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Original Article Research

Cold Compression and Kinesio Taping to Accelerate Football Athletes' Injury Recovery

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Abstract

The likelihood of injury because of sports is normal, particularly in soccer sports that have the potential for body contact. One of the ongoing injury treatment is using Cold Compression and Kinesio Taping. The aim of this study was to decide the impact of the utilization of Cold Compression combined with Kinesio Taping on Achilles Ligament wounds and Patella wounds of football competitors. The research method used in this study is a quasi-experiment with the research design of The Non-Equivalent Control Group Design. In this study we use instruments VISA-A (Victorian Establishment of Game Evaluation Achilles), VISA-P (Patella) and ROM (Range of Motion) to quantify the degree of agony experienced by partisipants. Partisipants in this study were football athlete who suffered an injury adding up to 19 partisipants, going in age from 16 to 24 years. We used a purposive sampling approach used with several participant criteria and incidental sampling. There are two groups, namely the group given treatment in the form of Cold Compression combined with Kinesio Taping, there are 9 athletes in this group with details of 5 Achilles injured athletes and 4 Patella injured athletes. The second group was a control group of 10 athletes with details of 5 Achilles injured athletes and 5 Patella injured athletes. The study was conducted for 8 days with the distribution of 4 days Cold Compression treatment and 4 days Kinesio Taping treatment. The analysis requirements tests used are normality tests, homogeneity tests, and for hypothesis tests using paired sample t-tests (parametrics). The results showed a significant effect on the Cold Compression group combined with Kinesio Taping compared to the control group. For future researchers, it is recommended to examine using different methodologies and with different types of injuries.

Keywords: Cold Compression, Injury, Kinesio Taping

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1. INTRODUCTION

Body contact sports such as soccer have a high enough potential to cause injury to athletes. So that handling injuries and accelerating injury recovery are needed to deal with these problems. One method that is common and has long been used for the treatment of injuries is the cold compression method. Studies conducted by Allan and Mawhinney (2017) show that cold compression leads to reduced pain response and thus it can be concluded that recovery has occurred. This method has been used many times and has undergone many developments according to the needs of athletes.

In addition to the cold compression method, the kinesio taping method has recently begun to be widely used by athletes. Used during training, matches and recovery processes. Kase et al (2013) report that Kinesio Taping can be utilized in any period of injury whether it is acute, sub-acute or chronic, and can be joined with different kinds of treatment. This method is not new, a great deal of examination has been finished to explore this technique, and the advantages got are likewise extremely huge. Among them, research conducted by Freedman, et al (2014) and Hajimirrahimi, et al (2014) explained that if there is damage to the musculoskeletal system, kinesio taping has the potential to reduce the effects of the pain. Another thing is that it can positively affect the perception of muscles that experience fatigue (Álvarez-Álvarez, et al, 2014).

Kinesio taping is made of cotton with acrylic adhesive so that it causes heat and has elasticity that influences increasing flexibility and muscle strength (Bravi R, et al: 2016, Szymura J, et al: 2016). The property of Kinesio Taping is elastic that can be stretched from 30% to 40% of its base length. In addition, Kinesio Taping is waterproof, so it can be used for a long period of time, with an estimated 72 hours (Yoshida A, Kahanov L: 2007). To provide a sense of comfort when used for a long period of time, cotton also applies one of the compositions of Kinesio Taping. Kinesio Taping causes a "recoil effect" (Parreira, et al, 2014). That is, if Kinesio Taping is used in the proximal to distal area then the Kinesio Taping will move backwards back to its original place. This impact brings about convolution of the surface layer of the skin, which will lift the outer layer of the skin so it can work with blood course and work on lymphatic flow. In this case, according to Kalron and Bar-Sela (2013) in cases of lymphatic disorders (eg Lymphedema), namely when there is damage to lymph vessels, lymph flow will be blocked and result in swelling.

Kinesio taping can be combined with other types of therapy (Kase et al, 2013), therefore in this study we combined cold compression and Kinesio Taping. This is based on our observations that we have found that studies trying to combine the two methods to accelerate injury recovery are still small. The purpose of this study is to review the contribution of cold compression and kinesio taping to the acceleration of injury recovery of soccer athletes.

2. METHOD

The method used in research is Quasi Experimental. We divided the participants into two groups: the Cold Compression group combined with Kinesio Taping and the control group. This research was conducted at one of the campuses in Bandung, Indonesia. The researchers' initial observations found soccer athletes who suffered injuries but were still present for training

and matches.

