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## **Level of understanding of fitness instructors on injury prevention and treatment in Yogyakarta fitness center**

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### **ABSTRACT**

A fitness instructor is critical in preventing severe injuries and providing the best care for members at fitness centers. This study aimed to discover whether fitness trainers' understanding of injury prevention and treatment is related to the trainees' injury histories. Furthermore, this study was also conducted to determine the fitness trainers' understanding of preventing and treating injuries in fitness centers in the Special Region of Yogyakarta. This study is cross-sectional and applies a survey approach. The data collection technique utilized in this study was multiple-choice questions, with 70 trainers and their 233 trainees as the research subjects. The results showed that the fitness trainers' understanding of injury prevention and treatment at the fitness center in the Special Region of Yogyakarta fell into the poor category. Meanwhile, the results showed that the fitness trainers' understanding of injury prevention and treatment have a strong negative relationship with trainee's injury histories ( $r = -0.700$ ,  $p < 0.001$ ). The higher the fitness trainers' understanding of injury prevention and treatment score obtained by the trainer, the lower the potential for the trainee to experience injury ( $\text{Exp } (B) 0.968 < 1$ ). On the other hand, weekly trainee exercises have a good relationship with the trainees' injury chances ( $p < 0.001$ ,  $\text{Exp } (B) 1.062 > 1$ ). Thus, fitness trainers' injury prevention and treatment knowledge and weekly trainees exercise are strong predictors for predicting trainee's injury histories. Although other predictors were unable to predict trainee's injury histories in this study, we propose that these predictors may have potential.

**Keywords:** Comprehension, prevention, treatment of injuries, fitness instructor

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## **INTRODUCTION**

Humans cannot be separated from two important physical and spiritual factors because they positively influence life (Boydell et al., 2018; Kool et al., 2013). Health is a state of complete physical, mental, and social well-being and not simply the absence of disease or infirmity. The understanding of health has shifted along with the times, thus providing benefits in life and stimulating someone to adopt a healthy lifestyle with exercise (Yulianti et al., 2018). People who perform various exercises must be supervised or guided by professional trainers or coaches, such as those who work in fitness, football, volleyball, gymnastics, archery, etc. However, the negative impact of exercising often happens in the form of injuries to various organs, such as the upper and lower muscles (Sole et al., 2019). Exercise using weights at the gym is often chosen by fitness enthusiasts, especially those who want an athletic body by building upper thighs, lower thighs, arms, chest, and back muscles (Lai et al., 2020).

Fitness enthusiasts often exercise using weights at the gym, especially those who want an athletic body by building the upper thighs, lower thighs, arms, chest and back muscles (McKay & Verhagen, 2016). The members can use various kinds of fitness equipment to shape the body to tighten and strengthen body muscles. This equipment involves barbells, dumbbells, gym

machines, and kettlebells. These tools can help people increase the body's muscles to strengthen, build muscle, and tighten the arms, abdomen, thighs, and other body parts (Lempainen et al., 2015). Beginner athletes in fitness centers are very prone to injury. However, new fitness members are attracted by the beautiful muscles of the old members or bodybuilders (Walrand et al., 2021).

Most beginner athletes do not think about the effects of injuries on various types of muscles when they choose the wrong gym that does not have a professional trainer. This is because the role of an instructor is essential to direct and provide gradual training to beginner athletes. One of the most important factors when using equipment in a gym is that a member must know the function and how to use these tools so that the members do not get injured and feel prolonged pain (Bachr, 2018). Beginner athletes need professional trainers with high average working hours or much experience training novice members so they do not get injured during light, moderate times, or heavy training (Keogh & Winwood, 2017).

Internal and external factors, such as joint injuries, muscle cramps, shoulder injuries, and others, cause injuries that often occur to fitness members. The level of injury in sports varies according to the types of sports and whether amateur or professional athletes carry out the training. Injuries occur when running an inconsistent exercise program and excessive loads (Bray et al., 2020). According to Kemler et al., (2022), 73.1% of gym injuries are caused by using gym equipment without professional supervision. From this data, the injuries occur when the members do specific exercises. Meanwhile, Todd & Shurley, (2016), firmly says that 20-30% of gym members experience injuries when participating in fitness training guided by professional training. Meanwhile, 40% of gym members participating in non-professional training accompanied by a professional coach suffered a sizable injury. Therefore, sports activities based on weight training (gym-based) have a relatively high risk of injury if performed alone. Meanwhile, under the supervision of professionals, the risk of injury is reduced more significantly.

