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Predicting Injury Risk in Sports Students: A Gender-Based Review

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Abstract

Anyone, even sports students, can experience sports injuries. The risk of injury experienced by students is even greater if a basic understanding of exercise does not accompany it; warming up and cooling down have an essential role in reducing risk. This study aims to determine the risk of injury to new students of the Sports Science Study Program class 2023. The research method uses a quantitative research design. The method used in the study was a survey method with tests and measurements. The sample withdrawal technique uses a total sampling technique. The sample used amounted to 119 students. Data analysis refers to the Functional Movement Screen score, which has 7 test movements. The results showed that female data were 33 samples, 67% of students had a low risk of injury, and 33% were in the medium injury risk category. No students were in the high-injury risk category. In comparison, male data were 86 samples: 6% of students were in the high injury risk category, 46% were in the medium injury risk category, and 48% were in the low injury risk category. The findings of the results in this study are that some samples have good fundamental movement patterns seen from the FMS scoring that has been done. The limitation of this study is that the samples used are students from various sports with various sports. Future research should be conducted prospectively, which includes a detailed injury survey on each individual and a more precise definition of injury to determine the physical condition of the sample before conducting the test.

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INTRODUCTION

Performance and risk factors are unavoidable when performing sports (F. Launay, 2014; Close et al., 2019). Sports injuries are often responded by the body with inflammations consisting of redness, pain or soreness, heat, limited joint range of motion, swelling, and decreased motor functions so that the resulting movement or force is not optimal (Sakinah 2021). The most common injury in almost all sports is a sprain, which occurs when a ligament is torn at a joint (Setyaningrum, 2019). A sprain occurs due to an excessive and sudden pressure on the joint (Kaplan, 2019). The athlete unawareness of the potential is called injury risks (Gemilang, 2023). Internal and external factors can cause injury risks (Schellack et al., 2018). Internal factors include anatomical factors, imperfect muscle and joint coordination, technical errors, and muscle imbalances. At the same time, the causes of external sports injuries include sports-type factors, equipment factors, and field factors (Anam, 2022). According to Meredith (2021), sports injuries can also be caused by sudden and intense movements.

The risk of injury is always associated with sports activities (Irawan et al., 2024; Putri, 2019). The risk refers to the possibility of injury to the body muscular, tendon, ligament, and skeletal systems due to physical activities (Frizziero et al., 2014). Risk is a danger or consequences that can occur due to an ongoing process or future events (Ruddy et al., 2019). Errors influence the risk of injury, structural abnormalities, and muscle weakness in training methods (Maralisa et al., 2020). According to Drew (2016), the risk of injury can be reduced by understanding the type of sport and factors causing injury to athletes.

Injuries are classified into three levels, including mild, moderate, and severe (Ziaee et al., 2015). Mild or moderate permanent injuries cause athletes to end their careers (Hidayat, 2021). Sports injuries can be prevented by warming up sufficiently, using appropriate sports equipment, and avoiding overtraining (Jacob, 2023). Injury preventions can also be done by improving excellent physical conditions (Anam, Sumartiningsih, 2022).

The potential for injury experienced by Sports Science students is even more significant if they do not comprehend the basic understanding of exercise, including warming up (stretching) and cooling down. Afzal (2021) says that warming up and cooling down are essential in reducing the risk of injury during sports activities. Warming up before exercise helps the body adapt from a state of rest to the physical activity intensity, while cooling down after exercise helps the body relax (Anam et al., 2024; Rezki et al., 2022).

Early diagnosis of sports injuries for student-athletes is essential to determine the potential risk to specific body parts. Sports injury is a factor leading to the decreased performance of athletes (Maffulli, 2013). Sports injuries in athletes are pretty high due to a lack of detection, thus interfering with the athlete performance (Van Eetvelde, 2021). It is necessary to test the potential risk of sports injuries. One of the instruments used to analyze the potential for sports injuries is the Functional Movement Screen (Pristianto et al., 2019). Functional Movement Screen is an instrument used to measure functional movements of body organs and can predict general musculoskeletal conditions and injuries (Enayatjazi, 2023). The Functional Movement Screen performs different movements on joints and muscles in different body parts, starting from the upper, middle, and lower body (Shintya, 2024). These movements indicate the extent of joint and muscle movement performance to individualize the risk of injury.

