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The Effectiveness of Hip and Knee Strengthening on Reducing Pain Intensity among Elderly with Osteoarthritis

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Abstract

Background: The population of elderly people increases from year to year along with increasing life expectancy. In 2000 the life expectancy in Indonesia was 64.5 years (with the percentage of the elderly population being 7.18%). It is estimated that the number of elderly people in 2020 reaches 9.9% of the total population in Indonesia. Osteoarthritis (OA) is a degenerative disease that occurs in the elderly due to thinning of joint cartilage, more common in the knee joint (89.91%) with pain manifestations. If the pain cannot be overcome, it can cause limitations in movement and disturb the daily activities, then it is suggested to do physical exercise, especially strengthening exercise. **Objectives**: the aimed of this study was to examine the effect of hip and knee strengthening to reducing pain in elderly patients with OA. **Methods**: A quasi-experimental study with randomised pre-post-test control design conducted in May until July 2014 in Yogyakarta. Seventy respondents with grade 1-2 OA and not having an increasingly severe disease by exercising recruited. OA pain assessed using numerical pain rating scale. The ordinal regression used to analyse the data. **Results**: hip and knee strengthening intervention statistically significant reduced pain intensity ($p = 0.00$). **Conclusions**: The result demonstrated the effectiveness of hip and knee strengthening to reduce pain in elderly patients with OA. Hip and knee strengthening intervention through video can be one of a suggested intervention to reduce pain in patients with OA.

Keywords: Elderly, Hip, Knee, Osteoarthritis, Pain, Strengthening

1. Introduction

Republic of Indonesia Law No. 13 of 1998 concerning the welfare of the elderly states that an elderly is someone who has entered the age of 60 years and over. The Center for Data and Information of the Indonesian Ministry of Health states that the average life expectancy in Indonesia is slightly higher than the average life expectancy in the world. Life expectancy in Indonesia in 2010 - 2015 is 70.7 years while in the world is 70 years. In 2015 - 2020, the life expectancy in Indonesia rises into 71.7 years while

in the world is 71 years. This indicating a success of development in the health sector causing an increase in the life expectancy. This means that with a high life expectancy, the dependency rate of non-productive age to productive age will be even greater [1].

The elderly population increases from year to year with an increase in life expectancy. In 2000 the life expectancy in Indonesia was 64.5 years (with the percentage of the elderly population being 7.18%). This number increased to 69.43 years in 2010 (with the percentage of the elderly population being 7.56%) and in 2011 increased to 69.65 years (with the percentage of the elderly population being 7.58%). The number of elderly people in Indonesia in 2012 is 7.59% of the total population [2]. It is estimated that the number of elderly people in 2020 will reach 9.9% of the total population in Indonesia. Special Region of Yogyakarta is one of the provinces that has the highest number of elderly (13.5%), followed by Central Java Province (11.7%) and East Java (11.5%) [3].

Health aspects of the elderly will experience a decrease in health status, functionally or due to certain diseases. Physiologically, the elderly will experience a decline in the function of all organs. Some of them is the joints and bones. Almost all elderly complain of knee pain due to thinning of joint cartilage. This knee pain indicates a joint disease called arthritis. This is in accordance with the 2013 Riskesdas data, which states that arthritis is the second largest disease after hypertension that occurs in the elderly [2]. The prevalence of joint disease based on the diagnosis of health workers in Indonesia is 11.9% and based on diagnosis or symptoms 24.7%. Whereas in Yogyakarta 5.6% [2]. This is possible because DIY is a province that has the largest number of elderly.

One of the joint diseases is osteoarthritis, which is chronic and progressive joint cartilage damage, thinning of the joint cartilage. Osteoarthritis is a degenerative disease that usually occurs at the age above 50 years. The most commonly affected cartilage is the knee and pelvis because the knee and hip joints are the biggest support of the body so that the possibility of joint damage is greater than the other joints [4]. Based on the elderly population that continues to increase, where the elderly population is the largest and arthritis is the second most common disease in the elderly in DIY and based on the available evidence regarding exercise so researchers are interested in researching about hip and knee strengthening in reducing knee pain in elderly osteoarthritis.

