Prevalence of Orthopedic Injuries in Amateur Runners in the Municipality of Gurupi-To.

ABSTRACT

Aims: This study investigated the characteristics of orthopedic injuries in amateur runners, aiming to understand the factors that influence them.
Study design: The research was conducted through a field study with a descriptive approach, combining quantitative and qualitative analysis of the collected data.
Place and Duration of Study: Data collection was carried out during the months of March and April 2024, in the city of Gurupi, Tocantins, Brazil.
Methodology: Using a quantitative approach, the responses of 103 participants regarding injury diagnoses, rest practices, behaviors during running, and frequency of fatigue were analyzed.
Results: The results revealed a diversity of training practices and individual experiences, highlighting the lack of direct association between increased training volume and the occurrence of injuries. The research also identified different approaches to increasing pace/speed and distance during races, suggesting the need for individualized training programs.
Conclusion: This study highlights the complexity of the factors involved in orthopedic injuries related to road running and highlights the importance of personalized strategies in the prevention and treatment of these injuries, contributing to a safer and more sustainable sports practice for amateur runners.

Keywords: Orthopedic injuries; Amateur runners; Prevention.

1. INTRODUCTION

In recent times, the practice of road running has gained increasing popularity, due to its numerous benefits and its convenience. However, just like with any sporting activity, runners are susceptible to injuries that may require medical treatment and temporarily stop playing the sport. Therefore, it is essential to adopt intelligent preventive measures to reduce both the frequency and severity of these risks[1].

Running has become a way of life for many, whether it's because of the ease of practice, the health benefits, or the low cost. However, even with its popularity, runners face risks associated with the practice, and most injuries appear to be multifactorial[2]. Case studies have proven the health benefits of running, but have also highlighted risks, such as increased medical visits in runners who run longer distances weekly[3].

The research is justified by the need to understand the risk factors and types of injuries most common among amateur runners, in order to promote safer and healthier running. With the increase in adherence to road running, the incidence of injuries has also increased, affecting approximately 36,5% of Brazilian amateur runners[4].

Several intrinsic and extrinsic factors may be related to these injuries[4]. One study revealed that a significant portion of the runners interviewed reported having suffered injuries, with the most affected areas being the calf and tibialis anterior/shin[5]. Musculoskeletal injuries, such as tendinopathies and muscle injuries, are common in medium and long-distance runners, with the knee and foot region being the most affected areas[6].

In recent years, street racing has gained more and more fans in the city of Gurupi, state of Tocantins (To). This sport, known for its many health benefits and convenience, has become a popular activity among people of different

ages and fitness levels. However, as with any sporting activity, running presents its own challenges, including the risk of orthopedic injury[1].

Previous studies have highlighted that despite the health benefits associated with running, runners, both amateur and professional, are susceptible to injuries that may require medical treatment and affect their ability to continue playing the sport[3]. Increased adherence to road running has been associated with a corresponding increase in the incidence of injuries, affecting approximately 36,5% of amateur runners in Brazil[4].

Previous research has also identified the most common types of injuries among runners, including tendinopathies, muscle injuries, and joint problems such as plantar fasciitis and chondromalacia patellae[6,9]. In addition, intrinsic factors, such as anatomical and biomechanical characteristics, and extrinsic factors, such as training errors, have been associated with the risk of injury[8].

Amateur runners who opt for routes of up to 10 km often face knee injuries, while amateur runners deal more with calf, thigh and ankle injuries[7]. Injuries resulting from strenuous running are related to intrinsic factors, such as biomechanical and anatomical anomalies, and extrinsic factors, such as errors in training planning and execution[8].

This study aims to determine the prevalence of orthopedic injuries in a group of amateur runners in the city of Gurupi-To, aiming to fill a knowledge gap in the literature and provide subsidies for the implementation of effective preventive strategies. The objectives also include not only determining the prevalence of orthopedic injuries, but also investigating associated factors, such as gender, age, course distance, weekly frequency, practice time, nutritional routine, water intake, rest time, physical fitness, and prevention and treatment strategies adopted by amateur runners.

2. MATERIAL AND METHODS

The research was conducted through a field study with a descriptive approach, combining quantitative and qualitative analysis of the collected data. A virtual questionnaire containing 22 questions was used, addressing topics such as time of sports practice, frequency of running and history of injuries. This questionnaire was distributed via link, through WhatsApp, to the administrators of one of the largest running groups in Gurupi-TO, called "Mispera", which has 176 active participants.
Inclusion criteria included being an amateur runner residing in Gurupi, being an active member of the "Mispera" running group, and agreeing to participate in the research. Participants were informed about the minimal risks associated with the research, including the possibility of data disclosure, and mechanisms were guaranteed to protect the privacy and confidentiality of information (Resolution No. 466/2012).

