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THE EFFECT OF EXERCISE THERAPY AND RANGE OF MOTION (ROM) ON CHRONIC ANKLE INSTABILITY (CAI) IN PELATDA PON XX ATHLETES DKI JAKARTA PROVINCE

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Abstract The purpose of this study is to determine the effect of exercise therapy methods and athlete's ROM on chronic ankle instability (CAI). The research method is an experiment with a treatment by level 2x2 design. The population of the athletes of Pelatda PON XX DKI Jakarta Province who experience chronic ankle sprain is 74 athletes. The number of samples from each level are: group (B1) is 27% of 74 = 19.98 (20) sample and group (B2) is 27% of 74 = 19.98 (20) sample. The research sample was 40 people. Hypothesis testing using the Tukey test. Based on the research results, it can be concluded: 1) there is a significant difference between the A1 and A2 methods on Y. Judging from $F_o = 54.269$ sig. $0.00 < 0.05$. 2) There is a significant interaction effect between A and B on Y. Judging from $F_o = 54.269$ sig. $0.00 < 0.05$. 3) there is a significant difference in Y using exercise therapy A1 and A2 in group B1. This is evidenced by the value of sig. $0.00 < 0.05$. 4) there is a significant difference in Y results using exercise therapy A1 and A2 in group B2. It is proven by the value of sig. $0.00 < 0.05$.

Keywords: therapy online; offline; rom; *chronic ankle instability*

INTRODUCTION

In the implementation of training Pelatda athletes cannot be separated from the obstacles that occur in the field. One of the obstacles that can affect the condition of athletes in training is injury. Based on data contained in the field of science and technology, KONI DKI Jakarta Province in 2021, there were 511 athletes of the XX PON Pelatda DKI Jakarta Province who experienced various types of injuries ranging from upper to lower body. Injury is a problem that is difficult for athletes to avoid and can be an obstacle to hinder an athlete's performance either in training or in a match. According to Maffulli et al. (2011) that injury can counteract the beneficial aspects associated with sporting activity if the athlete is unable to continue to participate because of the residual effects of the injury.

Based on the cause, the injury that occurs depends on the type of exercise and the sport. Generally, the injury occurs due to muscle weakness, poor infrastructure and overuse (Junaidi, 2018). Injuries can affect muscles and tendons, joints and ligaments, bones, and nerves (Kushartanti, 2015). This injury occurs due to a tear in the ligament fibers that bind the ankle joint. As stated by

Brunker and Khan, (1993: 439) one injury that occurs in sports players is an ankle sprain or ankle sprain, ankle sprain is an ankle injury due to sudden movements in the lateral or medial direction which results in tearing of the ligament fibers in the joint. ankle (Sumartiningsih, 2012).

According to (Anguish & Sandrey, 2018) that the reported injury rate of all ankle complaints is between 75% and 85% with lateral ankle sprains. The degree of ligament injury is the same as the degree of muscle injury, starting with grade one where the injury only damages some of the ligament fibers to grade three where the ligament fibers have been severed or nearly broken.

Maffulli et al. (2011) in the American Journal of Sports Medicine data, ankle injuries account for 21% of all sports injuries. Ankle ligament injuries were more frequently (83%) diagnosed as sprains in the ligaments and were more common in sports such as basketball and volleyball. Ankle sprains are a common and frequently occurring sports injury taken for granted by athletes and coaches. Based on data contained in the science and technology field of KONI DKI Jakarta Province in 2020, it was recorded that 74 (14,5%)

athletes from the XX PON Pelatda DKI Jakarta Province who suffered ankle sprain injuries from the total injury data of 511 athletes who complained of various types of injuries ranging from upper to lower body.

According to Doherty et al. (2017) that the incidence of ankle sprain injuries is quite high, posing a significant risk to participants from various types of activities and sports. Setiawan (2011), overuse can lead to chronic injury. Lateral ankle sprains have been shown to be one of the most common musculoskeletal injuries in athletes and the recreationally active population. In addition, it is estimated that approximately 30% of people with lateral ankle sprains will experience recurrent ankle sprains and experience symptoms of pain and instability lasting >1 year.

Chronic ankle instability (CAI) is the term used to describe cases involving recurrent ankle sprains and decreased function for >1 year after the initial ankle sprain. These include reduced range of motion, decreased strength, impaired neuromuscular control, and altered functional movement patterns (Donovan and Hertel, 2013).

People who experience their ankle sprain continue to develop chronic ankle instability (CAI). CAI conditions are often classified as pain, loss of function, and restriction, or failure, to return to a previous level of activity (Wikstrom and Brown, 2014). According to (Loudon, Reiman, & Sylvain, 2014) that chronic ankle instability can be caused by mechanical instability, functional instability or a combination of both.