2. Methods

2.1. Research design

This research design used a quasi-experimental study with randomized pre-post-test control design. This research started with pain acessing in intervention and control group. The researcher practice knee and hip strengthening exercise to intervention group after the respondents was examined by orthopedic. After finishing the exercise, respondents advised to do the exercise at home twice a day in every morning and evening, for fours weeks. The researcher was monitoring the respondent's obedience in doing the exercise every two days and assessed pain intensity every week by phone. Whereas in control group, after assessing pain intensity, the researcher educate the respondents about OA management. Researcher also evaluate pain intensity in control group every week until fours week by phone.

2.2. Sample

This study's participants were elderly who was diagnosed with knee osteoarthritis by a doctor, and were declared not to have any disease that gained weight by doing exercises. Seventy respondents were participated with 53 respondents included in the intervention group and 17 respondents in the control group. The division of the number of respondents was based on Pagano's theory which stated the sample divided into 75% in the intervention group and 25% in the control group.

2.3. Instrument

The instrument used to assess pain intensity was the numerical pain rating scale (NPRS). We apply pain scale in range 0 – 10, where 0 is used to painless and 10 for unbearable pain. Pain intensity can be divided into painless (scale 0), mild pain (scale 1-3), moderate pain (scale 4-6), severe pain (scale 7-9) and unbearable pain (scale 10). While, for the educational media used leaflets about osteoarthritis managements.

2.4. Data collection procedure

Before collecting data, researcher manage research license, prepare instruments that would be used to measure pain intensity and leaflets as education media. This research selected the respondents in a simple random way, by finding respondents who suitable in inclusion criteria by looking at the orthopedic registrants database. After getting

the appropriate sample, the researcher gives an explanation and asks for the information consent. Then assessed the pain intensity using numerical pain rating scale. Respondents in the intervention group were trained in hip and knee strengthening. The exercise is done twice a day with 25 movements, every 20 seconds movement, for 4 weeks. Researcher also educated osteoarthritis management to the control group. Then, assess the pain intensity of all respondents every week for 4 weeks.

2.5. Data analysis

Univariate analysis used to describe respondent's characteristic in intervention and control group. Bivariate analysis explained the difference of pain intensity between before and after intervention, and also compare the difference of pain intensity between intervention and control group. Ordinal regression was choosen because this research using ordinal scale. Data analysis using computer assistance.

3. Results

TABLE 1: The frequency distribution of respondent.

N=70				
Character	Intervention group		Control group	
	n	%	n	%
Gender:				
Male	11	20.8	2	11.8
Female	42	79.2	15	88.2
Age:				
60 – 69	42	79,2	13	76,5
70 – 80	11	20,8	4	23,5
BMI:				
<18,5	0	0	0	0
18,5 – 24,9	25	34	0	0
25 – 29,9	43	62	9	53
30 – 39,9	2	4	8	47
>40	0	0	0	0

The majority of respondents in both the intervention and control groups were female and BMI 25-29,9 (obesity).

The pain intensity before exercise compared with the intensity of pain 1^{th}, 2^{th}, 3^{th} and 4^{th} week obtained each p value 0.000 <0.025, it can be concluded that there was a significant difference in pain intensity before and after doing hip and knee

TABLE 2: Significance of pain intensity in intervention and control group.

	N=70	
Asymp. Sig. (2-tailed)	Intervention group	Control group
1th week	.000	.180
2th week	.000	.102
3th week	.000	.034
4th week	.000	.005

strengthening exercise every week. Pain intensity in the control groups, showed that significant occurred at the fourth week. In the first to third week it appears that the p value above 0.025

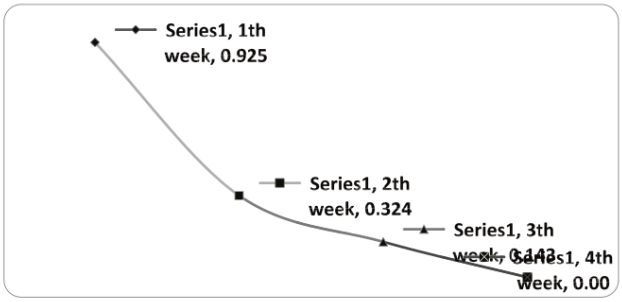

Figure 1: Significant difference in the decrease in pain intensity of the control group and the intervention group every week.