Studies on Functional Movement Screen have been conducted in various countries, including New Zealand (Moran et al., 2017), Lithuania (Šiupšinskas et al., 2019), and America (Bonazza et al., 2017). In Indonesia, the research on FMS includes the research on the sports injury potential for students at SMPN 1 Baturaden. This research involved thirty-two participants, including 20 male students and 12 female students. The results showed that fourteen students were in the normal category with a percentage of 43.75%, while eighteen students were in the potential sports injury category with a percentage of 56.25% (Syafei et al., 2020). The present research included samples coming from student athlete background and non-student athlete background. This type of research had been done, but the research only focused on athletes. Meanwhile, anyone, not only athletes, can experience sports injuries during performing physical activities. Research using a combined population (athletes and non-athletes) had never been conducted. For this reason, this research needs to be administered to provide information about the risk of injury and to provide insights into early sports injury preven-

tions. Injury prevention is essential in maintaining the health and performance of athletes. Based on this description, the researchers intended to conduct a Functional Movement Screen score analysis for predicting injury on sports students.

METHODS

This research used a quantitative description. The population of this study were all students of the Sports Science Study Program Class of 2023, Semarang State University. The samples involved 119 students. The determination of the sample size used the total sampling technique by taking the population as the research sample. The method used in the study was a survey method with tests and measurements.

Participants

The population of this study were all students of the Sports Science Study Program Class of 2023, Semarang State University. The samples included 119 students. The characteristics of the subjects in this study are shown in Table 1.

Table 1. Demographics Data of the Samples

Gender	N	Weight (Kg)	Height (Cm)	IMT	Athlete
Female	33	51,7±6,3	157,7±5,7	21,8±2,9	18
Male	86	61,6±7,02	167,6±5,1	22,6±3,4	38

Based on the data in Table 1, there were one hundred and nineteen students involved as the subjects of this study, including 33 women (average body weight = 51.7 ± 6.3 kg, height = 157.7 ± 5.7 cm, body mass index = 21.8 ± 2.9, and 18 student athletes) and 86 men (average body weight = 61.6 ± 7.02 kg, height = 167.6 ± 5.1 cm, body mass index = 21.8 ± 2.9, and 38 student athletes).

Sampling Procedures

The total sampling technique determines the number of samples by taking the entire population as the research sample. The total sampling technique was carried out by identifying the risk of injury of all new students majoring Sports Science in 2023.

Materials and Apparatus

The research instrument used the Functional Movement Screen (FMS), consisting of 7 movements (Cook, 2014). The details can be seen in Figure 1.

1. Deep Squat
2. In Line Lunge
3. Hurdle Step
4. Active Straight Leg Raise
5. Shoulder Mobility
6. Trunk Stability Push-up
7. Rotary Stability

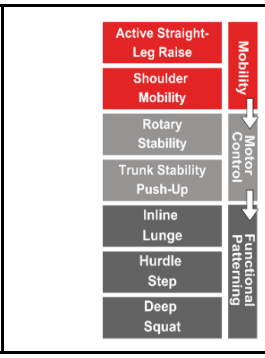

Figure 1. Item Tests of The Functional Movement Screen

Procedures

In testing and measuring the Functional Movement Screen (FMS), the samples performed each FMS movement in sequence. The score was given according to the sample ability to perform each movement based on the FMS scoring system (Šiupšinskas et al., 2019). The details can be seen in Table 2. Functional Movement Screen (FMS) assessment norms, based on (Alemany, 2017), are presented in Table 3.

Table 2. FMS Score Criteria

Criteria	Score
The movement is performed perfectly	3
The movement is performed using a compensation	2
Cannot perform the movement	1
Experiencing pain when performing the movement	0

Table 3. Norms of The FMS Injury Risk Score

No	Injury Risk Category	Score Range
1	High risk of injury	≤14
2	Moderate risk of injury	15-18
3	Low risk of injury	19-21

Design or Data Analysis

The analysis method of this study used the quantitative descriptive statistical analysis using percentages. The results of the Functional Movement Screening (FMS) measurements were analysed using Ms. Excel. Then, the data were presented in a graph illustrating the number of samples included in the high, moderate, and low injury risk categories.