Supervision by personal trainers or trainers during exercise can reduce injury rates for fitness members. However, injuries that occurred under the supervision of professionals still exist. This was well explained by Malek et al., (2002), who stated that injuries that occur during private fitness with a personal trainer are highly dependent on the level of knowledge of the personal trainer and other factors. A fitness coach must train members gradually, starting with easy, medium, and combination techniques. However, the reality shows that many trainers still do not have basic fitness and health knowledge, which will eventually cause a big problem for later. Fitness center trainers are limited to only attending training once and in a very short time. Most fitness trainers do not attend training with many members at all once and for an extended time (Mroczek et al., 2018). This will impact when they train the members because many things could be done inappropriately when accompanying the members in the field, for example, giving false directions to use inappropriate fitness equipment, improper warming-up and cooling-down, and low-level of nutritional knowledge of the members (Todd & Shurley, 2016). Thus, indirectly, the members do not perform optimally during exercise and in shaping their bodies. This also affects the level of fatigue of the members after participating in training at the fitness center with inappropriate training methods from the coach (Shinde & Sahasrabuddhe, 2021). Moreover, poor directions from an inexperienced or knowledgeable instructor can result in injury.

The level of understanding about injuries fitness trainers is relatively low because a few attend various studies and seminars on preventing and reducing injuries in fitness centers (Dunford et al., 2020). Injury is detrimental to the members; therefore, do not underestimate it. The injury must be considered and treated as early as possible because mishandling it will cause prolonged injury that will affect the exercise routine or, even worse, the members would no longer be able to participate in training (Jeong et al., 2021). The role of an instructor can help reduce injuries. For example, the instructor provides a programmed and systematic training method and proper instructions for using sports equipment according to the members' abilities (Worsfold & Sheffield, 2021). Injury is the members' mistake when they lift too heavy weight repeatedly, skip

warming up, apply the wrong techniques and movements, have little rest, and are not supported by an unhealthy lifestyle.

Fitness members are injured due to several factors, for example, excessive motivation to get a good body without involving professional and experienced trainers during exercise. Another factor is the unpreparedness of the members when participating in a fitness program at the fitness center. Taking into account these two things, including those injuries in gym-based training tend to occur in novice members and the low level of injury knowledge of personal trainers, which is considered a risk factor for injury to their clients, we wanted to find out whether the level of knowledge of injury prevention among personal trainers is related to injury histories of the members he trained. In addition, we were interested in researching the level of understanding of fitness trainers on preventing and treating injuries at the Yogyakarta fitness center.

## METHOD

### Design

The study used a cross-sectional study design with a survey (questionnaires) approach to discover the relationship between the fitness trainers' understanding of injury prevention and treatment and trainees' injury histories and whether the two have a relationship. A cross-sectional study is a study design that simultaneously investigates and measures outcomes (outcomes) on the participation of research subjects (Setia, 2016). Meanwhile, survey research is research that aims to describe various things such as phenomena, events, symptoms, and an event that occurs in an actual, systematic, and accurate manner (Teixeira et al., 2020).

### Participants and Recruitment Criteria

The subjects participating in this study involved 70 trainers and 233 trainees. The trainers involved in this study were male ( $n = 53$ ) and female ( $n = 17$ ) with an average age of  $33 \pm 3.6$  years,  $7 \pm 3.1$  years of experience, they worked an average of  $38 \pm 3.4$  hours per week, and had  $3.3 \pm 0.92$  trainees. In addition, the trainers in this study had high school education ( $n = 15$ ), Bachelors ( $n = 45$ ), and Masters ( $n = 10$ ). Meanwhile, the trainees in this study consisted of males ( $n = 172$ ) and females ( $n = 61$ ) aged  $31 \pm 9$  years, practicing  $7 \pm 1$  hours per week and practicing with the instructor  $3.4 \pm 1.1$  per month. From the available data, the characteristics of injury to trainees can be divided into uninjured (male = 144; female = 35) and injured (male = 58; female = 26). This research took place in the fitness centers in the Special Region of Yogyakarta, which included 23 trainers from five districts (Sleman, Yogyakarta Main City, Kulonprogo, Bantul, and Gunung Kidul Regency) along with their trainees.

