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Injury identification: a survey of athletes with flat foot

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ABSTRACT

The study of sports injuries is one of the interesting and very important things to discuss. To avoid, limit, and manage sports injuries, instructors, coaches, and athletes must grasp this. However, not all sports practitioners are aware of this, particularly when it comes to flat foot studies. Thus, the purpose of this research was to identify injuries through a survey of athletes with flat feet. A quantitative descriptive method with a survey methodology was used in this study. The sample of this study consisted of 89 male athletes who visited massage clinics for sports injuries. Techniques for collecting data include observation, interviews, questionnaires, and measurement tests. Purposive sampling was the sampling technique used. Wet footprint tests, stature metres weight scales, and questionnaires were used in this study. The percentage formula was used to analyse the data, which was supported by the Excel application. According to a study, athletes with flat feet are more likely to suffer from knee injuries (69%), ankle injuries (31%), external violence causes (22%), internal violence (52%), and overuse (26%). It can be inferred that athletes with flat feet who visit massage clinics for sports injuries frequently suffer knee and ankle injuries, with the majority of injuries being caused by internal trauma. This research can provide sports practitioners with information and understanding to help them choose a suitable sport. Those with flat feet should then practise strengthening and balancing exercises, as well as use help and equipment to avoid damage.

Keywords: Identification; sports injuries; flat feet

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

The study of sports injuries is one of the interesting and very important things to discuss (Tikna & Pratama, 2021; Weiler et al., 2016). Coaches, instructors, and athletes must all grasp this to manage training and reduce injuries in sports (Swords, 2018; Weiler et al., 2016). According to research, knowing injury prevention is an important aspect of the structure of an exercise programme to understand the history of injury and the efforts made to overcome it (Kusuma et al., 2022; Sanusi, 2020)

Injury is defined as the result of pressure exerted on the entire body or a portion of the body that exceeds the body's ability to handle it (Magrone, 2022; Sun et al., 2023). According to prior research, injuries are produced by excessive force or energy being bestowed on the body, causing the body to be unable to endure and respond (Hasanah & ., 2019). Several studies have confirmed that injuries in sports are injuries that affect the skeletal muscle system and can also affect other systems as a result of training, matches, and post-match activities (Alexander et al., 2020; Graha, 2019)

Furthermore, the causes of injury can be divided into two groups: internal and external factors. Internal factors are those that already exist within the athlete, such as muscle weakness, specifically an imbalance of

agonist and antagonist muscle strength, lower extremity alignment, joint laxity or instability, previous injuries, muscle inflexibility, tissue weakness, biomechanical weakness, overload, lack of conditioning exercises, overweight, and psychological changes during the competition (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015).

Meanwhile, external factors such as incorrect exercise practises, training errors, or a high level of exercise, the body produces certain hormones that temporarily weaken the immune system's ability and slow the healing of injuries. These factors include training schedules and matches that are too close enough, resulting in insufficient recovery time, high levels of competition, injuries caused by cheating, hot weather that causes loss of consciousness, defective infrastructure, and environmental issues (Arnason et al., 2004; Bhardwaj, 2013; Smith, 2003).

Based on various internal and external factors that have been detailed, the subject matter of this study focuses on the skeletal or musculoskeletal system, which is supported by several parts and has a significant impact on the arch structure of the foot. Low arches, high arches, and normal arches are the three types of arch structures (Jauza, Bachtiar, Ismiyasa, 2023). Normal foot structure occurs when the foot is perpendicular to the ground on the posterior surface of the calcaneus and the height of the foot arch is within normal limits (Sunardi, Sudibjo, 2020).

High arches, also known as pes cavus, is a conditions in which the alcaneus bone is turned upside down with a high degree of arches (Sunardi, Sudibjo, 2020). Flatfoot, also known as pes planus, is a condition in which the calcaneus bone is rotated laterally and the degree of the foot arch is low or missing (Sunardi, Sudibjo, 2020).

When the body is heavy, the arches of the feet absorb shock and propel the body forward when moving (Hardi, 2017; Subhan & Graha, 2019). When the foot comes into touch with the ground, the arch of the foot supports the body's weight and acts as a shock absorber (Hardi, 2017; Subhan & Graha, 2019). As a result, the existence of this foot arch is a balance between the front and back of the foot (Rosdiana et al., 2022).

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise.

A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December. This data is illustrated more clearly in the graph below:

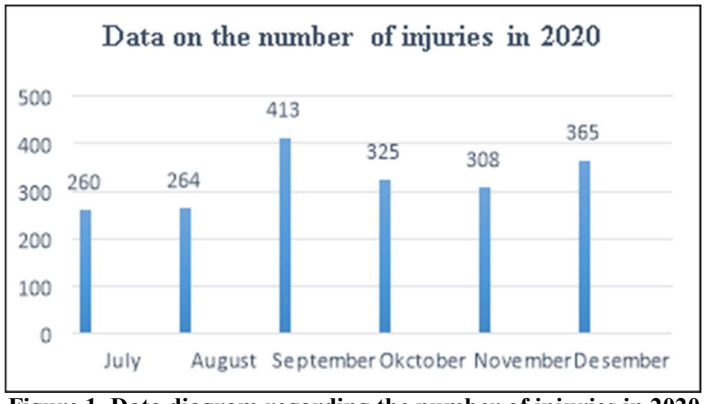

Figure 1. Data diagram regarding the number of injuries in 2020
Source: Personal documentation

Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type.

Nevertheless, there are still sports practitioners who do not grasp how the flat foot issue affects sports performance and contributes to sports injuries. Although this issue has been discussed in earlier studies, there are disparities in sample size, gender, period, and location. According to previous research, the study can be deemed to be innovative when there are distinctions in the situation, time, and location of the research (Noor, 2021). As a result of the concerns highlighted, the objective of this research is to describe by identifying sports injuries in athletes with flat feet that visit the Sports Injury Massage (MCO) clinic.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Amir et al., 2021; Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, F=frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited the sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints. Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	**Frequency**	**Percentage**
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	34	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**

Football	30	33%
Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%
Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese I sample was 16.00%, and the pre-obese sample was 31.00%. These findings point to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

Ankles	**Tissue**	**Percentage**	**Frequency**
	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%
Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration

of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016; Nisa & Jannah, 2021). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Putri, 2019; Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual's inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Mickle et al., 2006)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Dvorak et al., 2000)

It was also said that the most common extrinsic factor causing injury is a match violation, which accounts for 23% to 33% of all injuries (Dvorak et al., 2000; Peterson et al., 2000). Furthermore, a lack of training preparation, such as warm-ups and an insufficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Dvorak et al., 2000). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation

widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Zaidah, 2019). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Chang et al., 2010; Fuchsová, 2016; Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Mosca, 2010; Tashiro et al., 2015)

Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussion, the authors conclude that knee and ankle injuries are the most common injuries suffered by athletes with flat feet who visit sports injury massage clinics. According to the data gathered, the majority of the injuries incurred were caused by internal violence. As a result, this study can be used to provide practitioners, athletes, and trainers with knowledge and insight regarding the arch of the foot and injury classification. Because the anatomical structure is one of the reasons for injury, sports practitioners are encouraged to be able to select a sport that fits the anatomical structure. Exercises for balance and strength are recommended for athletes with flat feet. Athletes with flat feet can also employ equipment and technology to support performance while exercising and reduce the risk of injury.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Injury Identification: A Survey of Athletes with Flat Foot

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ABSTRACT

The study of sports injuries is one of the interesting and very important things to discuss. To avoid, limit, and manage sports injuries, instructors, coaches, and athletes must grasp this. However, not all sports practitioners are aware of this, particularly when it comes to flat foot studies. Thus, the purpose of this research was to identify injuries through a survey of athletes with flat feet. A quantitative descriptive method with a survey methodology was used in this study. The sample of this study consisted of 89 male athletes who visited massage clinics for sports injuries. Techniques for collecting data include observation, interviews, questionnaires, and measurement tests. Purposive sampling was the sampling technique used. Wet footprint tests, stature metres weight scales, and questionnaires were used in this study. The percentage formula was used to analyse the data, which was supported by the Excel application. According to a study, athletes with flat feet are more likely to suffer from knee injuries (69%), ankle injuries (31%), external violence causes (22%), internal violence (52%), and overuse (26%). It can be inferred that athletes with flat feet who visit massage clinics for sports injuries frequently suffer knee and ankle injuries, with the majority of injuries being caused by internal trauma. This research can provide sports practitioners with information and understanding to help them choose a suitable sport. Those with flat feet should then practise strengthening and balancing exercises, as well as use help and equipment to avoid damage.

Keywords: Identification; sports injuries; flat feet

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION (Font size: 12, Times New Roman, Bold)

The study of sports injuries is one of the interesting and very important things to discuss (Tikna & Pratama, 2021; Weiler et al., 2016). Coaches, instructors, and athletes must all grasp this to manage training and reduce injuries in sports (Swords, 2018; Weiler et al., 2016). According to research, knowing injury prevention is an important aspect of the structure of an exercise programme to understand the history of injury and the efforts made to overcome it (Kusuma et al., 2022; Sanusi, 2020)

Injury is defined as the result of pressure exerted on the entire body or a portion of the body that exceeds the body's ability to handle it (Magrone, 2022; Sun et al., 2023). According to prior research, injuries are produced by excessive force or energy being bestowed on the body, causing the body to be unable to endure and respond (Hasanah & ., 2019). Several studies have confirmed that injuries in sports are injuries that affect the skeletal muscle system and can also affect other systems as a result of training, matches, and post-match activities (Alexander et al., 2020; Graha, 2019)

Furthermore, the causes of injury can be divided into two groups: internal and external factors. Internal factors are those that already exist within the athlete, such as muscle weakness, specifically an imbalance of agonist and antagonist muscle strength, lower extremity alignment, joint laxity or instability, previous injuries, muscle inflexibility, tissue weakness, biomechanical weakness, overload, lack of conditioning exercises, overweight, and psychological changes during the competition (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015).

Meanwhile, external factors such as incorrect exercise practises, training errors, or a high level of exercise, the body produces certain hormones that temporarily weaken the immune system's ability and slow the healing of injuries. These factors include training schedules and matches that are too close enough, resulting in insufficient recovery time, high levels of competition, injuries caused by cheating, hot weather that causes loss of consciousness, defective infrastructure, and environmental issues (Arnason et al., 2004; Bhardwaj, 2013; Smith, 2003).

Based on various internal and external factors that have been detailed, the subject matter of this study focuses on the skeletal or musculoskeletal system, which is supported by several parts and has a significant impact on the arch structure of the foot. Low arches, high arches, and normal arches are the three types of arch structures (Jauza, Bachtiar, Ismiyasa, 2023). Normal foot structure occurs when the foot is perpendicular to the ground on the posterior surface of the calcaneus and the height of the foot arch is within normal limits (Sunardi, Sudibjo, 2020).

High arches, also known as pes cavus, is a conditions in which the alcaneus bone is turned upside down with a high degree of arches (Sunardi, Sudibjo, 2020). Flatfoot, also known as pes planus, is a condition in which the calcaneus bone is rotated laterally and the degree of the foot arch is low or missing (Sunardi, Sudibjo, 2020).

When the body is heavy, the arches of the feet absorb shock and propel the body forward when moving (Hardi, 2017; Subhan & Graha, 2019). When the foot comes into touch with the ground, the arch of the foot supports the body's weight and acts as a shock absorber (Hardi, 2017; Subhan & Graha, 2019). As a result, the existence of this foot arch is a balance between the front and back of the foot (Rosdiana et al., 2022).

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise.

A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December. This data is illustrated more clearly in the graph below:

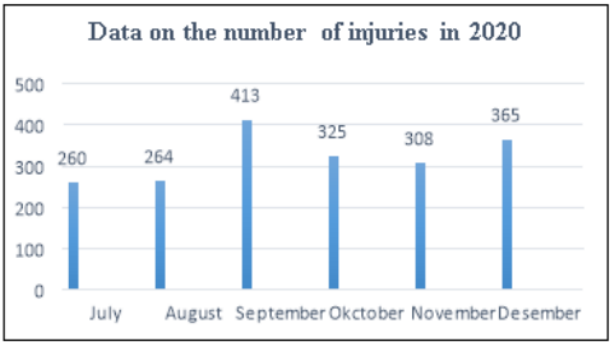

Figure 1. Data diagram regarding the number of injuries in 2020
Source: Personal documentation

Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type.

Nevertheless, there are still sports practitioners who do not grasp how the flat foot issue affects sports performance and contributes to sports injuries. Although this issue has been discussed in earlier studies, there are disparities in sample size, gender, period, and location. According to previous research, the study can be deemed to be innovative when there are distinctions in the situation, time, and location of the research (Noor, 2021). As a result of the concerns highlighted, the objective of this research is to describe by identifying sports injuries in athletes with flat feet that visit the Sports Injury Massage (MCO) clinic.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Amir et al., 2021; Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints.

Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	Frequency	Percentage
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	11	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**
Football	30	33%
Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%
Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese sample was 16.00%, and the pre-obese sample was 31.00%. These findings po to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

	Tissue	Percentage	Frequency
Ankles	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%

Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016; Nisa & Jannah, 2021). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Putri, 2019; Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Mickle et al., 2006)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Dvorak et al., 2000)

It was also said that the most common extrinsic factor causing injury is a match violation, which accounts for 23% to 33% of all injuries (Dvorak et al., 2000; Peterson et al., 2000). Furthermore, a lack of training preparation, such as warm-ups and an inefficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Dvorak et al., 2000). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Zaidah, 2019). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Chang et al., 2010; Fuchsová, 2016; Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Mosca, 2010; Tashiro et al., 2015)

Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury

massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussion, the authors conclude that knee and ankle injuries are the most common injuries suffered by athletes with flat feet who visit sports injury massage clinics. According to the data gathered, the majority of the injuries incurred were caused by internal violence. As a result, this study can be used to provide practitioners, athletes, and trainers with knowledge and insight regarding the arch of the foot and injury classification. Because the anatomical structure is one of the reasons for injury, sports practitioners are encouraged to be able to select a sport that fits the anatomical structure. Exercises for balance and strength are recommended for athletes with flat feet. Athletes with flat feet can also employ equipment and technology to support performance while exercising and reduce the risk of injury.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Injury identification: a survey of athletes with flat foot

Anonymous

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ABSTRACT

The study of sports injuries is one of the interesting and very important things to discuss. To avoid, limit, and manage sports injuries, instructors, coaches, and athletes must grasp this. However, not all sports practitioners are aware of this, particularly when it comes to flat foot studies. Thus, the purpose of this research was to identify injuries through a survey of athletes with flat feet. A quantitative descriptive method with a survey methodology was used in this study. The sample of this study consisted of 89 male athletes who visited massage clinics for sports injuries. Techniques for collecting data include observation, interviews, questionnaires, and measurement tests. Purposive sampling was the sampling technique used. Wet footprint tests, stature metres weight scales, and questionnaires were used in this study. The percentage formula was used to analyse the data, which was supported by the Excel application. According to a study, athletes with flat feet are more likely to suffer from knee injuries (69%), ankle injuries (31%), external violence causes (22%), internal violence (52%), and overuse (26%). It can be inferred that athletes with flat feet who visit massage clinics for sports injuries frequently suffer knee and ankle injuries, with the majority of injuries being caused by internal trauma. This research can provide sports practitioners with information and understanding to help them choose a suitable sport. Those with flat feet should then practise strengthening and balancing exercises, as well as use help and equipment to avoid damage.

Keywords: Identification; sports injuries; flat feet

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

The study of sports injuries is one of the interesting and very important things to discuss (Tikna & Pratama, 2021; Weiler et al., 2016). Coaches, instructors, and athletes must all grasp this to manage training and reduce injuries in sports (Swords, 2018; Weiler et al., 2016). According to research, knowing injury prevention is an important aspect of the structure of an exercise programme to understand the history of injury and the efforts made to overcome it (Kusuma et al., 2022; Sanusi, 2020)

Injury is defined as the result of pressure exerted on the entire body or a portion of the body that exceeds the body's ability to handle it (Magrone, 2022; Sun et al., 2023). ~~According to prior research,~~ Injuries are produced by excessive force or energy being bestowed on the body, causing the body to be unable to endure and respond (Hasanah & ., 2019). Several studies have confirmed that injuries in sports are injuries that affect the skeletal muscle system and can also affect other systems as a result of training, matches, and post-match activities (Alexander et al., 2020; Graha, 2019)

Furthermore, the causes of injury can be divided into two groups: internal and external factors. Internal factors are those that already exist within the athlete, such as muscle weakness, specifically an imbalance of

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Prevalence and Characteristics of Sports Injuries in Athletes with Flat Feet: A Quantitative Descriptive Study

Identifying Risk Factors for Sports Injuries in Athletes with Flat Feet: A Cross-sectional Study

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agonist and antagonist muscle strength, lower extremity alignment, joint laxity or instability, previous injuries, muscle inflexibility, tissue weakness, biomechanical weakness, overload, lack of conditioning exercises, overweight, and psychological changes during the competition (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015).

Meanwhile, external factors such as incorrect exercise practises, training errors, or a high level of exercise, the body produces certain hormones that temporarily weaken the immune system's ability and slow the healing of injuries. These factors include training schedules and matches that are too close enough, resulting in insufficient recovery time, high levels of competition, injuries caused by cheating, hot weather that causes loss of consciousness, defective infrastructure, and environmental issues ~~(Arnason et al., 2004~~; Bhardwaj, 2013; ~~Smith, 2003)~~.

Based on various internal and external factors that have been detailed, the subject matter of this study focuses on the skeletal or musculoskeletal system, which is supported by several parts and has a significant impact on the arch structure of the foot. Low arches, high arches, and normal arches are the three types of arch structures (Jauza, Bachtiar, Ismiyasa, 2023). Normal foot structure occurs when the foot is perpendicular to the ground on the posterior surface of the calcaneus and the height of the foot arch is within normal limits (Sunardi, Sudibjo, 2020).

High arches, also known as pes cavus, is a conditions in which the alcaneus bone is turned upside down with a high degree of arches (Sunardi, Sudibjo, 2020). Flatfoot, also known as pes planus, is a condition in which the calcaneus bone is rotated laterally and the degree of the foot arch is low or missing (Sunardi, Sudibjo, 2020).

When the body is heavy, the arches of the feet absorb shock and propel the body forward when moving (Hardi, 2017; Subhan & Graha, 2019). When the foot comes into touch with the ground, the arch of the foot supports the body's weight and acts as a shock absorber (Hardi, 2017; Subhan & Graha, 2019). As a result, the existence of this foot arch is a balance between the front and back of the foot (Rosdiana et al., 2022).

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise.

A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December. This data is illustrated more clearly in the graph below:

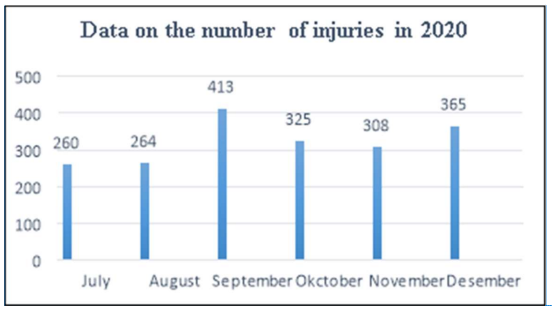

Figure 1. Data diagram regarding the number of injuries in 2020
Source: Personal documentation

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Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type.

Nevertheless, there are still sports practitioners who do not grasp how the flat foot issue affects sports performance and contributes to sports injuries. Although this issue has been discussed in earlier studies, there are disparities in sample size, gender, period, and location. According to previous research, the study can be deemed to be innovative when there are distinctions in the situation, time, and location of the research (Noor, 2021). As a result of the concerns highlighted, the objective of this research is to describe by identifying sports injuries in athletes with flat feet that visit the Sports Injury Massage (MCO) clinic.

Dikomentari [A7]: This problem should also be supported with references to journal articles.

Dikomentari [A8]: Although some relevant research has been described, the novelty and urgency of this research are still not strong enough.

