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## ORIGINAL

### ANALYSIS OF THE MOST FREQUENT INJURIES AND HABITS OF THE TRIATHLETES DURING THE COMPETITION

### ANÁLISIS DE LAS LESIONES Y HÁBITOS MÁS FRECUENTES DE LOS TRIATLETAS DURANTE LA COMPETICIÓN

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#### ABSTRACT

The objectives of this study are to determine and analyze the most frequent injuries and habits of triathletes during the development of a test. It is a descriptive, observational, transversal and retrospective study. The sample is composed of 84 participants (76 men and 8 women).

Two questionnaires were administered, pre and post test, and recorded: history of sports injuries, previous treatments, injuries during the test, etc.

Triathletes suffer a high incidence of dermal foot injuries during sports practice. 88% of adults and 90% of young people suffered sports-related injuries. In terms of previous foot care, the most common reason for podiatric consultation was foot orthoses; 25% and 80% of the youngsters and adults, respectively, received advice on the care of their feet. According to these data, it is necessary to implement a foot care program for triathletes.

**KEY WORDS:** Sports; Foot; Primary Prevention; Health Promotion; Risk Factors.

## RESUMEN

Los objetivos de este trabajo son determinar y analizar las lesiones y hábitos más frecuentes en triatletas durante el desarrollo de una prueba. Es un estudio descriptivo, observacional, transversal y retrospectivo. La muestra la componen 84 participantes.

Se administraron dos cuestionarios, pre y post prueba, se registraron: antecedentes de lesiones deportivas, tratamientos previos, lesiones durante la prueba, etc.

Los triatletas sufren una alta incidencia de lesiones podológicas dérmicas durante la práctica deportiva, Un 88% de los adultos y el 90% de los jóvenes sufrieron lesiones relacionadas con el deporte. En cuanto al cuidado previo de los pies, la razón más común para la consulta con el podólogo fue para los soportes plantares; El 25% y el 80% de los jóvenes y adultos, respectivamente, recibieron consejos sobre el cuidado de sus pies. De acuerdo con estos datos, es necesario implementar un programa de cuidado de los pies para los triatletas.

**PALABRAS CLAVE:** Pie; Prevención; Factores de riesgo; Carrera; Ciclismo; Natación; Deportes.

## INTRODUCTION

The triathlon is a relatively modern resistance sport, which commenced in the 1970s and combines three disciplines: swimming, cycling and running<sup>1</sup>. Because of the recent growth of the triathlon and the demand for foot consultation, we believe terms and conditions need to be drawn up to set up a Foot Healthcare Programme for this sporting discipline.

The term injury is defined as any musculo-skeletal problem that causes a stoppage in sports activity for at least one day, reduced performance, taking medication and quest for professional assistance.<sup>2</sup> According to a study performed by Korkia et al in 1994, the most common injuries in the triathlon are musculo-skeletal, and they take place in the foot/ankle, thigh and knee. A total of 65% of injuries take place whilst running, 16% during cycling and 12% during

swimming. Of the triathletes injured, 13% saw a podiatrist. Authors did not relate the incidence of injuries with number of hours training.<sup>2</sup>

During the triathlon, the leg undergoes a high incidence of injuries, of multifactorial aetiology, among which the kind of sports shoe used and its suitability for the athlete's biomechanical characteristics are notable<sup>3</sup>. As for the relationship between pain in the heel and plantar fasciitis after completing a triathlon, in the study performed by Wilk et al, in 2000<sup>3</sup>, they identified defective construction of the sports shoe as a possible cause. The biomechanics of each of the disciplines should also be considered as a source of damage. The triathlon is growing fast and the capacity to recognise the unique aspects of these injuries may help the athlete to train and compete correctly in a healthy and successful way.