There was a significant differences the reduction of pain intensity at 4^{th} week with *p* value 0.004 (<0.025) in the intervention group compared to the control group

The influence of the independent variables on the dependent variables was greatest in the fourth week (23%). This means that hip and knee strengthening exercises had effect of 23% of pain reduction, however 77% were influenced by other factors.

4. Discussion

The majority of respondents in both the intervention and control groups were female. The 8.5% of female experience joint disease and 18.6% are aged 65-75 years, 18.9% are aged over 75 years. It's mean that elderly women are at risk of joint disease [5].

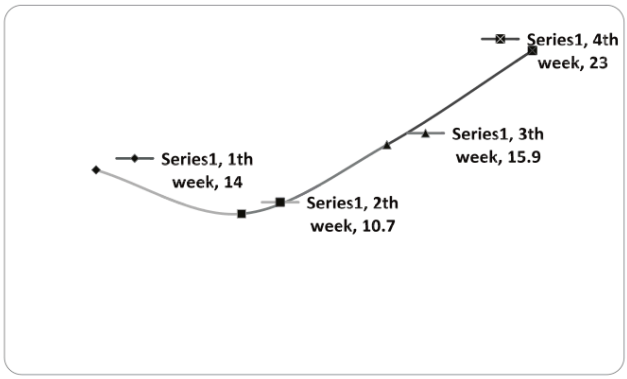

Figure 2: The influence of independent variables on the dependent variable.

The results of this study indicated that hip and knee strengthening exercises can reduce elderly knee pain with osteoarthritis. The elderly experience thinning of the joints due to an aging physiological process, so they often complain of knee pain. This happens because the knee joint is the joint that carries the most weight, so it experiences thinning of the joint cartilage more quickly. Hip and knee strengthening exercises that are performed regularly can increase joint metabolism resulting in an increase in joint fluid diffusion, adequate joint nutrition and increased cartilage integrity. This increased cartilage integrity causes the joints to move freely and reduce pain. The results of research states that hip and knee strengthening is effective in reducing the intensity of pain in patients with patelofemoral pain and increasing the activity of patients [6]. It is also in line with the general recommendations of the International Osteoarthritis Research Society and the MOVE consensus, which suggests strengthening exercise to reduce pain intensity.

The strengthening exercises are very beneficial for the elderly because they help bone strength and muscle growth or prevent fatigue [7]. Likewise, according to a systematic review found that hip muscle strengthening is effective in patients with patelofemoral pain syndrome. This is because hip and knee strengthening will increase muscle strength. With strong muscles it can support the body's burden so that the knee joint cartilage is not overburdened. This is what causes reduced pain [8]. A systematic review states that knee exercises reduce knee pain in osteoarthritis sufferers and

improve physical function and quality of life. Although this benefit lasts short between 2-6 months after cessation of treatment [9].

This exercise can also reduce cytokine levels in the synovial fluid of the knee OA patient, inhibits cartilage degradation and improves pain symptoms. Cytokines are one of the chemical mediators of inflammation and if cytokine levels fall then the mechanism of nociceptor stimulation by noxious stimulus is inhibited and the process of transduction in the mechanism of pain becomes obstructed [10]. The result of studied was found that knee exercises are effective in reducing pain in patients with knee osteoarthritis [11]. That 60% of osteoarthritis sufferers perform activities that are appropriate to reduce pain [12].

This stretching exercise helps increase muscle flexibility and affect the nerves, reduce the symptoms of cell oxygen deficiency which causes an increase in lactic acid, causing pain. Stretching exercises had an effect on decreasing knee joint pain in the elderly [13]. Besides that it can also be explained that by doing this strengthening stimulates the A beta fibers found in the skin, so it can deliver impulses faster. Provision of exercise stimulation to continue, make the input of the dominant impulse come from the A beta fibers so the gate (gate control) closes, and pain impulses cannot be transmitted to the cerebral cortex for interpretation [14].

5. Conclusion

The result demonstrated the effectiveness of knee and hip strengthening to reduce pain in elderly patients with osteoarthritis. Knee and hip strengthening intervention through video can be one of a suggested intervention to reduce pain in elderly patients with osteoarthritis. For the elderly with osteoarthritis of knee to routine exercises.

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Conflict of Interest

The author(s) declared no potential conflict of interest

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