2.1 Participants

The sampling technique used in this study is purposive sampling. The technique of taking participants was used by researchers because in this study many participant criteria were taken into consideration by researchers. *Purposive Sampling* is a conditional participant, namely: (1) Have experience competing for more than 2 years (so that it is included in the category of professional athletes). (2) Age level between 18-25 years (3) Injury (4) Do not have a history of allergies, especially on the skin. (5) Willing to participate in the entire series of research (proven by signing a letter of willingness to be a research participant). In addition to purposive sampling, we also use incidental *sampling techniques,* which are techniques for determining participants by chance, or anyone who happens (*incidentally*) to meet a researcher who is considered to match the characteristics of the specified participant will be made a participant (Ridwan, 2009). In this case when we do research and there are athletes who are injured at that time, then we prioritize being participants in this study. Therefore, from the 44 athletes in the study population, the researchers will identify athletes who have suffered injuries and are certainly willing to be participants in this study. Both *sampling* techniques determine the number of participants in the study. So that the total participants in this study amounted to 19 athletes.

2.2 Research Design

The research design used in this study is The Non-Equivalent Control Group Design. The Non-Equivalent Control Group Design is almost the same as the Pretest-Posttest Control Group Design method, the difference is that it does not use randomized techniques. In this design, it will compare between the experimental group and the control group. The groups were given a pre-test, then treated for a predetermined duration of time and ended with a post-test. Pre-tests are given at the beginning before treatment aims for initial data. The provision of post-test at the end (after treatment) in addition to evaluating is to review the impact of treatment that has been given. The following is a chronology of research divided into 3 namely pretest, treatment, and posttest.

2.3 Instruments

To measure the extent of injuries suffered by participants in this study, Kemi used the VISA Questionnaire. Especially in this study looking at the types of injuries experienced by participants were ahilles and patella injuries. Therefore, the first instrument we used was the VISA-A questionnaire which was considered valid for evaluating pain intensity in patients with Achilles tendon injury. The second instrument is VISA-P to detect pain that occurs in Patella. Although many researchers have conducted reliability and validity tests on the VISA-A and VISA-P questionnaires, it is still necessary to carry out reliability and re-validity tests carried out in accordance with research needs. To minimize the subjectivity of participants when filling out the questionnaire, we use the ROM (Range of Motion) test to avoid subjective data from participants. In this case, researchers used a goniometer to measure the degree of angular movement of the ankle and knee joints. The standard degree of plantar-flexion ROM at the ankle is 40 degrees while the standard degree of ROM dorsiflexion at the ankle is 20 degrees.

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2.3.1 Test the validity of VISA-A and VISA-P

Tabel 1.

Instrument Validity Results Table

VISA-A-P	Spearman's rho (r)	p-value
BCPT	0.72	<0.001

From these data, it describes that the VISA-A and VISA-P questionnaires are valid, because the data obtained is greater than 0.05, which is 0.72.

2.3.2 VISA-A and VISA-P Reliability Test

The following are the results of reliability calculations using SPSS after being given to participants but not actual participants by dividing the questions into 50% in the first group and the remaining 50% questions to the second group. The questions are systematized by dividing even questions and odd-numbered questions.

Table 2.

VISA-A-P Instrument Reliability Results

Cronbach's Alpha	N of Items
.771	2

The classification of instrument reliability according to Rakhmat and Solehuddin (2006) is as follows:

Table 3.

Instrument Reliability Criteria

Criterion	Category
0.91 - 1.00	Very High Degree of Reliability
0.71 - 0.90	High Degree of Reliability
0.41 - 0.71	Medium Degree of Reliability
0.21 – 0.41	Low Degree of Reliability
<0.20	Very Low Degree of Reliability

Based on the data obtained and classifying the data obtained with the table above, it is concluded that the level of reliability of the VISA-A and VISA-P questionnaires has a high degree of reliability. The calculation results obtained in the field are 0.771 in accordance with the criteria in the table which shows that 0.71 – 0.90 is in the high category.

2.4 Procedures

Data collection techniques in this study have several stages, which of each step reinforce

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each other. The purpose of this stage is that the data obtained can be trusted and representative. Here are the steps in collecting data in this study:

1. Ethical questionnaire which contains participant information from age, type of injury, injured body part, cause of injury and duration of injury experienced. At this stage, participants were also asked about whether they were willing to be participants which lasted for 8 days.
2. VISA-A and VISA-P questionnaires were given to measure pain levels and see the significance of the treatment. The treatments are Cold Compression and Kinesio Taping.
3. Interviews were conducted after obtaining preliminary data, researchers interviewed several participants about the treatment given and the pain felt.
4. Tertiary observation is the last stage to confirm participants' answers during interviews and when filling out VISA-A and VISA-P questionnaires. This observation was made to validate the research data and was carried out after the treatment was given so that the nature of this tertiary observation was a follow-up data.