This relevant research is still lacking, so please look for some relevant research as a comparison for this research.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Amir et al., 2021; Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, F=frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited the sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints. Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	Frequency	Percentage
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	34	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**

Football	30	33%
Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%
Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese I sample was 16.00%, and the pre-obese sample was 31.00%. These findings point to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

Ankles	**Tissue**	**Percentage**	**Frequency**
	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%
Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration

of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016; Nisa & Jannah, 2021). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Putri, 2019; Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual's inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Mickle et al., 2006)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Dvorak et al., 2000)

It was also said that the most common extrinsic factor causing injury is a match violation, which accounts for 23% to 33% of all injuries (Dvorak et al., 2000; Peterson et al., 2000). Furthermore, a lack of training preparation, such as warm-ups and an insufficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Dvorak et al., 2000). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation

widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Zaidah, 2019). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Chang et al., 2010; Fuchsová, 2016; Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Mosca, 2010; Tashiro et al., 2015)

Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussion, the authors conclude that knee and ankle injuries are the most common injuries suffered by athletes with flat feet who visit sports injury massage clinics. According to the data gathered, the majority of the injuries incurred were caused by internal violence. As a result, this study can be used to provide practitioners, athletes, and trainers with knowledge and insight regarding the arch of the foot and injury classification. Because the anatomical structure is one of the reasons for injury, sports practitioners are encouraged to be able to select a sport that fits the anatomical structure. Exercises for balance and strength are recommended for athletes with flat feet. Athletes with flat feet can also employ equipment and technology to support performance while exercising and reduce the risk of injury.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Dikomentari [A9]: State the limitation of research. For instance:
(Lack of sample and location, analysis that used need to be improved). Because this limitation can be the next research for the researcher or others.

Dikomentari [A10]: Many of your references are not clear. Improve the way you write your references.

Each reference from a journal article consists of the journal name, volume, number, page, and DOI.

Minimum 30 references (last ten years)

80% International Journal
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Sources taken from journal articles must have a DOI.

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Notifications ×

[JSA] Editor Decision

2023-05-08 02:18 PM

Arif Setiawan, dewangga yudhistira:

We have reached a decision regarding your submission to Journal Sport Area, "Injury Identification: A Survey of Athletes with Flat foot".

Our decision is: Revisions Required

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Journal Sport Area

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Prevalence and Characteristics of Sports Injuries in Athletes with Flat Feet: A Quantative Descriptive Study

Anonymous

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ABSTRACT

The study of sports injuries is one of the interesting and very important things to discuss. To avoid, limit, and manage sports injuries, instructors, coaches, and athletes must grasp this. However, not all sports practitioners are aware of this, particularly when it comes to flat foot studies. Thus, the purpose of this research was to identify injuries through a survey of athletes with flat feet. A quantitative descriptive method with a survey methodology was used in this study. The sample of this study consisted of 89 male athletes who visited massage clinics for sports injuries. Techniques for collecting data include observation, interviews, questionnaires, and measurement tests. Purposive sampling was the sampling technique used. Wet footprint tests, stature metres weight scales, and questionnaires were used in this study. The percentage formula was used to analyse the data, which was supported by the Excel application. According to a study, athletes with flat feet are more likely to suffer from knee injuries (69%), ankle injuries (31%), external violence causes (22%), internal violence (52%), and overuse (26%). It can be inferred that athletes with flat feet who visit massage clinics for sports injuries frequently suffer knee and ankle injuries, with the majority of injuries being caused by internal trauma. The contribution of this study provides a specific understanding of injury identification through flat foot sufferers so that individuals can choose appropriate sports. The limitations of this study survey are only one place, the number of sports has not been evenly distributed, the sample is only men. Further research is needed more complex methods, even distribution of samples and sports so that the resulting data can be generalized properly.

Keywords: Identification; sports injuries; flat feet

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

The study of sports injuries is one of the interesting and very important things to discuss (Weiler et al., 2016). Coaches, instructors, and athletes must all grasp this to manage training and reduce injuries in sports (Swords, 2018; Weiler et al., 2016). According to research, knowing injury prevention is an important aspect of the structure of an exercise programme to understand the history of injury and the efforts made to overcome it (Sanusi, 2020)

Injury is defined as the result of pressure exerted on the entire body or a portion of the body that exceeds the body's ability to handle it (Magrone, 2022; Sun et al., 2023). Injuries are produced by excessive force or energy being bestowed on the body, causing the body to be unable to endure and respond (Hasanah & ., 2019). Several studies have confirmed that injuries in sports are injuries that affect the skeletal muscle system and

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can also affect other systems as a result of training, matches, and post-match activities (Alexander et al., 2020; Graha, 2019)

Furthermore, the causes of injury can be divided into two groups: internal and external factors. Internal factors are those that already exist within the athlete, such as muscle weakness, specifically an imbalance of agonist and antagonist muscle strength, lower extremity alignment, joint laxity or instability, previous injuries, muscle inflexibility, tissue weakness, biomechanical weakness, overload, lack of conditioning exercises, overweight, and psychological changes during the competition (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015).

Meanwhile, external factors such as incorrect exercise practises, training errors, or a high level of exercise, the body produces certain hormones that temporarily weaken the immune system's ability and slow the healing of injuries. These factors include training schedules and matches that are too close enough, resulting in insufficient recovery time, high levels of competition, injuries caused by cheating, hot weather that causes loss of consciousness, defective infrastructure, and environmental issues (Bhardwaj, 2013; Ciesla, 2016; Southwick & Crupi, 2017).

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Based on various internal and external factors that have been detailed, the subject matter of this study focuses on the skeletal or musculoskeletal system, which is supported by several parts and has a significant impact on the arch structure of the foot. Low arches, high arches, and normal arches are the three types of arch structures (Jauza, Bachtiar, Ismiyasa, 2023). Normal foot structure occurs when the foot is perpendicular to the ground on the posterior surface of the calcaneus and the height of the foot arch is within normal limits (Sunardi et al., 2020). High arches, also known as pes cavus, is a conditions in which the alcaneus bone is turned upside down with a high degree of arches (Sunardi et al., 2020). Flatfoot, also known as pes planus, is a condition in which the calcaneus bone is rotated laterally and the degree of the foot arch is low or missing (Sunardi et al., 2020).

When the body is heavy, the arches of the feet absorb shock and propel the body forward when moving (Graha, 2019). When the foot comes into touch with the ground, the arch of the foot supports the body's weight and acts as a shock absorber (Subhan & Graha, 2019). As a result, the existence of this foot arch is a balance between the front and back of the foot (Rosdiana et al., 2022).

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise. A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December.

Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type.

In addition, there are still sports practitioners who do not understand that flat feet factors can affect sports performance and are factors that contribute to injuries in sports. In line with previous studies, only 18.5% were able to identify the morphology of the medial longitudinal arch, the rest could not identify it and were still misdiagnosed (Ramírez, 2022). Recently found studies on the identification and prevalence of flat feet in college students, with the results that age, body mass index, type of shoe, and nationality influence the occurrence of flat feet (Vashisth et al., 2023). However, the study focused on university students, not sportsmen and sports specifically.