Data collection was carried out during the months of March and April 2024, after approval by the Research Ethics Committee of the University of Gurupi (UnirG). The data were quantitatively analyzed using Microsoft Excel software, using descriptive and easy-to-understand statistics to present the results. The research was conducted in accordance with the ethical principles established by CNS Resolution 466/2012 and was only initiated after approval by the Research Ethics Committee.

The benefits of the research included providing up-to-date information on orthopedic injuries among amateur runners in Gurupi, as well as identifying specific preventive measures to reduce these injuries. The results may also contribute to promoting a safer environment for running and improving the care and recovery of injured runners.

3. RESULTS AND DISCUSSION

After conducting the survey in the "Mispera" group, which has a total of 176 participants, we obtained responses from 103 individuals, representing a significant response rate. Of the participants who responded to the questionnaire, 76 (74%) are male, while 27 (26%) are female.

In addition, the participants were divided into different age groups, which allows us to get a more detailed view of the demographic composition of the group. The most represented age groups are those between 35 and 39 years old, with 28 participants (27.18%), followed by the 40 to 44 age group, with 26 participants (25.24%). The age groups of 30 to 34 years and 45 to 49 years also had a considerable participation, with 11 (10.68%) and 8 (7.77%) participants, respectively. The age groups of 18 to 24 years, 24 to 29 years, 50 to 54 years and over 55 years

presented lower representativeness, with 6 (5.83%), 14 (13.59%), 8 (7.77%) and 2 (1.94%) participants, respectively.

In addition to demographic analysis by gender and age group, we also examined the weight of survey participants. Weight distributions provide additional data on the physical composition of amateur runners in the "Mispera" group and can influence the occurrence and severity of orthopedic injuries.

Of the research participants, we observed that most of them fit into the weight ranges between 55 and 64 Kg, with 17 participants (16.5%) in the range of 55 to 59 Kg and 19 participants (18.45%) in the range of 60 to 64 Kg. with 14 participants (13.59%) and 10 participants (9.71%), respectively.

The lowest weight ranges, between 49 to 54 kg and 50 to 59 kg, have 7 participants (6.8%) and 17 participants (16.5%), respectively. On the other hand, the higher weight ranges, from 85 kg, have a lower representation, with 7 participants (6.8%) in the range of 85 to 89 kg, 5 participants (4.85%) in the range of 90 to 94 kg and 95 to 99 kg, and 3 participants (2.91%) in the range of more than 100 kg, as can be seen in table 1.

Table 1. Demographics

Age	Interviewed	% n=103
18 - 24 years	6	5,82%
24 - 29 years	14	13,59%
30 - 34 years	11	10,67%
35 - 39 years	28	27,19%
40 - 44 years	26	25,25%
45 - 49 years	8	7,77%
50 - 54 years	8	7,77%
more than 55 years	2	1,94%

Sex	Interviewed	% n=103
Female	76	73,80%
Male	27	26,20%

Weight	Interviewed	% n=103
49 - 54 Kg	7	6,79%
55 - 59 Kg	17	16,52%
60 - 64 Kg	19	18,47%
65 - 69 Kg	10	9,70%
70 - 74 Kg	14	13,59%
75 - 79 Kg	10	9,71%
80 - 84 Kg	6	5,82%
85 - 89 Kg	7	6,79%
90 - 94 Kg	5	4,85%
95 - 99 Kg	5	4,85%
more than 100 Kg	3	2,91%

**Source: Primary data (2024).*

Still relating the primary data for analysis of the researched group, the data on the time of practice, frequency of practice and average kilometers traveled per week reveal a wide diversity of experiences and practices among the amateur runners interviewed. Regarding the time of practice, it is observed that most of the interviewees are in the

initial stage of their journey as runners, with 36.89% practicing for less than a year and 26.21% between 1 and 2 years. In addition, 22.33% have between 3 and 6 years of experience, while a smaller proportion have a more prolonged practice, with only 6.80% practicing for more than ten years.