There are many trainers in the Special Region of Yogyakarta, but the researchers chose an inclusive sample to limit the research subjects to fit the research objectives without reducing the meaning of the research. The subjects in this study had inclusion criteria: a fitness center instructor with experience of at least 2-3 years and a permanent workplace/fitness and health center company. At the same time, trainees have criteria that include being a personal trainer client, having at least completed a training program for 2 months, and being 18-60 years old. Meanwhile, trainees who met the exclusion criteria included professional athletes, those with a history of injury before the training program with their trainers, and other health problems were excluded from the research subjects. Detailed characteristics of the trainers and trainees including trainee's injury histories in this study can be seen in Table 1.

### Data Collection

Questionnaires are a way of collecting large amounts of information that are relatively cheap, fast, and efficient (Sanusi et al., 2020). Using a questionnaire, a researcher will get the data needed in large quantities, such as the subjects in this study. The questionnaire applied in this study was a closed questionnaire adopted from Sugiyono (2015), which was used to measure the fitness trainers' understanding of injury prevention and treatment. On the other hand, questionnaires for injury histories in trainees were taken using a developed retrospective survey. In general, retrospective studies use data that already exists or is recorded in a company or organization. However, seeing that not all fitness centers record members' injury histories, we used a survey

adapted from the research by Stathokostas et al., (2012) regarding measuring injury histories related to sports activities. The questionnaires in this study were distributed to the respondents over 3 weeks. This study started from February 1, 2020, until July 31, 2020.

**Table 1. Descriptive data of trainer and trainee**

	N	Min	Max	Mean	Std. Deviation
<b>TRAINER</b>					
Gender (male-female)	70				
1. Male	53				
2. Female	17				
Age	70	25.00	39.00	33.3571	3.61573
Experience	70	2.00	14.00	7.1714	3.16215
Working hours	70	32.00	46.00	37.8714	3.39617
<b>TRAINEE</b>					
Gender (male-female)	233				
1. Male	172				
2. Female	61				
Injured	84				
1. Male	58				
2. Female	26				
Age	233	18.00	55.00	31.2060	8.93851
Training Per Week	233	120.00	360.00	200.9013	60.48335
Training Time with Personal Trainer	233	2.00	6.00	3.3348	1.12167

### Statistical Analysis

The test in this study was carried out in 2 stages: correlation and regression test. A correlation test through Pearson Correlation was used to determine the relationship between the fitness trainers' understanding of injury prevention and treatment and injury histories. Because the Pearson Correlation test cannot compare categorical variables, a correlation test for the variable scores of the fitness trainers' understanding of injury prevention and treatment and the number of their trainees who have a history of injury was carried out. Meanwhile, a regression test using Binary Logistic Regression was carried out to estimate whether the predictor variable is related to the dependent variable or the trainee's injury histories. Before testing the correlation hypothesis, the data is tested for assumptions first. Then, the data obtained is tested for normality using the Kolmogorov-Smirnov test, and then it is tested for linearity using the Linearity Test. If the data passes the assumption test, the research data will proceed to the correlation test stage. The correlation test in this study used the Pearson Correlation Test to determine the relationship between the fitness trainers' understanding of injury prevention and treatment and the trainee's injury histories. Finally, a regression test using logistic regression was performed to strengthen the results of the correlation analysis. All data analysis was carried out using the SPSS version 27 application.

## FINDING AND DISCUSSION

### Finding

#### *Description of trainer's injury understanding, prevention, and treatment*

This section presents the results of data analysis conducted on the fitness trainers' understanding level of injury prevention and treatment in novice athletes. To find out the results of the respondents, the researchers used a questionnaire by utilizing electronic media such as E-mail, WhatsApp, Facebook, and Instagram. This study applied a research instrument in the form of 44 questions, which were divided into three factors, namely 1) Understanding of injury, 2) Prevention of injury, and 3) Treatment of injuries. The descriptive results of the overall data analysis can be seen in Table 2.

