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Differences in Sports Injury Characteristics of Track and Field Athletes at the PASI Papua Athletics Invitational Towards PON XXI

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Abstract
The risk of injury in athletes tends to be greater during competition. This study aims to determine the differences in the characteristics of sports injuries that are dominantly experienced by track and field athletes during selection of Papuan athletes for PON XXI 2024. This study uses quantitative research with comparative methods. The population in this study were 409 athletes who participated in the PASI Papua Athletics Invitation. Sampling was chosen purposively among athletes who made it into the final round on track numbers and field numbers which were 264 athletes (track numbers = 185 and field numbers = 79). Data was collected using sports injury identification questionnaire for athletes to find out the characteristics of the dominant sports injuries experienced by athletes. The results showed that the sports injuries experienced by track number athletes were sprain and strains that predominantly occurred in the lower extremities, while injuries experienced by field number athletes were also dominant sprain and strains that occurred in the upper extremities and lower extremities. The results of the independent sample t test was p=0.804 which indicates no differences in the characteristics of sports injuries experienced by athletics, although there are differences in the location of the injury.

Keywords: athletics; PON; running; sports injuries; track and field

1. Introduction

Athletics is a sport consisting of walking, running, jumping and throwing numbers which are classified as non-body contact sports (I. S. Kardi, 2020). Although athletics is classified as a non-body contact sport, athletes in athletics are prone to acute and chronic injuries (Boltz et al., 2021). This is due to the characteristics of the sport which consists of fast walking numbers, running numbers including short distance running including relay running, middle distance running, long distance running, and hurdle running. Sports track numbers are very important to provide high quality programs (Poblador et al. 2022). Field numbers include jumping numbers including long jumps, including horizontal jumps and high jumps, including vertical pole vaults, and throwing numbers including javelin throwing, discus throwing, shot put, and hammer throwing field events including throwing and horizontal and vertical jumping (Kardi et al. 2022). Basically, sports are all activities that involve the mind, body, and soul in an integrated and systematic manner in order to support, encourage, foster, and develop physical, spiritual, social, and cultural potential (Presiden RI 2022). Sports achievement is a very complex action and depends on multifactors (I. S. Kardi, 2019). In the process of reaching the peak performance of each athlete through a long process through training to competition. Similarly, it is stated that each requires rigorous and specific training for each event which leads to the possibility of injury (Boltz et al., 2021). Sports injuries are described as the end result of interactions between athletes in a sporting

context. Research results reveal that athletes often define injuries based on limitations in athlete performance, pain or soreness, and inability to participate in competition (Bolling et al., 2019). Performing high activity such as during a race results in muscle fatigue due to heavy intensity which can lead to muscle injuries that cause pain, which can be mild to severe pain (Asyiraq et al., 2022). Injury is a significant problem for athletes, especially when faced with the decision to continue or stop when injured (Bullock et al., 2020). Basically, the types of injuries that are likely to occur during exercise include abrasions, bruises, dislocations, strains, sprain, fractures, and concussions. Body structures and tissues that often experience sports injuries are muscles, tendons, bones, joints including cartilage, ligaments, and fascias (Barikah & Sari 2019). As with athletes competing in the PASI Papua athletics invitational, most athletes experience injuries throughout the competition. Observation results show that some athletes suffered injuries in the preliminary round. As in the 100-meter running number which is a popular number for Papuan athletes consists of 9 preliminary round series and 2 semi-finals, each series is followed by 8 athletes. Based on the results of these observations, it is necessary to conduct deeper research to find out the characteristics of injuries experienced by athletes.