Donovan and Hertel (2013) explained that patients with CAI exhibit various types of deficits, including decreased ROM and strength, impaired proprioception and neuromuscular control and changes in gait. Chronic ankle sprains are one of the most common musculoskeletal injuries, and up to 70% of individuals with acute ankle sprains may develop residual physical disability, which may include chronic ankle instability (Herzog, Kerr, Marshall, & Wikstrom, 2019). Mechanical instability refers to pathological anatomic changes, often acquired ligamentous laxity of the ATFL and CFL (Gruskay, Brusalis, & Heath, 2019).

Instability (decreased stability) of a joint can be affected by muscle

weakness, weakness by ligaments that function to stabilize the joint. The factors that play a role in the balance itself are various factors such as musculoskeletal disorders and disorders, decreased muscle flexibility, decreased sensory systems such as proprioceptive, visual, vestibular and neuromuscular systems (Riyanto & Wahyuni, 2019).

In addition to administering action or administering medication, several series of programs for injury rehabilitation are usually also recommended by a sports medicine specialist or medical rehabilitation specialist to be run after an athlete is consulted about the condition of his injury. The rehabilitation programs include; physiotherapy, massage therapy and also recommended exercise therapy according to the condition of the injury. Of course, with the aim of accelerating the healing process so that athletes can return to practice or compete with maximum performance. Rehabilitation programs are critical to achieving functional recovery after a sports injury (Roi, 2010).

Someone who is injured will automatically protect the injured body part by minimizing the movement of the injured part. This happens because of the

pain and the ability of the injured body part that is not ready to accept the body's burden. The lack of movement in the injured body part causes the function of the ligaments and muscles to decrease which results in a decrease in strength, and will be followed by impaired postural control or Proprioceptive disturbances from the injured body (Syafrianto, Muchlis, & Ayu, 2021).

Decreased Range of Motion (ROM) also occurs in someone who has an ankle sprain. As described in (Hamzah, Fauziah, & Sa'diah, 2020) that in the case of ankle sprain, a person experiences residual symptoms such as ligament laxity, proprioceptive impairment, decreased Range of Motion (ROM), repetitive swelling, pain during activity, and ankle instability. Exercise therapy is one way of injury rehabilitation to speed up the patient's recovery from injury and to prevent repeated injuries.

There are various ways to heal ankle injuries, from first aid, treatment, to injury rehabilitation. In injury rehabilitation can be done with exercise therapy (exercise therapy). Therapy and exercise are part of the injury management process. Exercise therapy can improve flexibility or Range of

Motion (ROM), strength, and muscle endurance (Kushartanti, 2015). Weaknesses or disabilities of the injured part can be reduced by exercise therapy. The importance of exercise therapy in the management of injuries to reduce muscle weakness so that the injury is not easily repeated. Exercise therapy can reduce the occurrence of chronic ankle sprains and may be effective in managing chronic ankle instability (Lin, Hiller, and De Bie, 2010)

In providing an exercise therapy program for injured conditions, there are various methods of exercise therapy that can be given to athletes according to the condition and part of the injury being complained of. Likewise, giving the right combination form of exercise therapy to improve stability in chronic ankle sprain conditions is very important. Balance exercise is also effective in preventing ankle sprains in athletes with previous sprains (Petersen et al., 2013).

The provision of exercise therapy, both active and passive, using tools or not using tools, can have the effect of increasing adaptation to recovery of tendon and ligament strength, and can increase muscle mass strength, and can maintain ankle joint

stability. This increases the range of motion in the ankle joint (Fadilla, 2018). (Kushartanti, 2015) explained that the basic components of exercise therapy include flexibility and ROM exercises, strength and muscle endurance exercises, and proprioceptive, coordination, and agility exercises. This is confirmed in the Journal of Medical Science And Clinical Research that a large body of literature demonstrates the benefits of early, progressive rehabilitation exercise for all types of musculoskeletal conditions. These benefits include restoration of ROM, decreased pain, nerve inhibition, faster return of muscle function, and improved performance in sports and all activities of daily living (M.P.T, 2017)

The pattern of injury rehabilitation through exercise therapy, which is usually done by athletes from Pelatda PON DKI Jakarta, is carried out by the KONI Polyclinic of DKI Jakarta Province accompanied by a therapist. With the ongoing Covid-19 Pandemic conditions as well as physical distancing policies as well as the PPKM (Enforcement of Community Activity Restrictions) policy as an effort to break the chain of the spread of Covid-19, this has an impact on the pattern of limiting

human activity in various sectors of life, one of which is in the field of education. sports are included in the rehabilitation process for athletes at KONI DKI Jakarta which also limits the visits of athletes at the KONI DKI Jakarta Polyclinic. If this is not addressed wisely, there is a risk that the athlete cannot be optimal in the rehabilitation process for the injury he is experiencing.