**Table 2. Descriptive data of trainer's injury understanding, prevention, and treatment**

Factor	N	Minimum	Maximum	Mean	Std. Deviation
Understanding	70	19.00	69.00	40.3286	14.29475
Prevention	70	12.00	37.00	19.4000	7.01220
Treatment	70	16.00	39.00	27.5000	4.68346
Total (Three Factors)	70	47.00	144.00	87.2286	24.08991

The results of the score acquisition was then classified into 4 different groups, namely 1) Excellent, 2) Good, 3) Poor, and 4) Very Poor. The grouping of the Understanding Levels of the Fitness Trainers on Injury Prevention and Treatment, can be seen in Table 3.

**Table 3. The results of distribution of understanding of fitness trainers' injury prevention and treatment**

Interval	Category	Frequency	Percentage
Total (Three Factors)			
162.5 ≤ X ≤ 176	Excellent	0	0,0 %
110 ≤ X < 162.5	Good	10	18.57 %
57.5 < X ≤ 110	Poor	47	67.14 %
44 ≤ X ≤ 57.5	Very Poor	13	14.29 %
Total		70	100,0 %
Understanding Injury Factors			
45 ≤ X ≤ 48	Excellent	0	0,0 %
30 ≤ X < 45	Good	6	8.6 %
15 < X ≤ 30	Poor	26	37.1 %
12 ≤ X ≤ 15	Very Poor	38	54.3 %
Total		70	100,0 %
Injury Prevention Factors			
45 ≤ X ≤ 48	Excellent	0	0,0 %
30 ≤ X < 45	Good	6	8.6 %
15 < X ≤ 30	Poor	26	37.1 %
12 ≤ X ≤ 15	Very Poor	38	54.3 %
Total		70	100,0 %
Injury Treatment Factors			
71.2 ≤ X ≤ 76	Excellent	0	0,0 %
47.5 ≤ X < 71.2	Good	18	25.7 %
23.8 < X ≤ 47.5	Poor	36	51.4 %
19 ≤ X ≤ 23.8	Very Poor	16	22.9 %
Total		70	100,0 %

Based on the results in Table 3 above, it can be seen that the fitness trainers' understanding level of injury prevention and treatment in the Special Region of Yogyakarta is in the "very poor" category by 14.29% (n = 13), "poor" category by 67.14% (n = 47), the "good" category by 18.57% (n = 10), and the "excellent" category by 0% (n = 0) and the average score was  $87.23 \pm 24.09$ . It can be concluded that the overall level of the fitness trainers' injury understanding, prevention, and treatment in the Special Region of Yogyakarta was in the *poor* category.

The mean result of the understanding level of the fitness trainers in the Special Region of Yogyakarta based on the injury understanding factor was  $40.33 \pm 14.30$ , as seen in Table 2. The descriptive grouping based on the acquisition of the understanding of the injury factor score can be seen in Table 3 above. The understanding level of the fitness trainers in the Special Region of Yogyakarta based on the understanding of injury factors was in the "very poor" category by 22.86% (n = 16), "poor" category by 51.43% (n = 36), "good" category by 25.71% (n = 18), the "excellent" category by 0% (16). Meanwhile, based on the mean value of  $40.32 \pm 14.29$ , it can be concluded that the understanding level of the fitness trainers in the Special Region of Yogyakarta

based on the understanding of injury factors is included in the poor category.

The mean result of the understanding level of the fitness trainers in the Special Region of Yogyakarta based on injury prevention factors was  $40.33 \pm 14.30$ , as seen in Table 2. Descriptive groupings based on injury prevention factor scores can be seen in Table 3. The understanding level of the fitness trainers in the Special Region of Yogyakarta about injury prevention and treatment based on injury prevention factors is in the “very poor” category by 54.29% (38 trainers), “poor” category by 37.14% (26 trainers), “good” category by 8.57% (6 trainers), and “excellent” category by 0% (13 trainers). Meanwhile, based on the average value of  $19.40 \pm 7.01$ , it can be concluded that the understanding level of the fitness trainers in the Special Region of Yogyakarta based on injury prevention factors is in the *poor* category.

