

# Differences between Influence of Delorme and Oxford Method for Strengthening Knee Muscle to Reduce Disability of Osteoarthritis Patient in Datu Beru Takengon Hospital

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**Abstract:** *Introduction: Osteoarthritis is a degenerative joint impairment that usually occurs in elderly or adults who have degenerative cartilage accompanied by reactive changes on subchondral bone. This impairment is a common type of arthritis that usually happens and provokes pain as well as loss of functional movement. The prevalence of osteoarthritis is relatively high. WHO suggests that 25% people with age of 65 years old has suffered from osteoarthritis, while in Southeast ASIA region, people that suffered from osteoarthritis is about 24 million. Knee muscles strength can be increased through strengthening exercise. General purpose of strengthening program is to improve performances and improve muscle function so that the disability index of osteoarthritic patient can be reduced. Method: this study was an experimental study with two groups of pre and post test control group design. Subjects on this study was osteoarthritic patients undergoing physiotherapy rehabilitation of Datu Beru Takengon Hospital. 36 subjects were into two groups, group I was applied with Delorme muscle strengthening exercise program and group II was applied with Oxford muscle strengthening exercise. Disability index measured by Lequesne index form, Lequesne index measure before and after treatment. Result: there was a significant difference after muscle strengthening exercise in both groups. Group I showed a significant difference with mean value Lequesne index  $9.42 \pm 0.988$  while in group II showed mean value  $9.47 \pm 0.866$ . Hypothetical analysis using independent t test did not find any significant differences of Lequesne index in both groups with p value  $p = 0.91$ . Conclusion: Delorme and Oxford exert similar beneficial effects in reducing disability index.*

**Keywords:** Delorme muscle strengthening program, Oxford muscle strengthening program, osteoarthritis

## 1. Introduction

Pain is one of the most common symptoms in osteoarthritis. Pain is defined as an unpleasant sensory and emotional experience followed by tissue damages. The pain which comes from sensitized free nerve endings (nociceptors) can be caused by microfracture of subchondral bone, increased venous pressure on subchondral bone and osteophytes, synovitis and thickening capillaries and subluxation[1].

Another symptom is muscle weakness of the knee which is caused by muscular inactivity. In fact, muscles lost 30% of their mass within a week and 5% decreased strength within one day in an immobile person who suffered from knee osteoarthritis [2]. Knee muscles are muscles that are responsible to maintain knees in healthy state. These muscles are considered to be the fastest muscle to experience atrophy than others. If they lose their strength, it leads to an increased in severity and disability of osteoarthritic knee, especially for activities such as standing, walking, squatting and stair climbing. In addition, muscle weakness is often found in knee osteoarthritis patients [3].

Furthermore, ligament laxity occurs due to imbalance distribution of knee joint pressure, thus applying more pressure on one side, which damages the joint surface (eruption). It in turn, leads to instability and deformity such as valgus and varus [4]. Several types of strength exercises

can be performed in order to increase knee muscles strength. The general role of this exercise is improve muscle's function.

Muscles which lose their strength should be exercised to add more actin and myosin filaments in myofibril. Myofibrils that contain enough actin and myosin will split to become new myofibrils, thus increasing its mass and strength[5]. The stronger a muscle becomes, the more stable it is for knee joints.

In general, strengthening exercise can be divided into two methods, namely isotonic and isometric exercise/ Each type of exercise has their own benefit. Isotonic exercise combined with concentric and eccentric contraction is a common exercise we usually use in exercise programs/ We can use external weights such as dumbbells or weight training machines to perform heavy resistance exercise,. This dynamic exercise will increase intramuscular pressure and blood pressure as well, so that the muscle can have more energy supply and less fatigue. In isotonic exercise, there are two methods of training programs: Delorme and Oxford method. In Delorme, the external weight begins with 50% of one maximum repetition and goes to 100% maximum repetition, whereas in Oxford the weight begins with 100% of one maximum repetition to 50% of one maximum repetition[6].

These two methods of training have benefit to increase muscle strength and mass, so that a research about these methods on oosteoarthritis patient in Datu Beru Takengon Hospital was performed.

## 2. Material and Methods

This was an experimental study with two groups, namely pre- and post-test control group design. Subjects on this study were osteoarthritic patients in physiotherapy rehabilitation at Datu Beru Takengon Hospital. As many as 36 subjects were divided into two groups, in which group I was applied with Delorme muscle strengthening exercise program and group II was applied with Oxford muscle strengthening exercise. Each exercise was performed three times a week for two months. Disability index was measured by Lequesne index form. Lequesne index was measured before and after two months of treatment. This research was done in January until February 2017 at Datu Beru Takengon Hospital.

Inclusion criteria were as follows: 1) having knee osteoarthritis as diagnosed by a medical doctor 2) age between 40 to 60 years old 3) able to communicate effectively 4) cooperative and willing to volunteer to this study 5) grade 1 and 2 knee osteoarthritis. Exclusion criteria were: 1) had total knee replacement history 2) has fracture problems 3) secondary osteoarthritis 4) any red flag signs.

Sampling technique used in this research was purposive sampling technique in which an individual with a certain condition and fit to the inclusion and exclusion criteria is taken as a subject of this research.

Data were collected in two phases. Phase I was the measurement and collection of lequesne disability index before the treatment began, whereas in phase II, the disability index was collected and measured after two months of treatment.

