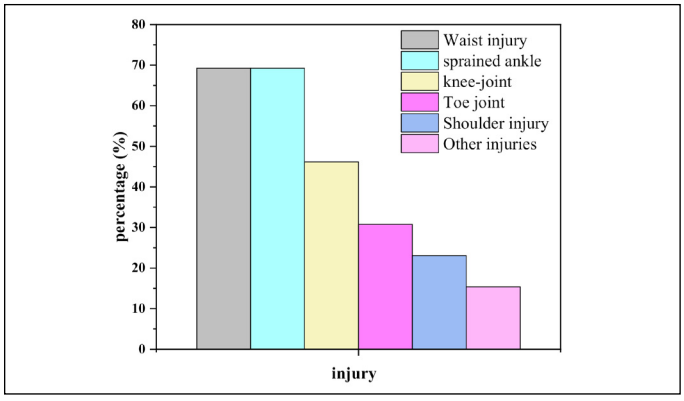

Figure 1. Percentage of Taekwondo athletes' injuries.

Table 1. The number of Taekwondo athletes with ankle injuries and their percentages.

Abnormal posture	Taekwondo athlete with ankle injury (9 people) The number of abnormal postures	The number of abnormal postures accounts for the percentage of Taekwondo athletes
Lean forward	6	66.66%
Turn right	6	66.66%
Center of gravity shifted to the left	9	100%
Abnormal plantar pressure distribution	9	100%
Foot valgus	4	44.43%
Foot varus	3	33.32%
Knee hyperextension	8	88.88%
Knee valgus	4	44.43%
Pelvic rotation	5	55.54%
Forward pelvis	4	44.43%
Right shoulder blade lift	4	44.43%

The abnormal posture of athletes with ankle injuries, correlation analysis with ankle joint injury was carried out, and the results are shown in Table 2, abnormal postures such as leaning forward, turning right, shifting center of gravity to the left, etc, the statistical significance probability of the correlation coefficient with ankle joint injury P<0.05, significant correlation; Abnormal plantar pressure distribution and abnormal postures such as knee hyperextension, the statistical significance probability of the correlation coefficient with ankle joint injury P<0.01, there is a very significant correlation; Foot valgus, foot varus, knee valgus, abnormal postures such as pelvic rotation, anterior pelvic tilt, right shoulder and spleen lift, the statistical significance probability of the correlation coefficient with ankle joint injury is P>0.05, and there is no significant correlation.

The overall posture characteristics of Taekwondo athletes with knee joint injury

For 6 Taekwondo athletes with knee sports injuries, perform overall posture evaluation data statistics, the overall posture data shows, 88.82% of athletes leaned forward, 66.66% of athletes turned right, 83.32% of athletes have abnormal plantar pressure distribution, and 100% of athletes have their center of gravity shifted to the left; Foot posture indicator display, 40.00% of athletes have foot varus, 33.32% of athletes have foot varus; In the knee posture index, 83.32% of athletes have knee hyperextension, 40.00% of athletes have knee valgus, 16.66% of athletes have knee varus; In the pelvic posture index, 66.66% of athletes' pelvis tilted forward with a certain degree of twisting, 40.00% of athletes have pelvic rotation; In the shoulder posture index, 40.00% of athletes have their right shoulder and foot lifted. (Table 3)

DISCUSSION

Propose pre-rehabilitation recommendations for Taekwondo athletes' sports injuries and abnormal postures

Timely and effectively analyze the overall posture of Taekwondo athletes

Before undergoing rehabilitation training, diagnose whether the athlete has injury pain at this time, when there is injury and pain, promptly carry out relevant medical treatment; When there is no injury or pain or the pain does not affect normal standing, then timely diagnose and evaluate the posture of Taekwondo athletes.[7] Traditional rehabilitation training, rehabilitation training of muscle strength and function is mainly aimed at the injured part, but due to the existence of the kinematic chain when the body is moving, the main complaint that caused the site injury may not be at the site of the injury, it may be in any other segment of the kinematic chain connected to it, so when we do the overall posture analysis before pre-rehabilitation, mainly to find abnormal positions, accurately judge the vulnerable parts and the risk of chain injury caused by other potential abnormal postures, provide targeted opinions for pre-rehabilitation training.[8]

Table 2. Correlation analysis between abnormal posture of ankle joint injury athletes and ankle joint injury.

Abnormal posture	Ankle injury pearson correlation
Lean forward	.616*
Turn right	606*
Center of gravity shifted to the left	.630*
Abnormal plantar pressure distribution	.822**
Foot valgus	.444
Foot varus	.365
Knee hyperextension	.843**
Knee valgus	.443
Pelvic rotation	-0.51
Forward pelvis	-.526
Right shoulder blade lift	.183

*. Significantly correlated at the 0.05 level (two-sided). **. Significantly correlated at the .01 level (bilateral).