2.5 Data Analysis

The information got in the field were then broke down utilizing a t-test with an importance level of 5%. The Measurable Bundle for Sociology (SPSS) series 22 program was utilized to dissect the information in this review. With respect to speculation testing utilizing factual investigation of the Matched Example t-test. The ordinariness test is done before different tests are completed, to see regardless of whether the information status is ordinary. This ordinariness test utilizes the Shapiro Wilk Test on the grounds that the quantity of members is under 30 individuals. Subsequent to seeing the ordinariness of the information, a homogeneity test was completed to guarantee that the gatherings that shaped the review subjects came from a homogeneous populace. The homogeneity test is looked for by the Levene test ($p > 0.05$). A definitive test is the speculation test. Before the Anova test, a matched t-test was completed to decide the viability of every free factor against the reliant variable. T-test will be performed when the effectiveness of each treatment is known. T-tests are performed to determine whether there are differences in the effectiveness of various kinds of treatments given to participants to treat injuries.

3. RESULTS

After processing and analyzing data using the SPSS application, the author presents a summary of the results of data processing along with its discussion to answer research questions. Several stages in the data processing flow are, starting with calculating the average and standard deviation, then continued with the normality test, homogeneity test and percentage increase results. Data from the questionnaire is in the form of interval numbers which are directly processed in the SPSS application. Each meeting is measured to see the progress / improvement of participants and see the effectiveness of the treatment given. The author's initial step is to determine the average value and standard deviation, because these values are the initial data used in subsequent statistical tests such as in normality, homogeneity, percentage increase and t tests to test research hypotheses. Here is the calculation of the average value and standard deviation:

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3.1 Tables

Table 4.

Normality Test Data Pretest and Posttest VISA Questionnaire

	Shapiro-Wilk		
	Statistic	df	Sig.
Initial Test	.952	19	.431
Final Test	.980	19	.941

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

Based on the results of the normality test in the table above, it is explained that the value of sig. in the Shapiro-Wilk column for pretest data is 0.431 while for posttest data is 0.941. Referring to the basis of decision making, if the sig value > 0.05, the data is normally distributed, so it can be concluded that, both pretest and posttest data on the VISA Questionnaire are normally distributed. The second instrument used by the author is ROM which is a measuring tool to minimize the subjectivity of filling out the questionnaire. Based on pretest and posttest data for ROM tests, statistical data are found in the following table:

Table 5.

Pretest and Posttest ROM Data Normality Test

	Shapiro-Wilk		
	Statistic	df	Sig.
Initial Test	.906	9	.286
Final Test	.937	10	.519

a.Lilliefors Significance Correction

*. This is a lower bound of the true significance.

The normality test data for the ROM test above explains that for the sig value. in the Shapiro-Wilk column for pretest data is 0.286 while for posttest data is 0.519. Referring to the basis of decision making, if the sig value > 0.05, the data is normally distributed, so it can be concluded that, both pretest and posttest data on ROM are normally distributed.

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Table 6.

Test Homogeneity of Pretest and Posttest Data VISA Questionnaire

	Levene Statistic	df1	df2	Sig.
Initial Test	.688	1	17	.418
Final Test	.363	1	17	.555

Based on the data in table 6 and the basis for homogeneity test decision making, the pretest and posttest data for the VISA-A and VISA-P questionnaires have homogeneous variances. For pretest data sig value. Greater than α with a value of 0.418 and posttest data get a SIG value. of 0.555 so that for hypothesis tests using independent tests, sample T tests can be continued and there is no need to use non-pametric pathways. The data for the ROM test also has homogeneous variances with detailed data as follows:

Table 7.

Test homogeneity of ROM pretest and posttest data

	Levene Statistic	df1	df2	Sig.
Initial Test	2.565	1	17	.128
Final Test	1.662	1	17	.215

For ROM test data in table 7 and the basis for homogeneity test decision making, the pretest and posttest data have homogeneous variances. The pretest data shows the sig value. Greater than α with a value of 0.128 and posttest data get a SIG value. amounted to 0.215.

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Table 8.

Results of the Pretest-Posttest Pretest-Posttest Cold Compression Group VISA Questionnaire Combined with Kinesio Taping

Paired Samples Test

		Paired Differences					t	df	Sig.(2 tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	pretest 1 - postest 1	-8.66667	5.70088	1.90029	-13.04875	-4.28458	-4.561	8	.002

For probability value: H0 is rejected if the probability value (Sig.) < 0.05. Based on the table above, the probability value (Sig.) < 0.05, then **H0 is Rejected.** Therefore, it can be concluded "there is a significant effect of the use of Cold Compression and Kinesio Taping on injuries in football athletes due to the sig value. in the Cold Compression and Kinesio Taping groups it is 0.002. As for the control group, it can be seen in the following table.