Based on the explanation of the problems above, the researcher tries to understand in-depth research. In this case, researchers will try to examine methods of exercise therapy for chronic ankle sprains that are carried out offline at the DKI Jakarta KONI Polyclinic and online for athletes who experience chronic ankle sprains with the aim of increasing ankle stability in athletes of Pelatda PON XX DKI Jakarta Province.

Furthermore, the researcher will conduct research on a scientific basis entitled "The Effect of Exercise Therapy and Rom (Range of Motion) on Chronic ankle instability (CAI) Athletes of the XX PON Pelatda DKI Jakarta Province".

METHOD

The general purpose of this study was to determine the effect of exercise therapy methods and athlete's ROM on chronic ankle instability (CAI). The

method used in this study using the experimental method. The research design used is a treatment design by level 2 x 2. The test instrument to measure ankle stability uses a Y-balance test and ROM uses a Goniometer. The population in this study were athletes from Pelatda PON XX DKI Jakarta Province who experienced chronic ankle sprain, totaling 74 athletes. The number of samples from each level are: the group of athletes who have high ROM (B1) is 27% of 74 = 19.98 or rounded up to 20 samples and the group of athletes who have low ROM (B2) is 27% of 74 = 19.

RESULTS AND DISCUSSION

Results

The description of the description of the research data aims to see in general the description of Chronic Ankle Instability (CAI) Athletes of PELATDA PON XX DKI Jakarta Province who are the research subjects. This research is divided into 4 research groups. The summary results of the calculation of descriptive statistics can be seen in the table below:

Table 2 Summary of Statistical Calculations

Range of motion (ROM)	Statistic	Exercise therapy		Total
		Online	Offline	
High	n	10	10	20
	\bar{x}	90,2	88,24	89,24
	s	2,10	2,30	2,38
Low	n	10	10	20

	s	\bar{x}	78,08 1,83	82,36 0,80	80,22 2,59
Total	n	\bar{x}	20 84,2	20 85,3	
	s		6,53	3,45	

Testing Requirements Analysis of Variance

The hypothesis testing of this research was conducted using two-way analysis of variance (ANAVA). As a requirement to perform the two-way ANOVA test, it is necessary to test for normality and test for homogeneity using the SPSS.26 application. The results of the normality test using Shapiro-Wilk obtained the results of 0.984 and the value of sig. or p-value $0.817 > 0.05$, so it can be concluded that all data groups in this study were taken from a normally distributed population so that it can be used for hypothesis testing. The results of the homogeneity test based on Levene's test obtained sig. or /p-value $0.125 > 0.05$, H_0 is accepted. Thus, it can be concluded that the data comes from a homogeneous variance.

Hypothesis test

Analysis of Variance (ANOVA) was carried out with SPSS 26. For more details, the results of hypothesis testing can be seen in the table below.

Table 5. Summary of Calculation Results Analysis of Variance (ANOVA)

Tests of Between-Subjects Effects
 Dependent Variable: Chronic Ankle Instability (CAI)

Source	F	Sig.
Model	83.332	.000
Intercept	78343.707	.000
TERAPI	54.269	.000
ROM	195.624	.000
* TERAPI ROM	54.269	.000

a. R Squared = .874 (Adjusted R Squared = .864)

- There is a difference between online exercise therapy (A1) and offline exercise therapy (A2) on Chronic Ankle Instability (CAI) (Y)**

Based on table 5, the output of SPSS Tests of Between-Subjects Effects can be obtained in the THERAPY column that the F value is 54,269, Sig. $0.000 < 0.05$, it means that the hypothesis is accepted. It means that there is a difference in Chronic Ankle Instability (CAI) Athletes of PELATDA PON XX DKI Jakarta Province in terms of the exercise therapy given.

Furthermore, the output of SPSS Tests of Between-Subjects Effects in the ROM column shows the value of Sig. $0.000 < 0.05$, it means that the hypothesis is accepted. Fcount $195.624 > Ftable$

4,113 which means that there is a difference in Chronic Ankle Instability (CAI) Athletes in PELATDA PON XX DKI Jakarta Province in terms of the athlete's ROM level.