Table 3. The number and percentage of abnormal postures of Taekwondo athletes with knee joint injuries.

Abnormal posture	Taekwondo athlete with ankle injury (6people) The number of abnormal postures	The number of abnormal postures accounts for the percentage of Taekwondo athletes
Lean forward	5	88.82%
Turn right	4	66.66%
Center of gravity shifted to the left	6	100%
Abnormal plantar pressure distribution	5	83.32%
Foot valgus	3	40.00%
Foot varus	2	33.32%
Forward pelvis	4	66.66%
Pelvic rotation	3	40.00%
Knee hyperextension	5	83.32%
Knee valgus	3	40.00%
Knee varus	1	16.66%
Right shoulder blade lift	3	40.00%

Perfect the technical movements of Taekwondo athletes

But if the knee lift starts, the calf is straight or not folded enough, it will start to increase the moment arm, and the load of the muscles that maintain the flexion and abduction of the thigh will increase the compensation, at the same time, there may be a contraction of the waist and abdomen muscles on one side of the leg, compensation force, long-term technical errors, undoubtedly increase unnecessary muscle load, increase the risk of sports strain and abnormal posture.[9] The second is to improve the training and pre-match preparation activities, the warm-up action is adapted to the Taekwondo technical action and fighting posture, in order to adapt to the competition or training, the state of the body is constantly changing, but still control the body to maintain the correct fighting posture and movement force method, the need to make standardized technical actions; The third is to improve the comprehensiveness of Taekwondo technical movements, not only can use one-sided dominant leg, can also be proficient in the technical movements of the opposite leg, make up for technical shortcomings, avoid strengthening the body due to the advantages of unilateral technical movements and causing abnormal posture on one side.[10]

CONCLUSION

Research shows, sports postures and exercise methods are important risk factors for sports injuries, it is one of the root causes of sports injuries. The results of this study show that, according to exercise posture and exercise method, carry out physical function assessment and rehabilitation training, can improve the problem of weak local athletic ability, it can play a positive role in the rehabilitation of sports injuries.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. TL: writing and performing surgeries; data analysis and performing surgeries; article review and intellectual concept of the article.

REFERENCES

1. Luiggi M, Griffet J. Sport injury prevalence and risk by level of play and sports played among a representative population of French adolescents. A school-based study. Revue d'epidemiologie et de sante publique. 2019;67(6):383-91.
2. Webster KE. Return to Sport and Reinjury Rates in Elite Female Athletes After Anterior Cruciate Ligament Rupture. Sports Medicine. 2021;51(4):653-60.
3. Erickson LN Sherry MA. Rehabilitation and return to sport after hamstring strain injury. 2017;6(3):262-70.
4. Schneider KJ, Emery CA, Black A, Yeates KO, Debert CT, Lun V et al. Adapting the Dynamic, Recursive Model of Sport Injury to Concussion: An Individualized Approach to Concussion Prevention, Detection, Assessment, and Treatment. Journal of Orthopaedic and Sports Physical Therapy. 2019;49(11):1-36.
5. Fehske K, Lukas C. Ligamentous ankle injury: an underestimated trauma?. Sportverletzung · Sportschaden. 2020;34(3):147-52.
6. Bäcker HC, Vosseller JT, Exadaktylos AK, Perka C, Benneker LM, Krause FG et al. Epidemiology and injury patterns of aerial sports in Switzerland. World Journal of Orthopaedics. 2020;11(2):107-15.
7. Nielsen RS, Shrier I, Casals M, Nettel-Aguire A, Møller M, Bolling C et al. Statement on Methods in Sport Injury Research from the First METHODS MATTER Meeting, Copenhagen. Journal of Orthopaedic and Sports Physical Therapy. 2020;50(5):226-33.
8. Karton C, Hoshizaki TB. Biomechanics of Sport-Related Neurological Injury - ScienceDirect. Clinics in Sports Medicine. 2021;40(1):19-38.
9. McGowan J, Whatman C, Walters S. The associations of early specialisation and sport volume with musculoskeletal injury in New Zealand children. Journal of Science and Medicine in Sport. 2020;23(2):139-44.
10. Hirohata K, Aizawa J, Furuya H, Mitomo S, Ohmi T, Ohji S et al. The Japanese version of the anterior cruciate ligament-return to sport after injury (ACL-RSI) scale has acceptable validity and reliability. Knee Surgery, Sports Traumatology. Arthroscopy. 2020;28(8):2519-25.