Injury is a worrying problem for all athletes, from amateur athletes to elite athletes who participate in the IAAF Athletics World Championships and the Olympics (Edouard et al. 2015). The results of previous research revealed that athletes' injuries in running, jumping and throwing numbers at KKO Surakarta occurred due to motion errors and were classified as moderate category injuries (Pratama, 2022). Basically, every sport, both body contact and non-body contact categories, has a risk of injury cases. Sports injuries are events that occur suddenly either during the training process or competition. Every physical activity has the potential to cause injury, the higher the physical activity performed, the higher the potential for injury. The results of research on sports injury cases in Malang City KONI athletes revealed that the average fostered athlete experienced a moderate category injury rate (fair) and the location of the injury was dominant in the upper ectemity and lower ectemity (Cahyo, 2020). Injury is an inevitable consequence of athletic performance with most athletes experiencing one or more injuries during their career as athletes (Close et al., 2019). Research results reveal that the burden of sport-related musculoskeletal injuries is substantial, with the greatest risk occurring in adolescents and young adults (Emery & Pasanen 2019). Another study revealed that one in 12 athletes sustained an injury during an international competition resulting in lost training time and continued competition, further explaining that muscle injuries accounted for more than 40% of all injuries with the lower extremities being the most predominant site of injury (Close et al., 2019). In addition, the results of previous studies have revealed that 78.6% of athletes experienced 200 injuries with a loss of time > 3 weeks for recovery, injuries classified as overuse and 17.3% of athletes who retired due to injury before turning 18 years of age (Huxley, O'Connor, & Healey 2014). In elite track and field athletes there are approximately 81 injuries per 1,000 athletes registered at the World Championships (Close et al., 2019).

Understanding that sports injuries are the result of interactions between many factors and knowing the types of sports injuries experienced by athletes is an important step in building sports injury prevention, treatment and rehabilitation programs (Fonseca et al. 2020). Various factors that support and support achievement must be considered, planned, implemented and evaluated carefully. This is because injuries experienced by athletes can be an obstacle to achieving peak performance. As stated that the cause of low achievement of athletes is not single, but multifactorial (I. S. Kardi, 2019). Injuries that often occur due to the cumulative process of repeated micro-trauma and overloading of the musculoskeletal system cause tissue damage that can have long-term negative consequences and can reduce athlete performance (Franco, 2021). The risk of injury during international athletics championships differs between male and female athletes based on the location, type, and number of events, therefore injury prevention strategies must be gender-specific, given the differences in location and type of injury experienced (Edouard et al. 2015). Therefore, creating training programs and providing optimal workloads to improve athletes' fitness and skills without increasing the likelihood of injury is important for coaches to know (Hulin et al., 2016). Based on this, it is necessary to conduct

research to identify the characteristics of the dominant injuries experienced by athletic athletes in Papua Province in track and field numbers.

The results of the researcher's observations found that most athletes in athletics suffered injuries. Based on these facts, it is necessary to take action to diagnose so that the right action can be given. Basically, athletics consists of several numbers that have different characteristics, in general athletics can be divided into two major parts, namely track numbers and field numbers. Based on this, this research was conducted to determine the differences in the types of injuries experienced by track and field athletes at the Papua PASI Athletics Invitation event which was held to recruit athletes for PON 2024 preparation.

2. Method

This study uses a type of quantitative research with a comparative method to determine the differences in the characteristics of the types of injuries experienced by athletic athletes between track numbers and field numbers in the PASI Papua athletic invitation event in order to recruit athletes who will take part in Pre PON and PON XXI. The population in this study were all athletes who participated in the athletic invitation totaling 409 athletes consisting of 313 male athletes and 96 female athletes. The sampling technique using purposive sampling with the criteria of athletes who made it into the final round on the track number as many as 171 athletes (men = 123 athletes and women = 48 athletes) who took part in sprint running events (100, 200, 400 meters), middle distance running (1500 meters) and long-distance running (5 km) and field numbers as many as 93 athletes (men = 62 athletes and women = 31 athletes) who took part in discus throwing, javelin throwing, and shotput events.