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Table 9.

Difference Test Results (T-Test) Pretest-Posttest VISA Questionnaire Control Group

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 2	pretest 2 - postest 2	-1.24000E1	7.12117	2.25191	-17.49418	-7.30582	-5.506	9	.000

For probability value: H0 is rejected if the probability value (Sig.) < 0.05. Based on the table above, the probability value (Sig.) < 0.05, then **H0 is Rejected.** Therefore, it can be concluded "there was a significant effect of treatment in the control group on injuries in football athletes due to sig values. in the control group it was 0.000. As for the ROM test data found by the author there is also significance between the two groups, the details are as follows:

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Table 10.

Cold Compression Group ROM Pretest-Posttest T-Test Results Combined with Kinesio Taping with control group

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretes 1 - Postes 1	-1.43333E1	6.61438	2.20479	-19.41759	-9.24907	-6.501	8	.000
Pair 2	Pretes 2 - Postes 2	-6.50000	3.37474	1.06719	-8.91415	-4.08585	-6.091	9	.000

The data above guarantees the test results using VISA-A and VISA-P that there is indeed a significant effect due to the sig value. which is smaller than α (< 0.005). So it can be concluded that there is significance from the treatment given to the Cold Compression group combined with Kinesio Taping and the Control group. However, the cold compression group combined with kinesio taping was more significant than the control group.

4. DISCUSSIONS

The study was given a pretest first using the VISA-A and VISA-P questionnaires according to the injured limbs. The questionnaire was developed by a group of sports experts at the Victoria Institute (Robinson et al, 2001). VISA measured participants' degrees of pain in both the Achilles (VISA-A) and Patella (VISA-P) tendons. The author not only measured pain levels, but also looked at the athlete's ROM (Range of Motion). This is done to emphasize more on the objectivity of research results. In the group that was given treatment in the form of Kinesio Taping, carried out for 48 hours (Csapo et al., 2012). Participants were given treatment in the form of Kinesio Taping based on injured limbs and based on the author's findings in the field that athletes had many injuries to the Achilles and Patella tendons. The VISA-A questionnaire is given to see the pretest value and a ROM test is carried out on the angkle which includes dorsiflexion, plantarflexion, inversion, and eversion. In this group, there were 5 people who suffered Achilles tendon injuries. The use of Kinesio Taping is done before the athlete does the training and is removed when finished training. However, after training, athletes are given Kinseio Taping again which is rehabilitative and used until the next training begins. It is carried out for 4 days.

On the second day, athletes have begun to get used to it and the author provides

knowledge on how to use Kinesio Taping properly and correctly. Starting from the form of Kinesio Taping and injured body parts and procedures for use. The author also observed athletes who used Kinesio Taping and checked whether it was correct or not. This is done because the purpose of experimental research is threefold, namely changing mindsets, changing behavior, and changing conditions. However, in this study the author only took data on the aspect of changing the condition, namely the condition of the injury. For the other two aspects, the author still focuses on providing knowledge on the correct use of Kinesio Taping and telling when injured what actions need to be taken.

On the fourth day, progress began to be seen so the author took the initiative to posttest again and it turned out that the results were significant. This can be seen from the movement pattern displayed by the athlete and the ROM angle is also close to the ideal number. The results of this study are relevant to research conducted by Myoung Kwon Kim and Young Jun Shin (2017) that Kinesio Taping can reduce pain (pain) in amateur soccer players with severe ankle injuries. Then Kim et al. (2014) added that Kinesio Taping can relieve pain and improve ROM in physical therapists. This study shows that Kinesio Taping can reduce pain. Another study conducted by Yamashiro K et al (2011) found that Kinesio Taping stimulates skin mechanisms. Based on counterirritant theory, afferent stimulation mechanisms induce the release of encephalin, and inhibit nociceptive signal transmission. Encephalin itself may inhibit neurotransmitters involved in pain integration (Lundy, 2007).