RESULT

The statistical data analysis of FMS scores of one hundred and nineteen Sports Science Students (86 males, 33 females) is presented in Table 4.

Table 4. Descriptions of Sample Data

Gender	Test Items	Min	Max	Mean	Std Dev.
Female (33)	Deep Squat	2	3	2.12	0.33
	Hurdle Step	2	3	2.67	0.47
	In-Line Lunge	2	3	2.91	0.29
	Shoulder Mobility	2	3	2.79	0.41
	Active SLR	1	3	2.85	0.43
	Trunk Stability Push-up	1	3	2.64	0.59
	Rotary Stability	2	3	2.79	0.41
	Total FMS Value	**16**	**21**	**18.76**	**1.18**
Male (86)	Deep Squat	1	3	2.09	0.33
	Hurdle Step	1	3	2.55	0.56
	In-Line Lunge	2	3	2.76	0.43
	Shoulder Mobility	0	3	2.72	0.58
	Active SLR	2	3	2.86	0.35
	Trunk Stability Push-up	0	3	2.65	0.71
	Rotary Stability	0	3	2.60	0.69
	Total FMS Value	**13**	**21**	**18.24**	**1.73**

Based on the results of the analysis presented in Table 4, female samples (33 samples) had a minimum value of 16, a maximum value of 21, a total value of 619, a mean value of 18.76, and a standard deviation of 1.18. Meanwhile, the male samples (86 samples) had a minimum value of 13, a maximum value of 21, a total value of 1569, a mean value of 18.24, and a standard deviation value of 1.73.

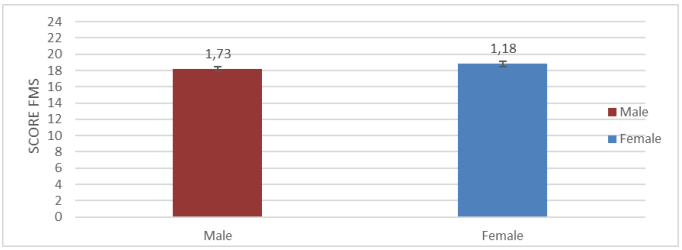

Figure 2. Descriptions of FMS Score Results

Based on the data analysis results from the FMS measurement test on Sports Science students, the male samples gained an average FMS value of 18.24 and a standard deviation of 1.73. At the same time, the female samples obtained an average FMS value of 18.76 and a standard deviation of 1.18.

The results of the potential risk injury measurement of Sports Science students are depicted in Table 5.

Table 5. Frequency Distributions of Injury Risks of Sport Science Students (n=119)

Gender	N	FMS Category		
		High	Moderate	Low
Female	33	0	11	22
Male	86	5	41	40

Based on the frequency distribution of injury risk results in female samples, there was no sample having a high injury potential, while 11 samples had a moderate injury potential and 22 samples had a low injury potential. Meanwhile, in male samples, 5 samples had a high risk of injury, 41 samples had a moderate risk of injury, and 40 samples had a low risk of injury.

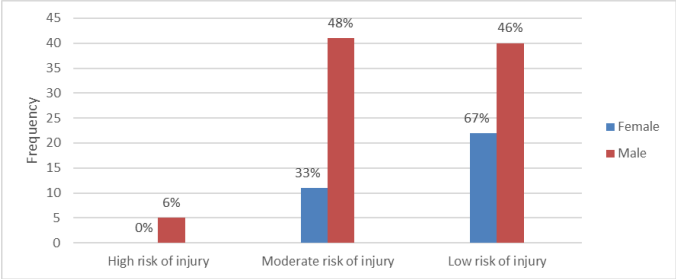

Figure 3. The Injury Risk Percentage of Sports Science Students

Figure 3 presents the data analysis results of the level of sports injury risk measurement of Sports Science students, Semarang State University. In the female student samples, 33% of the samples were in the moderate injury potential category, 67% of the samples were in the low injury potential category, and none of the samples, 0%, was in the high injury risk category. Meanwhile, in male students (86 samples), 6% of the samples were in the high injury potential category, 48% of the samples were in the moderate injury potential category, and 46% of the samples were in the low injury potential category.