The result of the fitness trainers' understanding level of injury prevention and treatment in the Special Region of Yogyakarta based on injury treatment factors was  $27.50 \pm 4.68$ , as seen in Table 2. Descriptive groupings based on injury prevention factor scores can be seen in Table 3. The table above show that the fitness trainers' understanding level of injury prevention and treatment in the Special Region of Yogyakarta based on injury treatment factors was in the “very poor” category by 5.71% (16 trainers), “poor” category by 85.71% (36 trainers), “good” category by 8.57 % (18 trainers), and the “excellent” category by 0% (0 trainers). Meanwhile, based on the average value of  $27.50 \pm 4.68$ , it can be concluded that the understanding level of the fitness trainers in the Special Region of Yogyakarta based on injury treatment factors was included in the *poor* category.

#### ***Correlation between the injury prevention and treatment understanding and trainees' injury histories of fitness trainer***

This research uses the Kolmogorov test to determine whether the residual values are normally distributed. The results of the Kolmogorov test show that the residual variable value of the understanding of fitness center trainers in the Special Region of Yogyakarta about injury prevention and treatment with a histories of trainee injuries has  $p = 0.200 > 0.005$  so that residual data can be said to be normal. Details of the normality test can be seen in Table 4.

**Table 4. Residual value normality test results**

Variable	Statistic	df	Sig.
Residual	0.66	70	0.200*

After went through the Kolmogorov test, the data was continued to determine whether there was a linear relationship between the dependent and independent variables. The linearity test of the understanding of fitness center trainers in the Special Region of Yogyakarta about injury prevention and treatment with the trainee's injury histories shows that the  $p$ -value =  $0.072 > 0.05$ , so the data can be said to be linear. Details regarding the results of the linearity test can be seen in Table 5.

**Table 5. Linearity test results**

X*Y	Sum of Squares	df	Mean Square	F	Sig.
Linearity	44.722	1	44.722	100.056	0.001
Dev. From Linearity	36.645	46	.797	1.782	0.072

The Pearson Correlation test was conducted to determine the relationship between the understanding of fitness center trainers in the Special Region of Yogyakarta regarding injury prevention and treatment with trainees' injury histories. At the Pearson Correlation Test stage, the analysis showed a relationship between the understanding of fitness center trainers in the Special Region of Yogyakarta about injury prevention and treatment or total (three factors) (X) and trainees' injury histories (Y), as seen from the  $p = 0.01 < 0.05$ . Meanwhile, the relationship between the two variables has a negative correlation direction with a significant relationship strength ( $r = -0.700$ ). Details of these results can be seen in Table 6.

**Table 6. Pearson correlation test results for variable X total and injury histories**

Variable	N	r	p
X Total*Y	70	-0.700	>0.001

### Logistic regression

Binary logistic regression data processing is carried out by entering the injury histories predictor variables taken from the characteristics of trainers and trainees into the logistic regression model. The logistic regression model was created to estimate the relationship between the independent variable (predictor variable) and the dependent variable (injury histories variable). The predictor variables included in the logistic regression model are explained in Table 7.

**Table 7. Classification of independent variables or predictors**

No.	Predictor Trainer	Type	Predictor Trainee	Type
1.	Total (three factors)	Continuous	Age	Continuous
2.	Experiences	Continuous	Training per Week	Continuous
3.	Working Hours	Continuous	Training Duration with Trainer	Continuous
4.	Age	Continuous	Gender	Categorical
5.	Gender	Categorical		
6.	Education	Categorical		

Before the Binary Logistic Regression Test is carried out, the omnibus test and Hosmer and Lemeshow test are carried out to find out whether the model can be said to fit with the existing data (observation model). Based on the results of these two tests, the logistic regression model in this study is said to be fit (Omnibus  $p < 0.001$  and Hosmer and Lemeshow Test  $p = 0.818$ ). Apart from that, the Nagelkerke R Square value = 0.846 indicates that the predictor variable can explain or predict the dependent variable by 84.6%. Details regarding the results of these tests can be seen in Table 8

**Table 8. Binary logistic regression model test results**

Omnibus			Nagelkerke R Square	Hosmer and Lemeshow Test	
Chi-Square	df	Sig		Chi-Square	Sig
223.781	11	>.001	0.846	4.413	0.818

Furthermore, it is known that the model can classify 92.7% correctly according to the actual class or observation model. Details can be seen in Table 9.