As for the frequency of practice, the data reveal that most runners are quite active, with 39.80% practicing three times a week and 28.20% practicing twice a week. In addition, 16.50% of the interviewees ran more than three times a week, indicating a significant commitment to regular physical activity (table 2).

Table 2. Time, frequency, and distance.

Practice time	**Interviewed**	**% n=103**
Less than 1 year	38	36,89%
1 - 2 years	27	26,21%
3 - 6 years	23	22,33%
6 - 9 years	8	7,77%
More than 10 years	7	6,80%
Practice Frequency	**Interviewed**	**% n=103**
1 time a week	16	15,50%
2 times a week	29	28,20%
3 times a week	41	39,80%
More than 3 times a week	17	16,50%
Average Km per week	**Interviewed**	**% n=103**
1 Km	2	1,90%
2 Km	1	1%
3 Km	2	1,90%
4 km	8	7,80%
5 Km	33	32%
More than 5 Km	57	55,30%

**Source: Primary data (2024).*

With regard to the average number of kilometers traveled per week, the results show a varied distribution. While a small portion runs shorter distances, such as 1 km (1.90%) and 2 km (1.90%), most respondents run longer distances, with 32% running 5 km, and a significant 55.30% running more than 5 km per week. These data highlight the heterogeneity of running practices among the research participants, reflecting different levels of experience, commitment, and individual goals in sports practice.

Adequate fluid intake is critical to the performance and health of athletes, whether they are professional or amateur. Dehydration, characterized by a rapid reduction in body water volume, can compromise physical performance and even individual health[10,11]. While these recommendations may vary depending on individual factors such as age, gender, physical activity level, and climate, the World Health Organization (WHO) offers general guidelines. The WHO's basic recommendation for daily water intake is around 2 to 2.5 liters per day for adults. However, it is important to note that this can vary depending on factors such as climate, physical activity, and individual health[11].

When analyzing the data obtained on the water intake of the research participants, we observed that most of the amateur runners have a healthy habit, with 53 participants (51.46%) reporting a daily intake of 2 to 2.5 liters of water. However, the number of participants who reported a lower than recommended water intake is worrying, with 7 (6.8%) consuming less than 1 liter per day and 24 (23.3%) consuming between 1 and 1.5 liters per day, we also have 14 participants (13.59%) reported consuming between 3 and 3.5 liters of water per day. On the other hand, only 5 participants (4.95%) reported consuming 4 liters or more of water per day (figure 1).

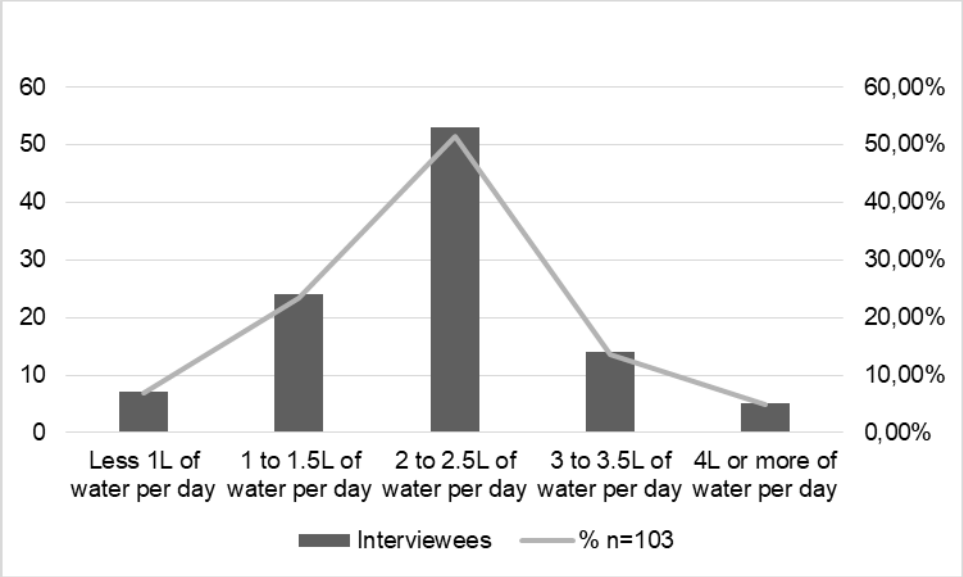

Fig. 1. Water Intake
Source: Primary data (2024).