Table 1. Track and field population and sample athletes

Athletics	Event	Gender	Semi-finals	Final
Track	100m	Male	70	8
	100m	Female	13	8
	200m	Male	50	8
	200m	Female	11	7
	400m	Male	32	8
	400m	Female	16	8
	1500m	Male	50	50
	1500m	Female	15	15
	5000m	Male	49	49
	5000m	Female	10	10
Field	Discus Throwing	Male	15	15
	Discus Throwing	Female	9	9
	Javelin Throwing	Male	26	26
	Javelin Throwing	Female	10	10
	Shotput	Male	21	21
	Shotput	Female	12	12
Sum			**409**	**264**

The average sample age was 21.36 years. The age of the respondents is adjusted to the age limit of PON 2024. Data collection uses a sports injury identification instrument in the form of a questionnaire. Questionnaire filling is done online using google form which consists of athlete biodata and instrument. The instrument used has a good level of validity with a reliability value of 0.823. (Dewantara, 2016). The data analysis technique uses quantitative description analysis and comparative analysis with t test using SPSS version 26.

3. Result

Data obtained through the sports injury identification instrument in athletes filled out online by 264 athletes to identify the characteristics of injuries experienced by athletes who participated in the PASI Papua athletics invitation event in 2023. The data is then processed using the SPSS version 26.

a. Results of descriptive data analysis of respondents

The data obtained was then analyzed to determine the characteristics of the respondents who became the research sample including age, gender of the respondent, and the number followed. The results of this data analysis can be seen in table 2.

Table 2. Characteristics of respondents

Type of Gender	F	%	Track	Field	Age (year)
Male	185	66.7	123	62	21.36
Female	79	33.3	48	31	
Sum	264	100	171	93	

Table 3. Frequency of training, training age, and duration of recovery of respondents

Frequency Training	F	%
1-2 day	21	7.95
3-4 day	74	28.03
5-6 day	148	56.06
7 day	21	7.95
Sum	264	100
Training Age		
<1 year	21	7.95
1-2 year	53	20.08
3-4 year	127	48.11
>5 year	63	23.86
Sum	264	100
Duration of Recovery		
1-3 day	159	60.23
3-21 day	20	7.58
>3 week	85	32.20
Sum	264	100

Based on the results obtained in table 1 that the respondents totaled 264 athletes consisting of 185 male athletes and 79 female athletes. The number of male athletes is more dominant than the number of female athletes. Athletes come from track number 171 athletes and field number 93. The average age of respondents who took part in the PASI Papua athletics invitation was 21.36 years with a participant age range of 18 - 33 years.

Based on the results of the study it was found that athletes who participated in the PASI Papua Athletic Invitation event dominantly practiced 5-6 days / week. The fact shows that the dominant athletes train between 3-4 years, and when an injury occurs the length of the recovery process is dominant between 1-3 days.

b. Results of descriptive analysis of sports injury characteristics experienced by athletes

Table 4. Sports injury characteristics of track athletes at the papua athletics invitational

Types of Injuries	Upper Extremity				Lower Extremity				Total
	Fingers	Wrist	Arms	Shoulder	Toes	Enkle	Knee	Thighs	
Lesion	-	-	-	-	12	9	-	-	21
Contusions	-	-	-	-	3	3	-	-	6
Dislocation	-	-	-	-	-	2	-	-	2
Strain	-	-	-	5	-	-	-	50	55
Sprain	-	-	-	-	-	75	20	-	95
Total	-	-	-	5	15	89	20	50	

Based on the results shown in table 4, it is illustrated that the dominant types of injuries experienced by athletes are sprain as many as 95 athletes, and strains 55 athletes. Sprain was dominant in the ankle with 75 athletes and knee sprain with 20 athletes. Strains predominantly occurred in the thighs as many as 50 athletes. In this study it was found that most athletes experienced more than two types of injuries.