**Table 9. Table of classification based on the binary logistic regression model**

		Predicted			Percentage Correct
		Injury	Not Injured	Injured	
Injured	0 = Not Injured		138	11	92.6
	1 = Injured		6	78	92.9
Overall Percentage					92.7

Through the Binary Logistic Regression Test, it is known that total (three factors) ( $p = 0.030 < 0.05$ ) and training per week ( $p < 0.001 < 0.05$ ) can significantly predict injury. In contrast, other predictor variables (trainees' age, gender, length of training with trainer, and trainers' education, experience, working hours, age, gender) have  $p > 0.05$  and are therefore considered statistically insignificant, indicating no significant relationship with injury. Meanwhile, it is known from the results of this analysis that the higher scores of the fitness trainers' understanding of injury prevention and treatment (a total of three factors) obtained by the trainer, the higher the potential

for the trainee not to experience injury ( $\text{Exp}(B) 0.968 < 1$ ). Meanwhile, the higher the trainee's weekly practice, the higher the risk of injury that trainees may experience ( $\text{Exp}(B) 1.062 > 1$ ). In other words, the level of knowledge regarding understanding the prevention and treatment of trainer injuries and training hours/week can potentially cause injury to the trainee. An interesting finding from this research is that trainee age, gender, length of training with trainer, and trainer education, experience, working hours, age, and gender do not influence injuries to trainees. More complete details regarding the Binary Logistic Regression Test results are in Table 10.

**Table 10. The results of binary logistic regression variable predictor test with injury group references**

Predictor	df	Exp(B)	95% CI		Sig
			Lower	Upper	
Trainee's Age	1	1.014	.905	1.137	.807
Gender Trainee (Male)	1	1.082	.267	4.383	.912
Training Duration with Trainer	1	.842	.387	1.833	.665
Training per Week	1	1.070	1.046	1.093	.000
Total (three factors)	1	.918	.850	.992	.030
Education	2				.619
Education (1)	1	.257	.010	6.695	.414
Education (2)	1	.270	.020	3.721	.328
Experience	1	1.672	.970	2.882	.064
Working Hour	1	.992	.800	1.228	.938
Trainer's Age	1	.864	.632	1.180	.358
Gender PT(Male)	1	1.217	.303	4.898	.782
Constant	1	.007			.480

## Discussion

Various study results in the Special Region of Yogyakarta found that fitness trainers' knowledge about injury prevention and treatment consists of three main factors: the definition of injury, injury prevention, and injury treatment (de Sousa Nogueira Freitas et al., 2020; Souter et al., 2018). Then, the data obtained from three factors shows that the average fitness instructor in the Special Region of Yogyakarta is all in the poor category. Understanding injuries, injury prevention, and injury care are basic things that a fitness center instructor must master. If this is ignored, it will cause many problems that will be experienced by members (Simone Pettigrew, Elissa Burton, Kaela Farrier, Anne-Marie Hill2, Liz Bainbridge, Gill Lewin, Phil Lewin4, 2014).

The findings in this study are that four factors greatly influence the understanding of fitness center trainers in the Special Region of Yogyakarta regarding injury prevention and treatment, including (1) educational background, (2) fitness conditions, (3) the lack of fitness trainers deepening prevention and treatment knowledge, (4) the perception of fitness trainers regarding injury prevention and treatment. The quality of an individual in the world of work, such as coaches, teachers, and fitness trainers, in addition to educational background experience, is a significant factor because education is the primary basis for a human being to gain knowledge according to his discipline and quality and noble character (Sardjana et al., 2019). The new findings revealed in this study are those who act as fitness trainers without a background in sports education, sports science coaching, and physical education.

Non-linear work is not new, but it would be better if fitness centers employed people with certifications or patents in that field (Semina et al., 2019; Sugiyono, 2015). so that they will have an expert who will handle the typical injury directly (Rose et al., 2017). As for the condition of the fitness center in the Special Region of Yogyakarta, fitness trainers in urban areas are more concerned with matters regarding injury care (Skovsmose, 2016). This is because the manager facilitates equipment that is inversely proportional to the condition of fitness centers in rural areas or areas far from the city, where the trainers tend to be less concerned about injury care due to the limited facilities provided. Some fitness centers are also inadequate, lack first aid kits, and even

a few do not provide restrooms, or the condition of the restroom is poor (Smith et al., n.d.).