It is important to emphasize the relationship between sweating and the need for fluid replacement during physical exercise. Sweating is an essential mechanism for cooling the body, but it also results in significant loss of water and electrolytes, especially during high-intensity activities and in high temperature conditions[12]. Failure to adequately replace these losses can lead to dehydration, which manifests itself through symptoms such as increased osmolality and sodium concentration in plasma, in addition to decreased plasma volume[11,13].

It is also necessary to talk about the importance of adequate nutrition or supplementation for the practice of physical activities, the analysis of these data reveals different approaches in relation to food and the use of supplements among the interviewees. The majority expressed a preference for a free diet (49.02%), indicating a choice for a less restrictive and more flexible diet in terms of food choices. On the other hand, a significant portion (34.31%) opts for a balanced diet, showing a concern with the variety and nutritional balance in their meals. A smaller proportion of respondents follow a specific nutritional diet (9.80%) or seek a caloric diet (6.86%), indicating more specific preferences or particular goals in relation to their diet.

Regarding the use of supplements, about 44.70% of the interviewees claim to use some type of nutritional supplement, while 55.30% report not using them. These numbers suggest a relatively even split between those who choose to supplement their diet with supplements and those who rely primarily on conventional eating to meet their nutritional needs. This diversity of dietary and supplementation approaches highlights the complexity and individuality of the dietary choices of the interviewees (table 3).

Table 3. Food and Supplements.

Type of Power Supply	Interviewed	% n=103
Balanced diet	35	34,31%
Nutritional Diet	10	9,80%
Free Feeding	50	49,02%
Caloric feeding	7	6,86%
Supplement Usage	**Interviewee**	**% n=103**
Yes	46	44,70%
No	57	55,30%

**Source: Primary data (2024).*

Appropriate intake of macronutrients and micronutrients plays a crucial role in sports performance, not only providing the necessary physiological conditions for the adaptations required by the body during sports practice, but also performing specific functions. Carbohydrates, for example, serve as essential substrates for energy production, muscle recovery, and the maintenance of blood glucose levels. Likewise, adequate protein consumption creates an anabolic environment that is conducive to tissue regeneration and repair, as well as facilitating vital enzymatic reactions. When ingested as recommended, these macronutrients promote improved sports performance, better physical recovery, and more effective protection of the central nervous system, reducing the risk of injuries and nutritional deficiencies[14].

The analysis of the participants' answers about the presence of a medical diagnosis of orthopedic injury already installed reveals a worrying panorama. Of the 103 participants in the study, 75 (72.8%) answered that they did not have a medical diagnosis of orthopedic injury. However, the other 28 participants (27.2%) reported a variety of orthopedic injuries already diagnosed, including gluteus medium tendinitis (2 participants), herniated discs (3 participants), calcaneal spurs (2 participants), among others that are described in table 4.

These data reflect the reality of the practice of street running, where the increase in the number of practitioners is associated with the growth of orthopedic injuries. In the literature, the prevalence of injuries varies considerably, reaching up to 87% in some population groups, with the lower limbs, especially the knees, being the most affected[15,16]. Factors such as excess mileage traveled weekly and abrupt modifications in the training schedule have been identified as significant influences on the occurrence of these injuries.

The literature highlights that both intrinsic and extrinsic factors are associated with the rate of injuries in road running. Intrinsic factors include age, anthropometric characteristics, and time of participation in races, while extrinsic factors include characteristics of training, clothing, hydration, and other activities performed concomitantly with running[17].

Data on orthopedic injuries related to road running provide a comprehensive overview of the challenges faced by amateur runners. Of the 103 participants in the survey, 58 (56.3%) answered that they had not suffered any running-related orthopedic injury. However, the other 45 participants (43.7%) reported a variety of orthopedic injuries resulting from the practice of this sport (table 4).

Table 4. Diagnoses of orthopedic injury and running-related orthopedic injury.

Diagnosis of installed orthopedic injury	**Interviewed**	**% n=103**
It has no lesions	75	73%
Tendonitis in the gluteus medium	2	1,94%
Herniated Disc (unspecified)	3	2,91%
Heel spur	2	1,94%
Patellofemoral syndrome	1	0,97%
Scoliosis	1	0,97%
Ligament injury	6	5,82%
Meniscus wear	3	2,91%
shin splints	1	0,97%
Adductor distension	1	0,97%
Runner syndrome	2	1,94%
Patellar chondropathy	1	0,97%
Tibia fracture	1	0,97%
Running-related orthopedic injury	**Interviewed**	**% n=103**
It has no lesions	58	56,31%
shin splints	8	7,76%
Ankle sprain	7	6,80%
Calcaneal injury	3	2,91%
Herniated Disc (unspecified)	1	0,97%
Iliotibial syndrome	2	1,94%