DISCUSSION

The Functional Movement Screening (FMS) test measures body balance, muscle strength and endurance, and range of motion (ROM). The FMS test identifies

the potential risk of injury. A high risk of injury in this research occurred because most students could not perform various movements perfectly. The movements in the FMS test have complex movement criteria that were new to Sports Science students, so the success rate of the movements was low. When applying the FMS, the movements assess three intrinsic aspects of the body, namely the mobility, motor controls, and functional patterns (Warren et al., 2018).

The results of previous studies showed that a small proportion of the sample could perform the movements in the FMS test well and perfectly (Abraham, 2015). Gender could also affect performance in performing the movements of the FMS test (Chimera, 2015). Gender was the only additional variable that significantly affected the regression model, but the incidence of injury in women was 1.7 times greater than in men (Gibbs et al. 2023).

Based on the results of the analysis, the male samples (86 students) gained a minimum FMS value of 13, a maximum value of 21, an average FMS value of 18.24, and a standard deviation of 1.73. At the same time, the female samples (33 students) had a minimum FMS value of 16, a maximum value of 21, an average FMS value of 18.76, and a standard deviation of 1.18.

The potential for injury in samples analyzed by comparing male and female genders showed that, in female students, 11 samples (33%) were in the moderate injury potential category, 22 samples (67%) were in the low injury potential category, and no female sample had a high risk of injury. Meanwhile, in male students, 5 samples (6%) were in the high injury potential category, 41 samples (48%) were in the moderate injury potential category, and 40 samples (46%) were in the low injury potential category.

The Functional Movement Screen (FMS) test evaluates and identifies a person essential ability to perform functional movements. However, it is essential to remember that FMS score results do not directly indicate the potential injury. FMS scores only provide information about an individual strength, flexibility, balance, and postural controls in the specific movement context. Meanwhile, a low score in the FMS may indicate an imbalance or weakness in movements, it does not directly indicate the risk of injury. Other factors, such as physical fitness levels, sporting experiences, correct techniques, and the overall physical state of the individual, also play an essential role in injury preventions.

In predicting injury risks, it is essential to combine the results of the FMS score with a thorough assessment by a trained healthcare professional, such as a physiotherapist or sports trainer, to evaluate other factors that may influence the risk of injury and provide appropriate recommendations for injury preventions, including improving movement techniques, providing appropriate exercise programs, and improving strength and balance. It is also important to remember that everyone has a unique physical characteristic and abilities. FMS score results should not be the sole assessment in determining the injury potential. Individuals need a proper care and guidance from trained health professionals to minimize the risk of injury and to maximize overall performance. Samples who achieve a combined FMS score above 14 have a lower risk of injury compared to those with a score below 14, showing a higher potential for injury (Coogan et al., 2020).

Students with a sporting talent and potential should undergo a gradual training program, from the multilateral phase to the specification phase. The multilateral phase of movement training or Basic Movement Skills is essential to provide students with various movement experiences, thus indirectly strengthening the muscle function naturally through various physical activities. Various physical activities and multilateral sports help the average growth and development of muscles and bones (Mejsnarová, 2021). Good bone and muscle development can help perform various movements and minimize injuries.

The findings of this study showed that some samples had good fundamental movement patterns seen from their FMS scores. Lower scores have a risk of sports injuries. The limitation of this study is that the samples were students from various sports recruited to participate in the current study. The type of sport played (upper-extremity dominant and lower-extremity dominant) by each individual might influence the FMS movement performance. Future research should be conducted prospectively, include a detailed injury survey of each individual, and provide a more precise definition of injury to determine the physical condition of the sample before performing the test.

CONCLUSION

The results of the research showed the potential for sports injuries in students of the Semarang State University, especially the Sports Science Study Program students Class of 2023. The study prevailed that, in female samples, 67% of students had a high risk of injury, 33% of students were at the moderate risk category, and no student was at the high-risk category. Whereas, in male students, 6% of the students were at the high-risk category, 48% of students were at the moderate risk category, and 46% of students were at the low-risk category.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

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