Experimental studies with special programs for athletes with flat feet with result gave positive effects (Javidi Mostaghni et al., 2022). However, when sports practitioners do not understand well related to the identification of injuries in flat feet sufferers, exercise programs cannot be compiled and implemented correctly. Studies specifically related to the prevalence and identification of injuries in athletes with flat feet are still needed. Ramires said this opened wide for future research to focus on injuries caused by misalignment of the feet (Ramírez, 2022). The purpose of this study was to determine the prevalence and characteristics of sports injuries in athletes with flat feet with quantitative descriptive studies.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, F=frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited the sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints. Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	Frequency	Percentage
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	34	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**
Football	30	33%
Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%

Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese I sample was 16.00%, and the pre-obese sample was 31.00%. These findings point to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

Ankles	**Tissue**	**Percentage**	**Frequency**
	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%
Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the

ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual's inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Mickle et al., 2006)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Dvorak et al., 2000)

It was also said that the most common extrinsic factor causing injury is a match violation, which accounts for 23% to 33% of all injuries (Dvorak et al., 2000; Peterson et al., 2000). Furthermore, a lack of training preparation, such as warm-ups and an insufficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Dvorak et al., 2000). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Utami & Syafri, 2021). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Chang et al., 2010; Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Mosca, 2010; Tashiro et al., 2015)

Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussion, the authors conclude that knee and ankle injuries are the most common injuries suffered by athletes with flat feet who visit sports injury massage clinics. According to the data gathered, the majority of the injuries incurred were caused by internal violence. As a result, this study can be used to provide practitioners, athletes, and trainers with knowledge and insight regarding the arch of the foot and injury classification. Because the anatomical structure is one of the reasons for injury, sports practitioners are encouraged to be able to select a sport that fits the anatomical structure. Exercises for balance and strength are recommended for athletes with flat feet. Athletes with flat feet can also employ equipment and technology to support performance while exercising and reduce the risk of injury. However, in this study there are still limitations, namely the sample is still minimal, men and women have not been categorized, data is taken only at one research location, data analysis is only limited to describing based on percentages. Hope that further research can be an improvement on this research

Dikomentari [A3]: State the limitation of research. For instance:
(Lack of sample and location, analysis that used need to be improved). Because this limitation can be the next research for the researcher or others.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Dikomentari [A4]: Many of your references are not clear. Improve the way you write your references.

Each reference from a journal article consists of the journal name, volume, number, page, and DOI.

Minimum 30 references (last ten years)

80% International Journal
20% National Journal

Sources taken from journal articles must have a DOI.

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Notifications ×

[JSA] Editor Decision

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Arif Setiawan, dewangga yudhistira:

We have reached a decision regarding your submission to Journal Sport Area, "Injury Identification: A Survey of Athletes with Flat foot".

Our decision is: Revisions Required

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Prevalence and characteristics of sports injuries in athletes with flat feet: A quantative descriptive study

Anonymous

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ABSTRACT

The study of sports injuries is a crucial and captivating topic that requires thorough exploration. Understanding and effectively managing sports injuries is essential for coaches, instructors, and athletes. However, there is limited awareness among sports practitioners, particularly regarding flat foot conditions. Therefore, this research aims to identify common injuries among athletes with flat feet through a comprehensive survey. Employing a quantitative descriptive method with a survey-based approach, this study included a sample of 89 male athletes who sought treatment for sports-related injuries at massage clinics. Data collection techniques encompassed observations, interviews, questionnaires, and measurement tests. Purposive sampling was utilised for participant selection. Wet footprint tests, stature metres, weight scales, and questionnaires were employed for data collection. Data analysis employed the percentage formula and was supported by Excel software. The findings indicate that athletes with flat feet are more susceptible to knee injuries (69%), ankle injuries (31%), external causes of injury (22%), internal causes of injury (52%), and overuse injuries (26%). These results imply that athletes with flat feet who seek treatment at massage clinics commonly experience knee and ankle injuries, with internal trauma being the leading cause. This study contributes to a better understanding of injury identification among individuals with flat feet, aiding in the selection of appropriate sports activities. Limitations of this study include a single research site, an uneven distribution of sports disciplines, and a male-only sample. Future research should employ more comprehensive methods and ensure representative samples across various sports to facilitate proper generalisation of the data.

Keywords: Identification; sports injuries; flat feet

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Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

The study of sports injuries holds significant importance and is an intriguing topic for discussion (Weiler et al., 2016). It is crucial for coaches, instructors, and athletes to have a comprehensive understanding of this subject in order to effectively manage training programmes and minimise the occurrence of injuries in sports (Swords, 2018; Weiler et al., 2016). Research has shown that incorporating injury prevention strategies into the design of exercise programmes is paramount to comprehending the injury history and implementing appropriate measures to mitigate such incidents (Sanusi, 2020). Furthermore, a thorough understanding of

sports injuries helps foster a safe and conducive training environment, thereby optimising athletes' performance and well-being

Injuries are defined as the outcome of external forces exerted on the body or specific body parts, surpassing the body's capacity to withstand and respond to such forces (Magrone, 2022; Sun et al., 2023). Excessive force or energy imposed on the body leads to injuries, overwhelming its ability to cope and adapt (Hasanah & ., 2019). Numerous studies have corroborated that sports injuries primarily affect the musculoskeletal system and can also impact other physiological systems due to the demands of training, competitive matches, and post-match activities (Alexander et al., 2020; Graha, 2019). Understanding the nature and mechanisms of sports injuries is essential for developing effective injury prevention strategies and optimizing athletes' overall health and performance

The cause of injury is two factors, namely internal and external factors. Internal factors such as muscle weakness, imbalance of agonist and antagonist muscle strength, extreme alignment of joint weakness and instability, inflexible muscles, tissue weakness, biomechanical weakness, overweight, lack of conditioning exercises, and psychological changes during the game (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015). External factors include errors in training, high levels of exercise, training schedules and matches that are too close so that recovery is not optimal, injuries due to cheating, hot weather that causes awareness, damaged infrastructure, and environmental problems (Bhardwaj, 2013; Ciesla, 2016; Southwick & Crupi, 2017)

Based on the detailed examination of various internal and external factors, this study specifically focuses on the skeletal or musculoskeletal system, which plays a crucial role in the structure of the foot arch. The foot arch can be categorised into three types: low arches, high arches, and normal arches (Jauza, Bachtiar, Ismiyasa, 2023). A normal foot structure is characterised by the foot being perpendicular to the ground on the posterior surface of the calcaneus, with the arch height falling within the normal range (Sunardi et al., 2020). High arches, also known as pes cavus, occur when the calcaneus bone is inverted, resulting in a pronounced arch (Sunardi et al., 2020). Conversely, a flat foot, also known as pes planus, is characterised by the lateral rotation of the calcaneus bone and a low or absent foot arch (Sunardi et al., 2020)

In addition, when an analysis is carried out that the foot arch is useful for reducing shock and balancing the body (Subhan & Graha, 2019). In line with other studies that when the feet come into contact with the ground, the bend of the foot supports body weight and functions as a shock absorber (Subhan & Graha, 2019). Therefore, the arch of the foot becomes a balance between the front foot and the back foot (Rosdiana et al., 2022). So that doing analysis of the structure of the foot becomes important for prevention for individuals or sportsmen

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise (Subhan & Graha, 2019). A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December.

Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type. In addition, sports practitioners must understand that foot arch factors can affect performance and are a cause of injury in sports (Pan et al., 2023).

Many studies have examined the prevalence and characteristics of flat feet, such as Ramirez's study, which examined the level of understanding to identify the morphology of the medial longitudinal arch, with the

results that 18.5% of individuals were able to identify, the rest could not identify and misdiagnose (Ramírez, 2022). Recently also found a study on the identification and prevalence of flat feet in college students with the results that age, body mass index, type of shoes, and nationality influence the occurrence of flat feet (Vashisth et al., 2023). Another relevant study states that the identification of flat feet is necessary to develop an appropriate program for athletes (Javidi Mostaghni et al., 2022).

These studies focus in part on one sport and university students only. Although many studies have conducted research related to the prevalence and characteristics of flat feet. While complex identification in terms of age, body mass index, sports, and martial arts, injury history and duration, as well as internal and external factors, have received less attention in previous studies. In this context, this research plays a role in filling the gap in previous research. Therefore, the purpose of this study is to determine the prevalence and characteristics of sports injuries in flat-footed athletes with quantitative studies.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, F=frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited the sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints. Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	Frequency	Percentage
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	34	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**
Football	30	33%

Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%
Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese I sample was 16.00%, and the pre-obese sample was 31.00%. These findings point to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

Ankles	**Tissue**	**Percentage**	**Frequency**
	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%
Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration

of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual's inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Pourghasem et al., 2016)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Renshaw & Goodwin, 2016; Theisen et al., 2014).

Dijelaskan juga bahwa faktor ekstrinsik yang menyebabkan cedera adalah pelanggaran dipertandingan (Samia et al., 2021). Furthermore, a lack of training preparation, such as warm-ups and an insufficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Whyte et al., 2018). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal

joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Utami & Syafri, 2021). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Tashiro et al., 2015). Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussions presented, it can be concluded that knee and ankle injuries are the most prevalent among athletes with flat feet who seek treatment at sports injury massage clinics. The data collected indicates that the majority of these injuries are attributed to internal factors. Consequently, this study holds valuable insights that can benefit practitioners, athletes, and trainers in understanding foot arches and injury classification. Considering that anatomical structure contributes to injury occurrence, sports practitioners are encouraged to select sports that align with their specific anatomical structure. Additionally, athletes with flat feet are advised to engage in exercises that enhance balance and strength. Furthermore, the utilization of appropriate equipment and technology can aid performance and reduce the risk of injury for athletes with flat feet. However, it is important to acknowledge the limitations of this study, including the limited sample size, the absence of gender categorization, data collection from a single research location, and the restriction of data analysis solely to percentage descriptions. Further research is needed to address these limitations and enhance the findings of this study.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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Notifications ×

[JSA] Editor Decision

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Arif Setiawan, dewangga yudhistira:

We have reached a decision regarding your submission to Journal Sport Area, "Injury Identification: A Survey of Athletes with Flat foot".

Our decision is to: Accept Submission

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Journal Sport Area

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[JSA] Editor Decision

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The editing of your submission, "Injury Identification: A Survey of Athletes with Flat foot," is complete. We are now sending it to production.

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Prevalence and characteristics of sports injuries in athletes with flat feet: A quantative descriptive study

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ABSTRACT

The study of sports injuries is a crucial and captivating topic that requires thorough exploration. Understanding and effectively managing sports injuries is essential for coaches, instructors, and athletes. However, there is limited awareness among sports practitioners, particularly regarding flat foot conditions. Therefore, this research aims to identify common injuries among athletes with flat feet through a comprehensive survey. Employing a quantitative descriptive method with a survey-based approach, this study included a sample of 89 male athletes who sought treatment for sports-related injuries at massage clinics. Data collection techniques encompassed observations, interviews, questionnaires, and measurement tests. Purposive sampling was utilised for participant selection. Wet footprint tests, stature metres, weight scales, and questionnaires were employed for data collection. Data analysis employed the percentage formula and was supported by Excel software. The findings indicate that athletes with flat feet are more susceptible to knee injuries (69%), ankle injuries (31%), external causes of injury (22%), internal causes of injury (52%), and overuse injuries (26%). These results imply that athletes with flat feet who seek treatment at massage clinics commonly experience knee and ankle injuries, with internal trauma being the leading cause. This study contributes to a better understanding of injury identification among individuals with flat feet, aiding in the selection of appropriate sports activities. Limitations of this study include a single research site, an uneven distribution of sports disciplines, and a male-only sample. Future research should employ more comprehensive methods and ensure representative samples across various sports to facilitate proper generalisation of the data.

Keywords: Identification; sports injuries; flat feet

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INTRODUCTION

The study of sports injuries holds significant importance and is an intriguing topic for discussion (Weiler et al., 2016). It is crucial for coaches, instructors, and athletes to have a comprehensive understanding of this subject in order to effectively manage training programmes and minimise the occurrence of injuries in sports (Swords, 2018; Weiler et al., 2016). Research has shown that incorporating injury prevention strategies into

the design of exercise programmes is paramount to comprehending the injury history and implementing appropriate measures to mitigate such incidents (Sanusi, 2020). Furthermore, a thorough understanding of sports injuries helps foster a safe and conducive training environment, thereby optimising athletes' performance and well-being

Injuries are defined as the outcome of external forces exerted on the body or specific body parts, surpassing the body's capacity to withstand and respond to such forces (Magrone, 2022; Sun et al., 2023). Excessive force or energy imposed on the body leads to injuries, overwhelming its ability to cope and adapt (Hasanah & ., 2019). Numerous studies have corroborated that sports injuries primarily affect the musculoskeletal system and can also impact other physiological systems due to the demands of training, competitive matches, and post-match activities (Alexander et al., 2020; Graha, 2019). Understanding the nature and mechanisms of sports injuries is essential for developing effective injury prevention strategies and optimizing athletes' overall health and performance

The cause of injury is two factors, namely internal and external factors. Internal factors such as muscle weakness, imbalance of agonist and antagonist muscle strength, extreme alignment of joint weakness and instability, inflexible muscles, tissue weakness, biomechanical weakness, overweight, lack of conditioning exercises, and psychological changes during the game (Haddara et al., 2020; Handayani, 2019; Poppler & Moran, 2020; Wang et al., 2015). External factors include errors in training, high levels of exercise, training schedules and matches that are too close so that recovery is not optimal, injuries due to cheating, hot weather that causes awareness, damaged infrastructure, and environmental problems (Bhardwaj, 2013; Ciesla, 2016; Southwick & Crupi, 2017)