Tendon injury, unspecified	2	1,94%
Achilles tendon injury	3	2,91%
Plantar fasciitis	4	3,88%
Meniscus wear	1	0,97%
Runner syndrome	1	0,97%
Gluteal Injury	1	0,97%
Sciatica Injury	1	0,97%
Adductor distension	1	0,97%
Patellofemoral syndrome	1	0,97%

**Source: Primary data (2024).*

These results are in line with previous studies highlighting the significant prevalence of injuries among amateur runners. Factors such as overload on the lower limbs, especially on the knees, and the repetition of movements can contribute to the development of specific injuries, such as shin splints, ankle sprains, and iliotibial syndrome, as mentioned by several authors[15,16].

In addition, other reported injuries, such as Achilles tendon, plantar fasciitis, and meniscus wear, corroborate the findings of the literature on the most common areas affected by the practice of road running. These data highlight the importance of preventive strategies and specific care for runners, aiming to mitigate the risk of injury and promote safer and healthier sports practice.

In figure 2, we see the analysis of the factors perceived by the participants as related to their orthopedic injuries offers valuable insights into the possible determinants of these events. Of the 103 survey participants, 46 (44.7%) reported that they had not experienced injuries, while the other 57 participants (55.3%) identified different factors that they believe contributed to their injuries. Among the most common factors reported are overload, mentioned by 30 participants (29.1%), followed by lack of physical fitness, reported by 20 participants (19.4%).

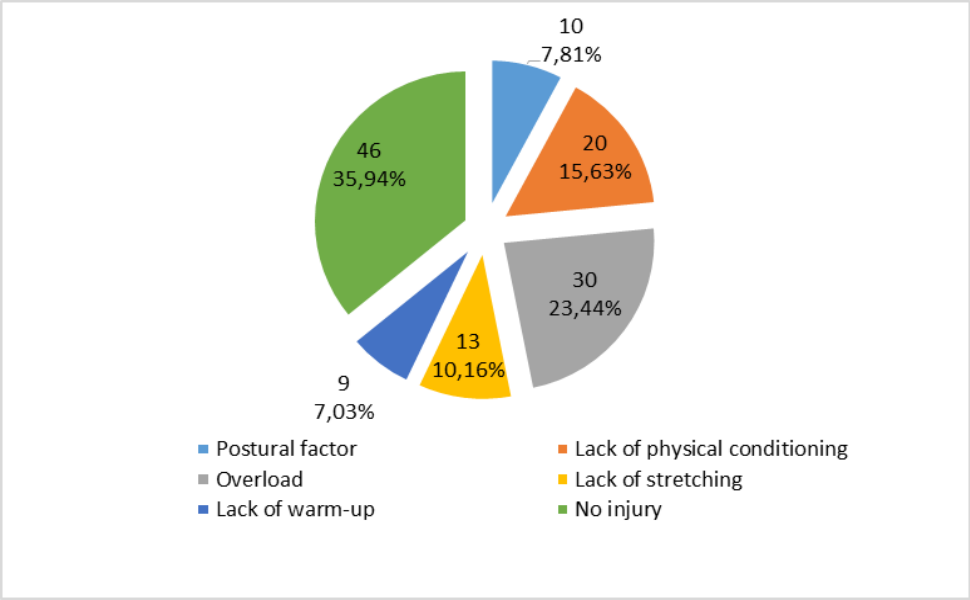

Fig. 2. Possible injury factors.
Source: Primary data (2024).

The analysis of the main places of the body where running-related injuries have occurred offers data on the areas most frequently affected by amateur runners. Of the 103 survey participants, the majority reported injuries to some part of the body, with only 42 participants (40.8%) indicating that they did not suffer running-related injuries. Among those who experienced injuries, the knees emerged as the most common site, mentioned by 34 participants (33%), followed by the anterior tibia (shin) region, with 18 participants (17.5%), and the feet, with 21 participants (20.4%) (figure 3).