The main results of this study indicate that the Level of Understanding of Fitness Trainers on Injury Prevention and Treatment has a strong negative relationship with trainee injury histories ( $r = -0.700$ ,  $p < 0.001$ ). It is known that through this relationship, the higher the level of understanding of fitness trainers on injury prevention and treatment, the lower the level of injury in the trainees they train. Meanwhile, the results of this correlation analysis were strengthened by the results of the regression analysis, which showed that the level of understanding of fitness trainers on injury prevention and treatment ( $p = 0.03$ ) together with the trainee's training per week ( $p < 0.001$ ) had a significant effect on the trainee's injury potential. Meanwhile, the relationship between the level of understanding of fitness trainers on injury prevention and treatment and the potential for injury is negative. When the level of understanding of fitness trainers on injury prevention and treatment is higher, the level of trainees experiencing injuries will be lower ( $\text{Exp}(B) 0.968 < 1$ ). Meanwhile, a positive relationship was shown by trainees' weekly training with injuries. The higher the trainee's weekly practice, the higher the potential for the trainee to experience injury ( $\text{Exp}(B) 1.062 > 1$ ).

However, knowledge about injury management from sports coaches or personal trainers is important in preventing injuries to athletes or clients they train (Tabben et al., 2023; Talpey & Siesmaa, 2017). Good knowledge of injury management can help trainers create safe programs and prevent injury. This includes creating training programs that suit individual portions. Following the findings of this research, research by Grier et al., (2022) shows an increase in the risk of injury as time spent on weight training per week increases. Therefore, it is recommended to apply moderate time spent by personal trainers when training trainees to achieve the training program well and pay attention to the principle of injury prevention.

Some fitness trainers in the Special Region of Yogyakarta tend not to try to deepen their understanding of Injury Prevention and Treatment. For them, the knowledge of physical education they get is enough to train at the fitness center. These individuals ignore existing sports injury training to deepen their understanding of injury prevention and treatment (Barranco-Ruiz et al., 2020; Summitt et al., 2016). This is often found in fitness trainers who are more senior but lack a systematic approach to injury prevention and management (O'Connor, 2019). The researchers even found facts that occurred in the field that there were fitness trainers who had the perception that exercise was enough to convey material on how to train members and did not care about the prevention and treatment of injuries (Skovsmose, 2016). Some of these fitness trainers assume that if an injury occurs to a member during training, the handling is immediately submitted to the nearest medical personnel, in this case, a clinic or hospital (Skovsmose, 2016). When trainee's body suffers from various types of injuries, an instructor in a fitness center must adequately carry out injury prevention and treatment. If this stage is not handled correctly, it can cause more severe tissue damage (Doolan-Noble et al., 2019). One method often used for injury prevention and treatment in fitness centers is RICE, namely Rest, Ice, Compression, and Elevation, to help relieve pain, reduce swelling, and speed up (Bianco et al., 2011). Rest the injured body part, and put ice packs on the injured body part. Do it for 20 minutes, 4 – 8 times daily, compressing and pressing the injured body part to prevent swelling and elevation (Pugh et al., 2020). Elevate the injured body part so blood flow returns smoothly (Latella & Haff, 2020).

Surprisingly, this study found no relationship between trainee age, trainee gender, length of training with the trainer's education, experience, working hours, age, and gender on trainee injuries. The relationship between the variables mentioned for injury cannot be explained with certainty and is currently contradicted by the existing literature. For example, the findings in this study contradict those of Ahmed et al., (2022) which stated that there is a relationship between PT experience and muscle injury in trainees. However, in line with this research, it also shows no relationship between trainer education and muscle injuries in the trainees they train. On the other hand, Malek et al., (2002), and Waryasz et al., (2016) stated that knowledge regarding injury prevention will increase according to the level of education and expertise certification. In this case, knowledge of injury management, injury prevention, and training program development is

closely related to the level of education. Alternatively, in other words, knowledge of injury prevention is also influenced by the level of education, and education can indirectly affect the risk of injury.