ROM tests were also conducted by the authors to initiate the subjectivity of participants in filling out questionnaires, and the results also had a significant effect. This is in accordance with the findings of Murray (2001), who reported that Kinesio Taping can reduce pain in the ankle through increased skin stimulation. The study also measured angles like ROM tests. For athletes who are injured in the patella, Kinesio Taping treatment is also given for a period of 4 days. The number of athletes with patella injuries in the kinesio taping group amounted to 5 people. The injured athletes were given the VISA-P Questionnaire for pretest and posttest. ROM tests are also carried out to check the objectivity of filling out the questionnaire. In the ROM test measured are hip exorotation, hip endorotation and knee flesion. As research conducted by Taradaj J et al, (2014), Aguilar-Ferrándiz ME et al, (2014), and Chou YH et al, (2013) reported that the use of Kinesio Taping can produce positive effects on injuries such as swelling. For injuries that occur in the patella, the athlete experiences swelling or dislocation so that he feels his knee is slightly wobbly.

The author suspects that participants are getting used to using Kinesio Taping when practicing. For the argument of participants about not feeling any movement resistance caused by Kinesio Taping, because the author provides a lighter strain than before at the time of Kinesio Taping installation. Increased mobility is certainly good for participants in injury recovery efforts. As a study conducted by Kim WI et al, (2014) reported that participants who had good mobility when given Kinesio Taping treatment (in this case the Kinesio Taping strain was adjusted) resulted in a better level of effectiveness in injury recovery and it led to balance that occurred in the protagonists, synergists, and antagonists' muscles. Even in a study conducted by Christoph Windisch et al, (2016) revealed that Kinesio Taping is a tool for lymph therapy equivalent to the A-V Impulse System to reduce swelling. So that in knee injuries, it can also be concluded that Kinesio Taping can reduce pain and it is proven through the VISA-A, VISA-P questionnaire, and ROM test that Kinesio Taping has a positive effect on the recovery of achiles and patella injuries of female futsal athletes.

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Then participants were given a 4-day cold compression treatment. But technically, we give cold compression treatment two days at the beginning then kinesio taping four days and two days at the end we give cold compression again. We carried out Cold Compression treatment in two days, based on research conducted by Smeltzer and Bare (2002) which reported that 24-48 hours duration of Cold Compression use. However, after the author gave treatment for 24 hours, there was no effect caused by Cold Compression on the pain felt by the participants. Therefore, we continue with a duration of 48 hours. The increase in duration turned out to have a significant effect on participants with Ankle injuries. The authors suspected that at the time of treatment for 24 hours and the changes shown were not significant because the injured participants were not in a condition of truly acute injury. So, it takes an additional duration to cause effectiveness in the treatment. On that basis, researchers gave cold compression treatment repeatedly in 2 days.

Cold Compression is given for 15-20 minutes and done 3 times every day. The author uses *Ice Bag* to compress the body part that feels pain during the duration of time. Cold Compression circulatively decreases tissue temperature, then the vasoconstriction process occurs. So that participants who experience swelling can limit the process of straining through cold compresses. Almost the same thing explained by Smeltzer & Bare (2002), through Cold Compression treatment causes the vasoconstriction process so as to reduce capillary permeability in this case decreases blood flow and cell metabolism also decreases so as to reduce bleeding, edema and discomfort. Based on interview data, the authors found that pain that began to subside occurred when this treatment was given on average at 10 minutes. In this case, it takes at least 10 minutes so that the cold effect of this treatment can be felt on the painful tissue.

ROM tests are also carried out daily to see progress and evaluate the treatment given. The authors found no contradiction in data from the results of the VISA-A, VISA-P, ROM tests, and tertiary observations. This stage is carried out to check the validity of the information provided by participants and minimize the subjectivity of participants in providing information. Both treatments are given when athletes are doing regular training and include them in the rehabilitation period of athletes who have injuries to the Achilles tendon. In any case, in view of the consequences of information handling led by the creator when thought about between the Chilly Pressure bunch joined with Kinesio Taping with the benchmark group, the impact caused isn't vastly different yet at the same time better cool pressure treatment joined with kinesio taping. Our combination, the kind of injury and the hour of injury assume a significant part in the utilization of the treatment. That is, if athletes who are injured *on the spot on the* field should be given Cold Compression treatment because the treatment can relieve pain within 10 minutes. It is suitable for first aid. So it can be proven that Cold Compression combined with Kinesio Taping has proven to have a significant effect on handling Achilles and patella injuries of football athletes.

5. CONCLUSIONS

This study proves that cold compression therapy combined with kinesio taping has a significant effect on accelerating the recovery of soccer athletes' injuries. Especially injuries to the Achilles and Patella tendons. This effectiveness can be a consideration for athletes and coaches to use these methods, in handling athlete injuries. However, this study has limitations such as the duration of the study and full control of the study participants (the need for participants to be quarantined). Recommendations for future researchers, using different methods and different instruments to enrich the discussion and information related to this topic.

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