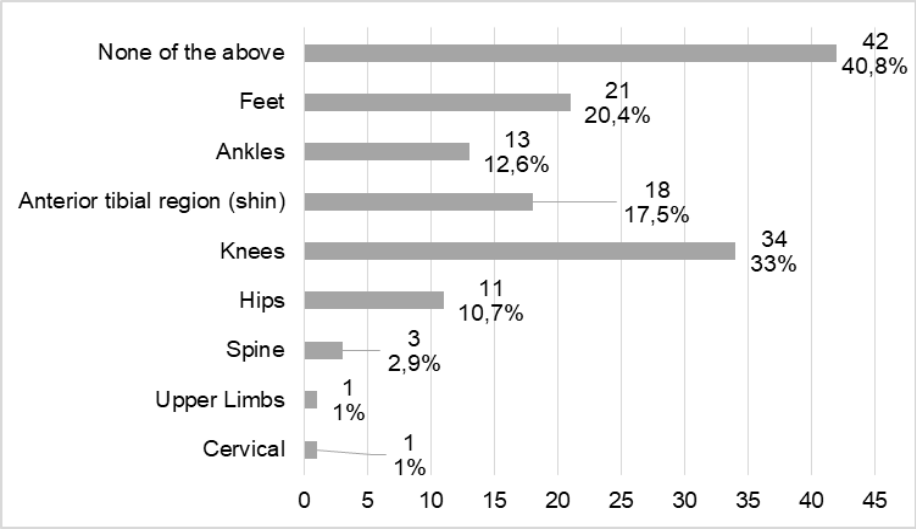

Fig. 3. Locations of major running-related injuries.
Source: Primary data (2024).

These results corroborate the existing literature, which highlights the knees as one of the area's most frequently affected by the practice of road running, along with the regions of the anterior tibia and the feet[16,18]. In addition, other areas of the body mentioned, such as the hips, ankles, and spine, are also subject to running-related injuries, highlighting the importance of a holistic approach to the prevention and treatment of these injuries[18].

Which also implies whether the runner has sought professional guidance to prevent injuries, these data reveal that the majority of respondents, 55.34%, seek professional guidance, such as physiotherapists or trainers, to prevent injuries, while a significant portion, 44.66%, do not. This suggests an awareness of the importance of receiving specialized guidance to prevent injuries resulting from sports practice or intense physical activity (figure 4).

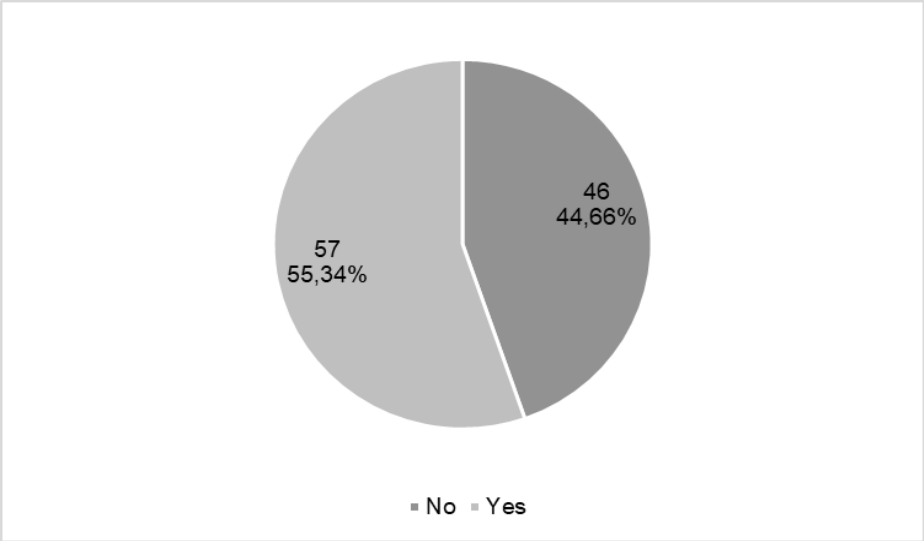

Fig. 4. Seeking Professional Guidance to Prevent Injuries.
Source: Primary data (2024).

Those who choose to seek professional guidance may be seeking specialized knowledge about training techniques, ergonomics, specific injury prevention, or rehabilitation in order to maximize their athletic performance and minimize the risk of injury. On the other hand, respondents who do not seek this guidance may rely on other sources of information or feel able to manage their physical activity without professional assistance.

These data highlight the need for specific training and care programs aimed at these areas of the body, aiming to reduce the risk of injuries and promote safer and more sustainable sports practice for amateur runners[18]. The data

reflect the complexity of orthopedic injuries in road running, where biomechanical, physical conditioning, and previous preparation factors can play a significant role in the emergence of these injuries[11,12].