As for when the injuries occur, these mainly appear whilst running in 38,4%, 2% of injuries take place when swimming where the shoulder is the area most commonly injured<sup>4</sup>. In a study<sup>5</sup> performed by Sánchez et al.<sup>5</sup>, in 2007, on the most common dermopathies in the sportsperson's foot, 79,7% had suffered from some kind of injury; blisters occurred most often in all groups, followed by fungal infection and, finally, ingrown toenail. Among the causes that had led to such injuries, 25,4% of those surveyed attributed these to moisture, 50,8% signalled out rubbing of socks against the footwear and 23.8% did not know the reason. These injuries caused a total loss of 70 days training, with an average of 2 days per sportsperson. Foot dermopathies have a high incidence in sports (triathlon, swimming, athletics and basketball) and cause losses of days training, whereby the sportsperson must be educated to undertake prevention and avoid such injuries wherever possible.<sup>5</sup>

Most triathlon injuries are because of overload and are associated with intrinsic and extrinsic factors. Notable intrinsic factors are excessive or pathological pronation, *pes cavus* (high arched foot), the high impact of the race, knee varus or valgus, patellofemoral dysplasia, dissymmetry of the legs and joint hypermobility. Extrinsic factors are climate, inappropriate footwear, poor training, poor warming up and stretching, and insufficient care of the muscles<sup>6</sup>. In a 2008 study performed by Gosling et al on musculo-skeletal injuries in the triathlon, lack of knowledge on the incidence of injuries, profile of injuries sustained and evidence for prevention of injuries in the triathlon were all highlighted.<sup>7</sup> The little data available on the incidence of injuries, with minimal scientific evidence in the studies published, justify there being no preventive recommendations for the Triathlon.<sup>8</sup>

The TRIPP (Transferring Research into the Practice of Preventing Injuries) model proposed by Mechelen in 1992 outlines four phases of research for the prevention of injuries<sup>9</sup>: Phase 1: set out the magnitude of the problem (Incidence-Severity). Phase 2: set the injury's risk factors and mechanisms. Phase 3: Introduce preventive measures. Phase 4: set out the programme's efficacy by repeating phase 1.

The model proposed by Mechelen has been modified to add two additional phases:<sup>10</sup> Phase 5: set out the efficiency of the preventive measure. Phase 6: evaluate the risk/benefit ratio of applying the preventive measure.

Most Triathlon studies have been limited by the few high quality prospective studies, research into the incidence of injuries during the triathlon and the factors that contribute to its onset. This has led to an inability to draw up injury prevention strategies (TRIPP) for this sport.<sup>7</sup>

It is essential to perform epidemiological studies, based on a well-organised healthcare information system. This entails the healthcare professional, in this case the podiatrist, having broad knowledge of the sport, its risk factors and mechanisms of origin to especially understand specific foot pathologies and to be able to set up a foot care prevention programme.

In a study performed by Gosling et al.<sup>11</sup>, in 2013, titled: "Professional perceptions of the health of musculo-skeletal lesions and risk factors in Australian athletes: a factorial analysis", the results were that the perception of healthcare professionals on the risk of injuries in triathletes depended on the following factors: training, demography, prevention of biomechanical injuries, health, medical follow-up and the triathlete's preparation. These results show that future risk prevention studies for injuries in the triathlon should at least include detailed training load and demographic factors to prove their impact as risk factors for injuries among the triathlete population.

## **OBJETIVES**

The objectives of this work are to determine and analyse the most common injuries and habits in triathletes during a race.

## **METHODS**

This is a descriptive epidemiological study on participants in the XXVII Seville Triathlon,

in which more than 3000 participants had registered, performed by means of two questionnaires. Subjects gave their informed consent and prior authorisation was obtained from the University of Seville ethics committee and Andalusian Triathlon Federation. Samples were collected upon handing out competition numbers for Olympic distance, Sprint and Super Sprint (pre-questionnaire), and at the finishing line to all those who came to the medical services treatment station (post-questionnaire), by means of simple random sampling. Inclusion criteria were: for the pre-questionnaire: race subjects. For the post-questionnaire: subjects who had completed the race came to the medical services treatment station.