Meanwhile, although this study did not find a relationship between gender differences and injury, the research results of Grier et al., (2022) dan Quatman et al., (2009) show that gender can influence injuries during weight training. It is known that injuries are more experienced by men than women, with men more likely to experience sprains and strains during weight training, while women experience accidental injuries. However, the level of injury compared by gender cannot explain why men are more likely to suffer injuries than women. Currently, the incidence of injuries in women is higher than before. This increase can be explained by increasing women's participation in weight training or sports activities in the gym (Kerr et al., 2010). Different from several decades ago, weight training or gyms are dominated by men (Lefkowich et al., 2017; Nuzzo, 2020).

This study could not find a relationship between trainee age and injury. This is in contrast to the findings of Noteboom et al., (2023) which stated that the young population (and men) are at greater risk of injury than the older population (and women). The study added that young people have a higher risk of injury due to the choice of higher exercise intensity than old age. Meanwhile, according to Huebner and Ma (2022) age also has a risk of injury, with the prevalence of injury associated with the decreased physiological function of the body. Looking at various previous studies, it can be concluded that the relationship between age and injury is still very ambiguous. We also suggest it is very early to interpret the relationships between injury-to-injury predictor variables. Further in-depth research must be conducted by reducing research bias to make the results more accurate.

Prevention and Treatment are the conditions and forms of injury experienced by the members. This is done when caring for injured members (Sole et al., 2019). Prevention is an excellent thing to do so that members avoid injury. Many things can be done to minimize the occurrence of injuries, including using the correct and appropriate sports equipment such as dumbbells, barbells, bench presses, and others, warming up well before exercising, using the proper technique, using good rest periods, paying attention to fluid and food intake, and finally stretch after exercise (Elbashir et al., 2014; Zagnit et al., 2016). If these things can be done correctly, it can be ascertained that the members have a slight chance of getting injured.

Although this research has been carried out as closely as possible, we realize it is not free from its limitations. The limitations of this study can be mentioned in at least several essential parts. First, since many predictors influence injuries, we assume that our results are not optimal because they do not include other potential predictor variables that might affect injuries (medical and psychological measurement results). Second, our research uses a survey or self-reported questionnaire method, which can cause high bias. We cannot know whether our research sample answered this research question honestly. Third, measurements related to injury histories have different recall periods.

In contrast, the measurement of an injury histories that we adopted from Stathokostas et al., (2012) uses a 12-month recall period, which may cause differences in bias regarding how individuals understand the injuries they have experienced. Fourth, we realize that injuries to trainees are known to be related to training programs and gym facilities. Meanwhile, we did not investigate further about differences in gym facilities and the application of training programs provided by trainers. In other words, the main limitation of this research is the scope of factors that the researcher examines. There is insufficient variation in the data presented in this study. As well as the number of fitness center places. The researcher hopes that other researchers will examine this research on a broader scale, presenting more varied data and having more fitness centers in their research.

## CONCLUSION

The findings in this study show that the level of understanding of fitness trainers on injury prevention and treatment, according to the correlation test, has a strong negative relationship with the trainee's injury histories ( $r = -0.700$ ,  $p < 0.001$ ) and is strengthened by the results of the binary logistic regression test ( $p = 0.030$ ,  $\text{Exp}(B) 0.968 < 1$ ). Meanwhile, trainee training per week ( $p < 0.001$ ,  $\text{Exp}(B) 1.062 > 1$ ) is positively related to the potential for trainee injury. A fitness center is an alternative that an individual highly prefers as a place to improve the quality of health and performance of various sports activities with professional facilities and trainers, considering that the level of understanding of fitness trainers on injury prevention and treatment in this study is in a poor category. Therefore, the understanding of fitness trainers in the Special Region of Yogyakarta regarding preventing and managing injuries needs to be improved. It is necessary to improve themselves by participating in international and national studies and seminars to develop potential in this field. To improve trainers' understanding of injury prevention and treatment, the proper steps to improve the quality of trainers are attending various seminars, training, small-scale and large-scale discussions between trainers, and taking certificates of injury prevention and treatment.

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