2. There is an interaction between exercise therapy (A) and range of motion (ROM) (B) on Chronic Ankle Instability (CAI) (Y)

Based on table 5 in the THERAPY*ROM column, it is found that the value of F0 (AB) = the value of 54.269 with p-value/Sig. 0.000 < 0.05, it means that the hypothesis is accepted. This means that there is an interaction between exercise therapy (online and offline) and Range of Motion (high and low) on Chronic Ankle Instability (CAI) Athletes of PELATDA PON XX DKI Jakarta Province. Based on the analysis results, the effect of exercise therapy (online and offline) and Range of Motion (high and low) on Chronic Ankle Instability (CAI) Athletes in PELATDA PON XX DKI Jakarta Province is 86.4%. The effect of the interaction is shown visually in the following figure:

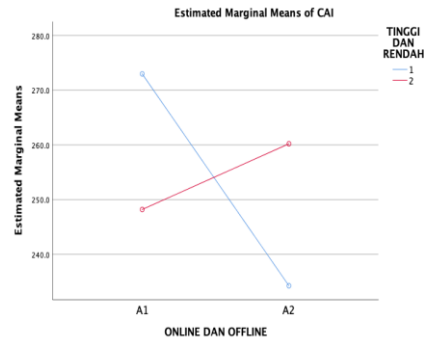


Figure 1 Interaction between Exercise Therapy and Range of Motion (ROM) on chronic ankle instability (CAI)

3. There is a difference between online exercise therapy (A1) and offline exercise therapy (A2) on chronic ankle instability (CAI) (Y) in the group of athletes who have a high Range of Motion (ROM) (B1)

The results of the calculation of the hypothesis test on the simple effect test for B1 were carried out using the Tukey test. The results can be seen in the table below:

Table 6 calculation results of the third hypothesis test

Multiple Comparisons				
Dependent Variable: Chronic Ankle Instability (CAI)				
Tukey HSD				
	(I)	(J)	M	Sig.
	A1B1- A2B1 DAN	A1B1- A2B1 DAN	Mean	
	A1B2- A2B2	A1B2- A2B2	Difference (I-J)	
1	A1B1	A2B1	1.9970	.000
2	A1B2	A2B2	-4.2810*	.000

Based on the spss output from the Analysis of Variance (ANOVA) further

test with the Tukey test, it was found that the difference in Chronic Ankle Instability (CAI) Athletes PELATDA PON XX DKI Jakarta Province (Y) between online therapy (A1) and offline therapy (A2) in group of athletes who have a high range of motion (ROM) (B1).

The simple effect test for B1: (A1B1-A2B1) has a sig value of 0.000 < 0.05 so that H₀ is rejected. This means that there is a difference in the average results of Chronic Ankle Instability (CAI) of athletes who are treated online with offline therapy, there is a group of athletes who have a high range of motion (ROM) (B1). The average value of athletes treated online was higher than the group treated offline in the group of athletes who had a high range of motion (ROM), the mean difference was 2.00.

4. There is a difference between online therapy (A1) and offline therapy (A2) on Chronic Ankle Instability (CAI) (Y) in the group of athletes who have low Range of Motion (ROM) (B2).

Based on the spss output from the Analysis of Variance (ANOVA) further test with the Tukey test, it was found that the difference in Chronic Ankle Instability (CAI) Athletes PELATDA PON XX DKI Jakarta Province (Y) between online therapy (A1) and offline

therapy (A2) in group of athletes who have a low range of motion (ROM) (B2). The simple effect test for B1: (A1B2-A2B2) has a sig value of 0.000 < 0.05 so that H₀ is rejected. This means that there is a difference in the average results of Chronic Ankle Instability (CAI) athletes treated online with offline therapy in the low range of motion (ROM) group (B1). The average score of athletes treated offline was higher than the group treated online in the group of athletes who had a low range of motion (ROM), the mean difference was 4.2810.

Discussion

1. There is a difference in the effect of online exercise therapy with offline exercise therapy on Chronic Ankle Instability (CAI)

The results of testing the first hypothesis showed that the overall average Chronic Ankle Instability (CAI) score in the online exercise therapy group was smaller than the offline exercise group of 84.2 < 85.3. From these findings, it can be stated that the offline form of exercise therapy is more effective than the online form of exercise therapy.

This can be seen from the results of statistical analysis with a mean difference of 1.143. Thus, it means that Chronic Ankle Instability (CAI) using

offline exercise therapy has a better effect than online exercise therapy.