The present study was based on two questionnaires prepared for this research by adapting previously published questionnaires<sup>12,13</sup> and used in other sports

disciplines under the supervision of 5 expert doctors in the field belonging to Spanish universities. The data compiled in the pre-questionnaire were: distance, age, sex and competition number. The following questions were asked (7 items): do you have or have you sustained sporting injuries? Where? Which professional treated you for your foot injuries? Have you received information on how to look after your feet? How? Have you ever been to the podiatrist? Why? Do you think it is important to undertake a foot study before the triathlon? Why? Post-questionnaire data: competition number, distance, age, and sex. The following questions were asked (5 items): have you sustained injuries or pain the foot during or after the test? What kind of pain? Have you sustained other injuries not in the foot? Where? At what moment in the test did the discomfort begin? Which healthcare professional would you see in case of sustaining an injury in your foot? The bare foot was subsequently examined (dorsal and plantar views). They are considered young if it is less than or equal to 20 years.

The study was comprised of 84 participants, 44 undertook the questionnaire before the test and 40 filled in the post-test questionnaire. Data were analysed with the statistical software package SPSS for Windows (2003 SPSS Science, Chicago, Illinois, USA). The descriptive analysis was determined as percentages and frequencies. The Chi-squared test was performed to determine whether there was a relationship between the different variables analysed. Statistically significant differences were considered as  $P < 0.05$ .

## RESULTS

A total of 84 questionnaires were analysed, 44 pre-race (11% women and 89% men with ages between 14 and 46 years; with an average of  $25,34 \pm 10,55$  years) and 40 post-race (8% women and 92% men with ages between 16 and 51 years; with an average of  $26,27 \pm 9,77$  years), which corresponded to 84 subjects (no professional) from the 27th Seville Triathlon.

The first questionnaire (pre-race), was completed by 23 young people (8,7% women and 91,3% men) and 21 adults (14,3% women and 85,7% men). We determined that 61,4% of subjects in the study had sustained sports-related injuries at some time. Of these, 52,2% were young people and 76,4% adults. The results reveal that the frequency of injuries is unrelated to age range ( $P=0,190$ ). As regards these injuries, the foot was the anatomical segment most commonly injured, 15,9%. This was followed by the knee and leg, with 9,1% and 6,8% respectively. Another 9,1% sustained knee and foot injuries. The anatomical segment least injured was the thigh with 2,3%. Table 1

**Table 1.** Location of pre-race injuries

Injury	No	Foot	Leg	Knee	Thigh	Hip	Arm
Young people	47,8%	17,4%	0%	13%	4,3%	0%	4,3%
Adults	23,8%	14,3%	14,3%	4,8%	0%	0%	0%
Overall sample	36,4%	15,9%	6,8%	9,1%	2,3%	0%	2,3%

As regards sports-related foot injuries, 4 young people answered that they had seen the doctor to resolve them, 10 adults went to the physiotherapist and 4 to the podiatrist. A total of 26,1% young people surveyed and 81% of adults had received podiatrist education. Chi-squared test results reveal that age range, among young people and adults, is related to podiatrist information received ( $P<0.001$ ). A total of 33% of adults received foot healthcare information from the podiatrist, and 21,7% of young people received information from other means (trainer, physiotherapist and parents); 65,2% of young people had never seen a podiatrist and 61,9% of adults had visited one at some time. Chi-squared test results reveal that age does not have a statistically significant impact on visit to the podiatrist but a certain trend is revealed ( $P=0,72$ ). The most common reason for podiatrist consultation in both groups was for plantar supports, 13% and 23,8% in the young and adults, respectively. This is followed by problems in the nails and joint pain in 8,7%.

All adults and 82,6% of young people thought it important to undergo a prior foot study before completing in a triathlon; 34,8% of young people and 57,1% of adults thought it important to undertake a podiatrist study to prevent sports-related injuries, other justifications for the importance of the triathlon foot study were “to improve performance” in 4,3% of young people or “to ascertain the right sports shoe for their foot” in 8,7% of young people and 9,5% of adults. The second questionnaire (post-race) was undertaken by 16 young people and 24 adults. We found that 65% of subjects had sustained injury or pain in the feet during the race. Of these, 41,7% were young people and 75% were aged over 19. Results reveal that age range, among the young and adults, is related to the likelihood of sustaining an injury ( $P=0,043$ ). A total of 62% sustained skin injuries in the foot during the test, 33,3% of young people and 75% of adults. A total of 75% of young people and 71,4% of adults did not sustain injuries in other areas outside the foot. Results on the location of sports injuries sustained during the race are shown in the next table. Table 2