Table 5. Sports injury characteristics of field athletes at the papua athletics invitational

Types of Injuries	Upper Extremity				Lower Extremity				Total
	Fingers	Wrist	Arms	Shoulder	Toes	Enkle	Knee	Thighs	
Lesion	24	-	-	-	21	11	-	-	56
Contusions	-	-	-	-	8	11	5	-	24
Dislocation	-	-	-	-	-	5	-	-	5
Strain	-	13	34	18	-	-	-	84	149
Sprain	-	-	-	-	-	127	32	-	159
Total	24	13	34	18	29	154	37	84	

Based on the results shown in table 5, it is illustrated that the dominant types of injuries experienced by athletes are sprain as many as 159 athletes, strains 149 athletes, and lesion 56 athletes. Sprain was dominant in the ankle with 127 athletes and knee sprain with 32 athletes. Strains predominantly occurred in the hip as many as 84 athletes, elbow 34 athletes, shoulder 18 athletes, and wrist 13 athlete. In this study it was found that most athletes experienced more than two types of injuries.

Table 6. Causes of sports injuries in athletes

Causes of Injuries	F	(%)
Overuse	106	40
Lack of Warm-Up	66	25
Incorrect Technique	58	22
Collision	13	5
Unsupportive Infrastructure	13	5
Others	8	3
Total	264	100

Based on the results shown in table 6, it is illustrated that the cause of sports injuries in athletes is dominantly caused by overuse or excessive use without being balanced with optimal recovery, which is 40%. Furthermore, the cause of sports injuries due to lack of warm-up or less than optimal warm-up is 25%. The cause of sports injuries caused by technical errors amounted to 22%. In addition, injuries caused by collisions and unsupportive facilities and infrastructure amounted to 5% each, while the types of injuries caused by other factors amounted to 3%.

c. Results of data analysis using an Independent sample t-test

Table 7. Results of independent sample t-test of injury characteristics between track and field athletes

Sport injuries	p-value
	.804

Based on the results of the t test shown in table 7, it is found that there is no difference in injury characteristics between track and field athletes, this can be seen from the p-value (2 tailed) = 0.804 > 0.05. The characteristics of injuries experienced by athletes are lesion, contusions, dislocations, strain, and sprain. Although there is no difference in injury characteristics, the difference is found in the location of the injury. Track athletes predominantly experience injuries to the lower extremities, while field athletes in addition to experiencing injuries to the upper extremities also predominantly experience injuries to the lower extremities.

4. Discussion

Based on the results of the research obtained, it is found that athletes who take part in the throwing number of the Papua Athletics Invitation event have the characteristics of sports injuries that are dominantly experienced by athletes, namely sprain which dominantly occurs in the ankle and lower extremities which is dominantly caused by overuse, less than optimal warming up, and technical errors in throwing. Strains are dominant in the lower extremities and upper extremities. Based on the results of this study, it was found that the dominant injury occurred due to overuse because most athletes have been practicing for years with repetitive movements. Another thing that was found was that the frequency of training athletes was dominant 5 - 6 days per week, there were even a small number who practiced with a frequency of 7 days per week. This is a trigger and increases the risk of injury. Intrinsic risk factors such as age, gender, neuromuscular control, muscle strength, psychological factors, and previous injuries and extrinsic risk factors such as sport, equipment and environmental factors affect the risk of injury (Sonesson et al., 2023). After physical exercise the body will increase inflammatory markers, inflammation is a protective response generated by injury or tissue damage caused by physical trauma, damaging chemicals, or microbiological substances (Ayubi et al., 2020). The main causes of sports injuries can result from excessive stress, inability to concentrate, physical trauma, and overtraining (Li, Wu, & Chen 2020). Based on this, risk screening also significantly reduces the risk of sports injuries.