Based on the detailed examination of various internal and external factors, this study specifically focuses on the skeletal or musculoskeletal system, which plays a crucial role in the structure of the foot arch. The foot arch can be categorised into three types: low arches, high arches, and normal arches (Jauza, Bachtiar, Ismiyasa, 2023). A normal foot structure is characterised by the foot being perpendicular to the ground on the posterior surface of the calcaneus, with the arch height falling within the normal range (Sunardi et al., 2020). High arches, also known as pes cavus, occur when the calcaneus bone is inverted, resulting in a pronounced arch (Sunardi et al., 2020). Conversely, a flat foot, also known as pes planus, is characterised by the lateral rotation of the calcaneus bone and a low or absent foot arch (Sunardi et al., 2020)

In addition, when an analysis is carried out that the foot arch is useful for reducing shock and balancing the body (Subhan & Graha, 2019). In line with other studies that when the feet come into contact with the ground, the bend of the foot supports body weight and functions as a shock absorber (Subhan & Graha, 2019). Therefore, the arch of the foot becomes a balance between the front foot and the back foot (Rosdiana et al., 2022). So that doing analysis of the structure of the foot becomes important for prevention for individuals or sportsmen

Furthermore, the presence of the arch impacts a person's mobility to be faster and more agile when moving from one location to another, because the arch serves to reduce the athlete's shock when performing activities that rely on physical characteristics as the primary aspect (Imam et al., 2021). According to the studies, the arches of the soles of the feet serve as stability, mobility, and damping when athletes and individuals perform regular movement activities and exercise (Subhan & Graha, 2019). A survey done at a sports injury massage clinic (MCO) found that there were 260 cases in July, 264 cases in August, 413 cases in September, 325 cases in October, 308 cases in November, and 365 cases in December 2020. Based on these data, we can conclude that the number of people injured each month is increasing, particularly in September and December.

Based on the data analysis, the authors investigated the factors that lead to injuries experienced by athletes, including internal factors such as questioning the source of the injury, the length of the injury, and the sport involved. Internal factors such as specific foot arch form features such as flat feet, on the other hand, are still lacking in analysis. According to the authors' observations at the Sports Injury Massage (MCO) clinic, there are still sports practitioners who do not grasp the technique for determining the kind of arch of the foot, particularly the flat foot type. In addition, sports practitioners must understand that foot arch factors can affect performance and are a cause of injury in sports (Pan et al., 2023).

Many studies have examined the prevalence and characteristics of flat feet, such as Ramirez's study, which examined the level of understanding to identify the morphology of the medial longitudinal arch, with the results that 18.5% of individuals were able to identify, the rest could not identify and misdiagnose (Ramírez, 2022). Recently also found a study on the identification and prevalence of flat feet in college students with the results that age, body mass index, type of shoes, and nationality influence the occurrence of flat feet (Vashisth et al., 2023). Another relevant study states that the identification of flat feet is necessary to develop an appropriate program for athletes (Javidi Mostaghni et al., 2022).

These studies focus in part on one sport and university students only. Although many studies have conducted research related to the prevalence and characteristics of flat feet. While complex identification in terms of age, body mass index, sports, and martial arts, injury history and duration, as well as internal and external factors, have received less attention in previous studies. In this context, this research plays a role in filling the gap in previous research. Therefore, the purpose of this study is to determine the prevalence and characteristics of sports injuries in flat-footed athletes with quantitative studies.

METHOD

The authors utilised a quantitative descriptive research method with a survey approach to generate conclusions from this research (Akhiruyanto et al., 2022; Hafidz et al., 2021). Purposive sampling was utilised in this study, which found a sample of 89 participants who met the criterion for flat feet, aged 15-44 years, male and female. The sampling was conducted from April to May 2021. Interviews and questionnaires were used to obtain data. The instruments in this study were wet footprint tests, stature meter weight scales and questionnaire sheets (Antara et al., 2017). The data analysis technique uses percentage analysis with the formula P=F/N 100%, P=percentage sought, F=frequency, N=number of respondents, data analysis is assisted using the Excel application (Akhiruyanto et al., 2022; Simanjuntak et al., 2022; Yudhistira et al., 2023)

RESULTS AND DISCUSSION

The study, which took place in April-May 2021, aimed to identify sports injuries in athletes who visited the sports injury massage clinic (MCO). Identification based on the following parameters is reported in this study: (1) age, (2) body mass index, (3) sports involved, (4) identification of ankle and knee injuries, (5) classification of injuries based on causative factors, and (6) duration of the injury. The research subjects in this study were athletes who had ankle and knee injuries. When ankle and knee injuries are looked at more closely, there is a classification of the tissue that has an impact on the injury to the ankle and knee joints. Aside from that, to do further study, the authors analysed the injury in terms of the primary causes and the length of the injury. The followings are the results and discussion data:

Table 1. Identification of Age Categories, BMI and Sports Branches

Age	**Frequency**	**Percentage**
15-19 years old	6	7%
20-24 years old	24	27%
25-29 years old	24	27%
30-34 years old	16	18%
35-39 years old	11	12%
40-44 years old	8	9%
Category	**Frequency**	**Percentage**
Thin	3	3%
Normal	51	46%
Pre-obesity	34	31%
class I obesity	19	16%
Class II obesity	3	3%
Class III obesity	0	0%
Sports Branches	**Frequency**	**Percentage**

Football	30	33%
Futsal	18	20%
Volleyball	14	16%
Badminton	8	10%
Basketball	5	6%
Running sport	6	7%
Bicycle sport	3	3%
Martial Sports Branch	2	2%
Bowling	1	1%
Free diving	1	1%
Court tennis	1	1%

According to the findings presented above, the most injured sample is 20-24 years old (27%), 25-29 years old (27%), and 35-39 years old (18%). These data confirm that the dominating age group that is injured is 20-29 years old. Based on the data, the obese II sample was 3.37%, the obese I sample was 16.00%, and the pre-obese sample was 31.00%. These findings point to a particular concern, that the higher the fat in the body is one determinant in the likelihood of injury. The results above show that football had the highest percentage of injuries (33%), futsal had 20%, volleyball 16%, and badminton 10%. It should also be noted that sports that rely on physical contact are inherently dangerous.

Table 2. Results of Analysis of Ankle, Knee Injury, Causal Factors and Duration of Injury

Ankles	**Tissue**	**Percentage**	**Frequency**
	Ligament	15	54%
	Muscle	13	48%
	Tendons	0	0%
	Bone	0	0%
Knee	**Tissue**	**Frequency**	**Percentage**
	Ligament	48	79%
	Muscle	13	21%
	Tendons	0	0%
	Bone	0	0%
Causative factor	**Tissue**	**Frequency**	**Percentage**
	External Violence	20	22%
	Internal Violence	46	52%
	Over-use	23	26%
Duration	**Month(s)**	**Frequency**	**Percentage**
	1-5	47	53%
	6-10	16	18%
	11-15	8	10%
	16-20	2	2%
	21-25	7	7%
	26-30	0	0%
	31-35	0	0%
	36-40	5	6%
	41-45	0	0%
	46-50	2	2%
	51-55	0	0%
	56-60	2	2%

Based on the findings, ankle injuries have a 54% impact on ligaments and a 48% impact on muscle tissue, whereas knee injuries have a 79% impact on ligaments and a 21% impact on muscle tissue. Furthermore, the internal violence factor is 52%, over-use is 26%, external violence is 22%, and the duration

of the injury is 53% for 1-5 months and 18% for 6-10 months. This is of crucial concern because flat feet are one of the leading contributors to injury, particularly to the ankles and knees.