**Table 2.** Location of sports-related injuries during the triathlon race according to post-race questionnaire.

Injury	Foot	Leg	Knee	Thigh	Hip	Arm
Young people	41,7%	16,7%	0%	8,3%	0%	0%
Adults	75%	14,3%	47,1%	0%	0%	10,7%
Overall sample	65%	15%	5%	2,5%	0%	7,5%

As regards onset of discomfort, existence of pain or injury, 9,7% of young people and 60,7% of adults answered that they commenced during the race. As

for the professional they would visit in case of foot injury, we found that 50% and 32,1% of young people and adults, respectively, would consult a physiotherapist.

According to the podiatrist examination performed, 8,3% of young people and 35,7% of adults presented blisters (27,5% of all triathletes). The dermal injury that followed was running sore, 17,5% (25% and 14,3% in young people and adults, respectively).

According to the kind of injury presented in relation to distance run by subjects, we found that 72,4% sustained skin injuries at Olympic distance, compared to 36,4% at Sprint distance. As for the distance in relation to the skin lesion, we found that 34,5% of subjects at Olympic distance sustained blisters on the feet, compared to 9,1% at Sprint distance. Chi-squared test results reveal that the frequency of injuries is related to the distance run ( $P=0,110$ ). Increased distance is directly proportional to the existence of foot injuries. Both young and adult triathletes most commonly sustain an injury during the walking part of the race.

## DISCUSSION

There is a limited amount of literature on podiatrist prevention programmes in triathletes and there lies the relevance of the research. The absence of available data on the incidence and prevalence of injuries, in addition to publications with a minimal level of evidence, make it impossible to make preventive recommendations with a scientific basis for the triathlon. We highlight in the characteristics of the study population an incidence close to 90%, data that coincide with recently published studies.<sup>2,8,14,15</sup>

Controversy exists over the term injury, as some triathletes with blisters on their feet, when questioned whether they had suffered an injury, answered no. In connection with this point we disagree with authors who only define the term "injury"<sup>16</sup> as a musculo-skeletal problem. Not all injuries are musculo-skeletal and a clear example of this is that, according to our study's results, 84% of injuries are skin-related. The race was the segment where triathletes suffered most discomfort, which coincides with the results of other authors: Collins en 1989, Korkia en 1994 y Gosling en 2010.<sup>2,17,13</sup> Only 35% of all young people and 62% of adults had visited the podiatrist at some time. In other studies, only 13% of injured triathletes went to the podiatrist.<sup>2</sup> Therefore, one of the aims of the study is to promote and disseminate both the preventive and therapeutic roles of the podiatrist among the triathlete population, especially among young people.

The results showed that the high incidence of injuries can be due to overuse, excess training or inadequate training, as reported by other studies.<sup>2,12,14,18</sup> These results are very similar to those found by Bernasconi et al.<sup>19</sup>, Bertola et al.<sup>14</sup>, Andersen et al.<sup>20</sup> and Spiker et al.<sup>21</sup>, who described that the highest

incidences of injuries were recorded in the lower extremity; in the foot or in the knee as in this study.

In the beginning, it was intended to administer the pre and post questionnaire to the same participants, due to the organization of the test was not possible. As a prospective of the study, we intend to expand the sample and that the same subjects receive both questionnaires to avoid bias in the data collection. Likewise, the questionnaire will be modified, including the exact area of the injuries and the nature of the same.

Due to the low incidence of Triathletes attending the podiatrist, the design of preventive strategies that favor health promotion and prevention of the disease in said population will be carried out. Through talks, colloquia at sporting events and evaluations at sports schools.

## **CONCLUSIONS**

Triathletes suffer from a high incidence of podiatrist injuries when practicing sport; 65% of subjects suffer from feet pain or discomfort during the race (75% in adults). The Chi-squared test reveals a direct relationship between age and the existence of injuries ( $P=0,043$ ). Skin injuries were the most common. The 72,4% of subjects at Olympic distance presented blisters on the feet. The 50% of subjects sustained sports-related injuries throughout their career. The foot, knee and leg were the most commonly injured areas. According to these data it is necessary to develop a Podiatric Health Program for triathletes.



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