Which leads us to the use of medication, the vast majority of the interviewees (77.66%) do not make frequent use of any of the drugs mentioned. This suggests that most people surveyed do not regularly require painkillers, muscle relaxants, anti-inflammatories, or opioids to deal with pain, inflammation, or other related conditions. Among those who report frequent use of drugs, muscle relaxants have the highest rate of use, with 9.70% of respondents indicating their use. Analgesics are the second most used type of drug, with 6.79% of respondents reporting their frequent use. Anti-inflammatories come next, with 7.76% of use, while opioids have the lowest rate of use, with only 0.97% of respondents making frequent use (figure 5).

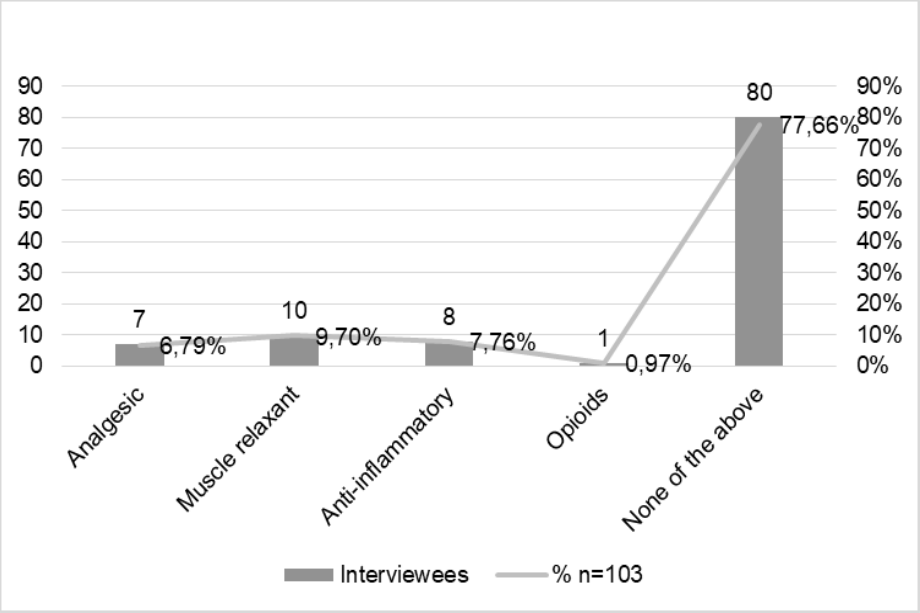

Fig. 5. Medication Use.
Source: Primary data (2024).

These data suggest that although the majority of respondents do not regularly rely on drugs to manage pain or inflammation conditions, there is still a significant portion of the population that uses these drugs. This underscores the diversity of health needs and approaches among respondents. This variety of health management approaches highlights the complexity of individual needs and the different strategies adopted to address specific health conditions. In addition, it emphasizes the importance of a personalized approach to the treatment of health conditions, taking into account the patient's preferences, the severity of the condition, and the potential side effects of medications[12,16].

In addition, other factors identified, such as lack of stretching and inadequate warm-up, corroborate the importance of pre-and post-exercise care in the prevention of musculoskeletal injuries. The results highlight the need for well-structured training programs, which include not only the physical aspect, but also awareness of warm-up techniques, stretching, and proper management of the training load. These preventative measures can help reduce the incidence of injuries and promote safer and more sustainable sports practice for amateur runners.

Analysis of the data on the rest period between runs reveals a variety of practices among the survey participants. Of the 103 interviewees, most reported adopting some rest period between their runs, and 45.6% of the participants (47 individuals) opted for a rest day. Meanwhile, 31.1% (32 individuals) prefer two days of rest, followed by 6.8% (7 individuals) who opt for three days. Notably, 14.6% (15 subjects) reported resting for more than three days, and only 1.9% (2 subjects) stated that they did not adopt any rest periods between their runs.

Regarding the frequency of the feeling of fatigue, 26.2% (27 respondents) of the participants reported feeling fatigued frequently, while the majority, 73.8% (76 respondents), stated that they did not experience this feeling regularly. These data highlight the diversity of rest practices adopted by amateur runners, as well as the prevalence of fatigue among a significant portion of these individuals. This information is relevant to understanding the recovery habits of runners and can influence injury prevention and sports performance (table 5).

Table 5. Rest between running and fatigue.