The dominant injury characteristic experienced by throwing athletes in the Papua Athletics Invitation event is overuse. Similar to the results of previous research which revealed that overuse injuries are the result of a complex interaction between many factors (Tranaeus, Martin, & Ivarsson 2022). Sports injuries have been identified as a frequent occurrence in elite athletic athletes, with two out of three athletes experiencing at least one injury each year (Everard et al. 2021). It is confirmed by the results of other studies that overuse is an injury that often occurs in athletes with repetitive movements such as in athletics. The incidence of injury among adolescent and adult elite athletic athletes is quite high which is related to the high intensity of training, the number of hours of training and a history of previous severe injury is a predictor of injury (Jacobsson et al., 2013). Frequent injury due to continuous repetitive loading of the musculoskeletal system without adequate rest is a trigger for injury (Timpka et al., 2014). Studies in youth athletics have shown the incidence of musculoskeletal injuries to range from 35%-65% and the majority of injuries ranging from 65%-95% are related to overuse affecting the lower extremities (Ek, Kowalski, & Jacobsson 2022). The results also revealed that overuse injuries resulted in lost time for training and even missed competitions and 64% of athletes had at least one injury (Lambert et al. 2022). The results of another study also showed that 178 boys completed 391 competitive seasons experiencing 290 injuries (Silvan, 2021).

Basically, the numbers in athletics, especially the throwing numbers, are non-body contact sports, but the risk of injury is also potentially experienced by athletes. As stated that traumatic injuries occur in certain identified events with or without contact with other athletes or objects, for example enkle sprain. The results of this study reveal that athletes who take part in the Papua Athletics Invitation event have the characteristics of a dominant sprain injury experienced by athletes with an injury location on the ankle. The most common types of injuries reported in youth athletics are hamstring strains, fractures, and ankle sprain. This is due to overuses, less than optimal warming-up, and technical errors accompanied by a dense training frequency, high intensity, and length of time working on throwing numbers.

Research has revealed that incorrect or inappropriate training postures and training methods result in damage to body tissues (Liu, 2022). Other studies have revealed and identified deficits in passive hamstring and ankle dorsiflexion range of motion as weak risk factors for hamstring injuries (Dyk et al. 2019). Moreover, the risk of injury during international athletics championships differs between female and male athletes based on the location, type and number of events (Edouard et al., 2015). Therefore, injury prevention strategies should be gender-specific, given the differences in injury location and type. Injuries are common in every sport, especially team sports and negatively affect the team's success in national or international competitions (Hulin et al., 2016). Throwing events involve high stress on the lower back and shoulder joints, which can result in injury to the rotator cuff muscles especially in javelin throwing events during the javelin release motion (Walden, 2022). Overuse injuries result from the cumulative process of repetitive microtrauma and overloading of the musculoskeletal system, leading to tissue damage. Therefore, these injuries may have long-term negative consequences that decrease athlete performance (Franco et al. 2021). Sports injuries in young athletes can negatively impact current and future sports participation, physical activity (PA) levels and future health (Bargoria et al. 2020). When undertaking an exercise program, unwanted injuries can interfere with achieving optimal training goals (Marcaida et al., 2022). Therefore, it is recommended that the PASI Papua management can provide injury treatment to athletes who have the potential to participate in PON 2024, so that the injuries experienced can recover perfectly to be able to accept the training program.

5. Conclusion and Recommendation

Based on the results obtained, it is concluded that the dominant injury characteristics experienced by track and field athletes are sprain. It was also found that the cause of sports injuries experienced was due to overuse with imperfect recovery. In this study, there was no significant difference between the injury characteristics of field number and track number athletes. The difference is seen in the location of the injury, namely track number athletes predominantly occur in the lower extremities, while field number athletes predominantly occur in the upper extremity area and also the lower extremities.

Based on the research results obtained, it is recommended that coaches and athletes pay attention to the pre-competition preparation process such as nutrition, warm-up, facilities and infrastructure used, and the recovery phase after competition to minimize the occurrence of athlete injuries. Further research that can be done is handling injuries in sports, especially first aid, so that the injuries experienced by athletes are not severe and accelerate the recovery process.

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