Exercise therapy is an injury rehabilitation method to speed up the patient's recovery from injury and to prevent repeated injuries. The importance of exercise therapy in the management of injuries to reduce muscle weakness so that the injury is not easily repeated and can recover quickly. The exercise therapy program must be structured with the right dose in a systematic manner according to the level of injury the athlete has and must be carried out in accordance with the exercise program and under the direct supervision of the therapist.

In this pandemic period, online exercise therapy is one of the preferred methods of injury therapy. However, based on the results of research in this study, offline exercise therapy can provide better results than online exercise therapy. However, these two types of therapy still provide an increase in Chronic Ankle Instability (CAI).

2. There is an Interaction between exercise therapy and Range Of Motion (ROM) on Chronic Ankle Instability (CAI)

From the results of testing the second hypothesis, it proves that there is an interaction showing that there is an interaction between online exercise

therapy and offline exercise therapy with Range of Motion (ROM) in its effect on Chronic Ankle Instability (CAI) Athletes Pelatda PON XX DKI Jakarta Province or in other words the research hypothesis submitted is proven to be true.

If the therapist uses the right form of exercise therapy, it will be able to increase the Range of Motion (ROM) owned by the Pelatda PON XX athletes of DKI Jakarta Province. Along with this, there will also be an increase in Chronic Ankle Instability (CAI) owned by Athletes of the XX PON Pelatda DKI Jakarta Province. Based on the explanation above, it can be concluded that by using the right form of exercise therapy in training Range Of Motion (ROM), it will also be able to increase the Chronic Ankle Instability (CAI) of the athletes of Pelatda PON XX DKI Jakarta Province.

3. Athletes of Pelatda PON XX DKI Jakarta Province who have a high range of motion (ROM) will have better chronic ankle instability (CAI) if they are treated with an online form of exercise therapy than if they are treated with an offline form of therapy

The mean value in the A1B1 group is 90.2 and the mean value in the A2B1 group is 88.24, or it can be written $A1B1 > A2B1$. Based on the difference

in average, it can be concluded that the athletes of Pelatda PON XX DKI Jakarta Province who have a high range of motion (ROM) will have better chronic ankle instability (CAI) if they are treated with online exercise therapy instead of being treated with other forms of therapy offline.

The results of testing the third hypothesis showed that overall, the Chronic Ankle Instability (CAI) scores in the group given the online form of exercise therapy and the offline form of therapy in the high category range of motion (ROM) were significantly different. From these findings, it can be stated that the online form of exercise therapy in the high category range of motion (ROM) has a greater average score than the Chronic Ankle Instability (CAI) score in the group given the offline exercise therapy form in the range of motion (ROM). high category.

4. Athletes of Pelatda PON XX DKI Jakarta Province who have a low range of motion (ROM) will have better chronic ankle instability (CAI) if they are treated with an offline form of exercise therapy than if they are treated with an online form of therapy

The mean value in the A1B2 group is 78.08 and the mean value in the A2B2 group is 82.36 or it can be written $A1B2 < A2B2$. Based on the average

difference, it can be concluded that the athletes of Pelatda PON XX DKI Jakarta Province who have a low range of motion (ROM) will have better chronic ankle instability (CAI) if they are treated with offline exercise therapy than if they are treated with other forms of therapy on line.

The results of testing the fourth hypothesis show that overall, the Chronic Ankle Instability (CAI) scores in the group given the online form of exercise therapy and the offline form of therapy in the low category of range of motion (ROM) have significant differences. From these findings, it can be stated that the form of offline exercise therapy in the low category range of motion (ROM) has a greater average score than the Chronic Ankle Instability (CAI) score in the group given the online form of exercise therapy in the range of motion (ROM) low category.

CONCLUSION

1. There are differences in the results of the Chronic Ankle Instability (CAI) that is owned by Athletes of Pelatda PON XX DKI Jakarta Province who are trained using online exercise therapy and offline exercise therapy.
2. There is an interaction between the form of exercise therapy and the

range of motion (ROM) owned by the Athletes of the XX PON Pelatda DKI Jakarta Province against Chronic Ankle Instability (CAI). That is, training the range of motion (ROM) with appropriate online exercise therapy and offline exercise therapy will be able to increase the Chronic Ankle Instability (CAI) of the athletes of Pelatda PON XX DKI Jakarta Province.

3. Athletes of the PON XX Pelatda DKI Jakarta Province who have a high range of motion (ROM) will have better Chronic Ankle Instability (CAI) if they are treated with online exercise therapy than offline exercise therapy.
4. Athletes of Pelatda PON XX DKI Jakarta Province who have low range of motion (ROM) will have better Chronic Ankle Instability (CAI) if they are treated with offline exercise therapy than online exercise therapy.

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