From a medical standpoint, it is known that the epiphyseal plate closes between the ages of 17 and 20. As a result, the closure of the epiphyseal plate indicates that the athlete's posture has stabilised (Wardhani, 2020). In terms of long-term athlete development, athletes join the training to complete the phase between the ages of 17 and 21. This means that athletes prioritise match performance (Varghese et al., 2022). At this stage, athletes are focused on improving their ability in the sport they are participating in, as well as improving their roles and positions in their respective sports (Varghese et al., 2022).

This is why athletes between the ages of 17 and 21 are at risk for injury. Logically, athletes at this stage want to provide their best effort and win every game (Gustian, 2016). Furthermore, when athletes are neglectful and physical decline is undoubtedly a factor in injury, a level of concentration, attention, and vigilance is essential in every match (Gustian, 2016). Therefore, athletes aged 17-21 years who are in the training to complete stage require a comprehensive physical training programme to assist and minimise injury (Rasyono, 2021)

Aside from the age factor, one of the concerns that cause injury is the body mass index factor. Obese athletes predominated in the authors' study. Athletes with less-than-ideal bodies are more likely to sustain injuries because they support and maintain body posture so that the feet become the primary support so that they may perform sports activities appropriately. According to prior research, being overweight is unhealthy. It is generally associated with fitness such as strength and endurance, followed by low neuromuscular levels such as body coordination and balance (Carter & Micheli, 2011)

Intriguing evidence was also discovered indicating the association between body mass index to injury is strong, with ankle injuries, particularly sprains, being the most common (Amoako et al., 2017). This is owing to the individual's inability to alter momentum fast and effectively, resulting in injury (Tyler et al., 2006). The stress used on the ankle ligaments during the support phase to move specific talents feels heavy because of a high increase in body mass index, leading to injury (Fousekis et al., 2012). Supported by other studies that individuals who are obese for a long time can affect the arrangement of the arches of the feet which will cause flat feet (Pourghasem et al., 2016)

According to the survey's findings, football is the most injury-prone sport. Basketball, volleyball, and futsal come next. Many studies have shown that body contact sports are highly risky for injuries (Yudhistira, Siswantoyo, et al., 2021; Yudhistira, Suherman, et al., 2021; Yudhistira & Tomoliyus, 2020). According to a more extensive study on the sport of football, the factors that cause injuries in football include extrinsic factors. This factor is associated with facilities and infrastructure, training management, and the number of matches played, whereas intrinsic factors are associated with biological and psychosocial conditions such as individual flexibility (muscle and ligament pathological weakness), a history of previous injuries, an inadequate rehabilitation process, and functional instability (Renshaw & Goodwin, 2016; Theisen et al., 2014).

Dijelaskan juga bahwa faktor ekstrinsik yang menyebabkan cedera adalah pelanggaran dipertandingan (Samia et al., 2021). Furthermore, a lack of training preparation, such as warm-ups and an insufficient number of exercises, as well as several matches that are not following the training phase, raises the risk of injury (Whyte et al., 2018). It was established that sports involving physical contact require special attention from both internal and external factors so that athletes can prepare as early as possible to avoid injuries.

According to the study results, factors that contribute to the occurrence of injuries include internal violence, external violence, and overuse. The results of this poll show that internal violence is the leading cause of injury. Furthermore, studies suggest that ankle and knee injuries mostly damage the ligaments and muscles. We can deduce from this that internal violent causes or factors connected to body anatomy play a significant role in producing injuries when athletes practise and compete.

This internal factor is similar to the athlete's physical anatomy, which includes the shape of flat feet. Injuries in sports can be induced by abnormal anatomical configurations such as hyperlaxity, according to previous studies (Wardhani, 2020). Hyperlaxity is a joint condition in which the degree of surface translation widens as the elasticity and length of the joint connective tissue increase (Wardhani, 2020). When normal

joint capacity fails to maintain mechanical stability, hyperlaxity occurs, resulting in bodily instability (Wardhani, 2020). If this problem is not addressed, it will result in flat feet, which is the condition of the soles of the feet curving lengthwise or collapsing (Wardhani, 2020). Flat foot's condition of the soles of the feet allows for more injuries than normal soles (Widiantoro, 2013)

Athletes with flat feet will endure fatigue and disrupted body balance because the lever system cannot work properly when the foot departs its foothold (Utami & Syafri, 2021). Moves involving bodily balance pose a significant risk of injury to the muscles and ligaments (Steinberg et al., 2016). Flat feet are anatomical conditions in which the medial arches or longitudinal soles collapse (Koeswandi, Muliani, Yuliana, 2022). This is because when doing weight-bearing activities, the entire surface of the soles of the feet touches the floor (Koeswandi, Muliani, Yuliana, 2022).

Humans have a flat foot form at birth due to an adipose cushion under the medial longitudinal arch; this condition will improve between the ages of two and five years (Koeswandi, Muliani, Yuliana, 2022). There are also flat feet that develop in adulthood as a result of obesity, genetics, and hypokinesia (Sadeghi-Demneh et al., 2016). According to other sources, flat feet are caused by muscle imbalance, bone structural distortion, ligament weakness, and posterior tibial tendon dysfunction (Kido et al., 2013; Letafatkar, 2013; Tashiro et al., 2015). Furthermore, the duration of the injuries suffered by research subjects ranged from 1 to 10 months. This is one of them influenced by the improper handling and care of injuries before entering the sports injury massage clinic (MCO). It could also occur as a result of past injury cases that have not fully recovered. Thus, the authors can divide the injuries into two categories: acute and chronic. According to relevant studies, the duration of activity is related to the duration of the injury. This is directly proportional to flat feet, which is related to hyperlaxity since flat feet can come from overly flexible ligaments and, in the long run, from hyperlaxity (Atik, 2014)

CONCLUSION

Based on the findings and discussions presented, it can be concluded that knee and ankle injuries are the most prevalent among athletes with flat feet who seek treatment at sports injury massage clinics. The data collected indicates that the majority of these injuries are attributed to internal factors. Consequently, this study holds valuable insights that can benefit practitioners, athletes, and trainers in understanding foot arches and injury classification. Considering that anatomical structure contributes to injury occurrence, sports practitioners are encouraged to select sports that align with their specific anatomical structure. Additionally, athletes with flat feet are advised to engage in exercises that enhance balance and strength. Furthermore, the utilization of appropriate equipment and technology can aid performance and reduce the risk of injury for athletes with flat feet. However, it is important to acknowledge the limitations of this study, including the limited sample size, the absence of gender categorization, data collection from a single research location, and the restriction of data analysis solely to percentage descriptions. Further research is needed to address these limitations and enhance the findings of this study.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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