Rest period between races	Interviewed	% n=103
Someday	47	45,6%
Two days	32	31,1%
Three days	7	6,8%
More than three days	15	14,6%
No rest	2	1,9%
Fatigued frequently	**Interviewed**	**% n=103**
Yes	27	26,2%
No	76	73,8%

**Source: Primary data (2024).*

When analyzing the behaviors of amateur runners in relation to increasing pace/speed and distance during their runs, it was observed that 28.15% of participants (29 individuals) choose to do a rapid increase in pace or speed. On the other hand, a slightly larger share, corresponding to 33.01% of the total (34 participants), chooses to add distance to their runs. Surprisingly, a significant 38.83% (40 participants) stated that they did not adopt any of the options, suggesting a variety of approaches or preferences among amateur runners regarding their training and strategies during races (figure 6).

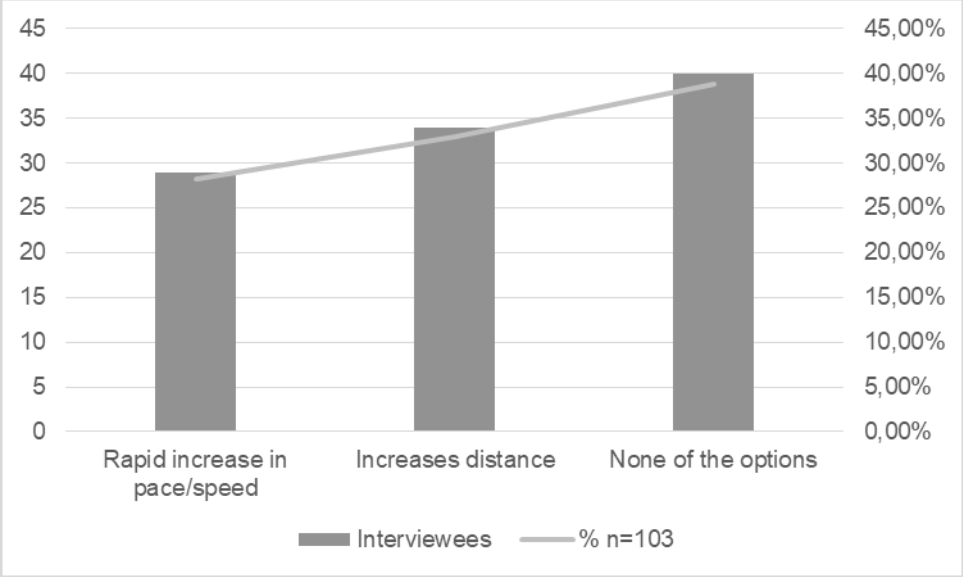

Fig. 6. Increased race pace.
Source: Primary data (2024).

These data reflect the diversity of approaches taken by amateur runners regarding pace and distance training. While a significant portion choose to quickly increase pace or speed, others prefer to add distance to their runs. Understanding these behavior patterns is key to guiding individualized training programs and promoting safer and more effective sports practice for amateur runners.

Although some studies have pointed to increased weekly training volume and running pace as potential risk factors for running-related injuries (LRC), the study revealed that there may be a direct relationship between weekly training volume and speed variables, as well as the number of previous injuries among runners[19]. According to our analyses, the progression in running intensity and volume did not show a significant association with an increase in the frequency of running-related injuries[20].

Despite the relevance of these factors, the number of studies on the subject in the literature is still limited, highlighting the need for additional research to better understand the mechanisms and risk factors involved in orthopedic injuries related to the practice of road running.

4. CONCLUSION

The findings of this study highlight the complexity of the factors influencing orthopedic injuries among amateur runners. The data reveals a diversity of training practices and experiences among participants, reflecting different individual approaches to running. Although common patterns have been identified, such as most runners practicing several times a week and covering considerable distances, the lack of a direct relationship between increased training volume and the occurrence of injuries underscores the complexity of the phenomenon.
Additionally, the variety of reported injuries and the factors associated with them emphasize the need for individualized approaches in the prevention and treatment of running-related injuries. Strategies that take into account not only training load but also fitness, posture, stretching, and warming up can play a crucial role in reducing the risk of injury and promoting safer and healthier sports practice.

By considering the individual complexities of each runner, it is possible to minimize orthopedic injuries and promote sustainable sports practice, contributing to the overall health and well-being of amateur runners.

DEFINITIONS, ACRONYMS, ABBREVIATIONS

N: number of respondents
Kg: kilograms
L: liters

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