### 1) Early phase

Research preparation including permit submission of facilities in Datu Beru Takengon Hospital.

### 2) Implementation

Assessing patient symptoms, measuring disability index before treatment began and after two months of treatment. Descriptive analysis was used to describe subjects' age, sex, daily activities and Lequesne index. Normality was tested using Shapiro-Wilk test. In addition, data homogeneity was also measured using Levene's test. Lastly, paired t test was used for comparative assessment within each group for both pre- and post-test data.

## 3. Results

### 3.1 Subject Characteristics

Table 1 showed that group I had 55.6% of subjects with age within 56-60 years old and group II had 61.1% subjects with age within 56-60 years old.

**Table 1:** Subject Characteristics

Subject Characteristic	Group I		Group II		
	n	%	n	%	
Age	46-50	0	0	1	5.6
	51-55	8	44.4	6	33.3
	56-60	10	55.6	11	61.1
Gender	male	15	88.3	15	83.3
	female	3	16.7	3	16.7
BMI	Thin (<18.5)	0	0	0	0
	Normal (15.5-22.9)	2	11.1	0	0
	Overweigh (23-24.9)	4	22.2	4	22.2
	Obesity 1 (25-29.9)	12	66.7	14	77.8
	Obesity 2 (≥30)	0	0	0	0

### 3.2 Normality and homogeneity test

Table 2 showed that data from both groups were normal with  $p > 0.05$ . Data on group I before treatment with  $p = 0.118$  and after treatment  $p = 0.413$ . Data on Group II before treatment is  $p = 0.085$  and after treatment  $p = 0.230$ , and Levene's test showed  $p = 0.713$ , demonstrating its homogeneity

**Table 2:** Normality and homogeneity

	Saphirowilk Test		Lavene Test
	Group I	Group II	
Lequesne Index	p	p	p
Before Treatment	0.118	0.085	0.713
After Treatment	0.413	0.230	

### 3.3 Paired t test Lequesne Index on group I and group II

Table 3 showed both groups had the same significant results with  $p = 0.001$ . Lequesne index for group I before and after treatment were  $9.42 \pm 0.988$  and  $7.56 \pm 0.873$ , respectively. Lequesne index for group II before and after were  $9.47 \pm 0.866$  and  $7.58 \pm 0.624$ , respectively.

**Table 3:** Paired t test on group I and group II

Groups	Before Mean ± SD	After Mean ± SD	p
Group I	$9.42 \pm 0.988$	$7.56 \pm 0.873$	0.001
Group II	$9.47 \pm 0.866$	$7.58 \pm 0.624$	0.001

### 3.4 Independent t test between group I and group II

Table 4 showed that both groups had no significant differences with  $p = 0.913$ , Group I had Lequesne index score of  $7.56 \pm 0.87$ , whereas group II had Lequesne index score of  $7.58 \pm 0.62$ .

**Table 4:** Independent t test between group I and group II

Groups	n	Mean±SD	t	p
Group I	18	$7.56 \pm 0.87$	0.110	0.913
Group II	18	$7.58 \pm 0.62$		

## 4. Discussion

Based on data analyses, it showed that Delorme training method on group I before treatment had Lequesne index of  $9.42 \pm 0.988$ , after treatment was  $7.56 \pm 0.873$ . Lequesne index with  $p = 0.001$ , which means that Delorme training method was effective in reducing Lequesne index disability on osteoarthritis patient at Datu Beru Takengon Hospital.

These results conformed Hardjono's research that Delorme had significant effects to increase knee's muscles strength. Increased muscle strength will improve joint stability on subjects with osteoarthritic knee and reduce disability [7].

Nugroho also found significant results of muscle strengthening effect using Delorme and Oxford training method with  $p = 0.001$  [8]. Increased muscle strength will improve stability of knee joints as the most common problem for osteoarthritis patient. It limits their ability to move functionally and increasing the severity of the osteoarthritis itself [4].

Data analyses on group II showed the Lequesne index before treatment was  $9.47 \pm 0.866$  and after treatment was  $7.58 \pm 0.624$  Lequesne index with  $p = 0.001$ . It means that Oxford training method posed a significant effect to reduce Lequesne disability index.

Oxford method has beneficial effects to increase muscle strength and mass, increase joints stability and functional movement for osteoarthritis patient [9]. An increase in muscle strength and mass will increase their joints stability and decrease disability index. Kivitz showed the result of his research that Oxford method had a significant effect to increase joints stability on osteoarthritic patient. The more stable a joint has, the more effective it is during functional movements [10].

After comparing both of these methods using independent t test, both groups did not show any significant difference with  $p = 0.913$ . Based on this data, both groups had a significant effect to reduce Lequesne index scores and both groups did not show different effects in reducing Lequesne index scores.

Basically, Delorme and Oxford has the same principal. Overload principal with same number of repetition but starting weight, Delorme begin with 50% of one maximum repetition to 100% of one maximum repetition, while Oxford begin with 100% of one maximum to 50% of one maximum repetition.

Both methods have benefit to increase muscle strength and mass. In our research, both of these methods had a significant effect to reduce Lequesne index scores, but they did not yield any significant effects after we analyzed it with independent t test.

Hardjono during his research also found the same result, in which Delorme and Oxford has no significant different to increase muscle strength [4].

## 5. Conclusion

Delorme and Oxford training method has the same beneficial effect to reduce Lequesne index on osteoarthritic patient, but these methods does not show any significant difference.

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