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EFFECTIVENESS OF DYNAMIC NEUROMUSCULAR STABILIZATION EXERCISE ON REDUCING PAIN IN THE ELDERLY WITH GENU OSTEOARTHRITIS

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Abstract

A pattern of muscle imbalance is seen clinically in osteoarthritis. Quadriceps weakness has been identified as a cause of osteoarthritis in the genu, indicating a link between muscle imbalance and osteoarthritis. The DNS approach aims to exploit brain plasticity and reactivate the patient's dormant natural motor patterns, stimulating global motor reactions and minimizing muscle imbalance. The purpose of this study was to determine the effectiveness of giving dynamic neuromuscular stabilization exercise on pain reduction in the elderly with genu osteoarthritis. This type of research is quantitative: a quasi-experimental pre-post test with a control group design non random sampling with a sample of 50 subjects divided into two groups, namely 25 experimental groups and 25 control groups. The research instruments used closed questionnaires, structured interviews, and pain measurements with NRS. Dynamic Neuromuscular Stabilization Exercise intervention was carried out twice a week for 4 weeks. Data processing in this study used SPSS software program version 26. Data analysis was carried out in the form of a data normality test using the Kolmogorov Smirnov test because the number of subjects was 50 ($\geqslant$50) people, and the differential effect test used was the Mann-Whitney Test because the data was not normally distributed. The results of this study indicate that there is a difference in influence between the experimental group and the control group of NRS values of p=0.044. There is an effect on the experimental group, and there is a difference in the effect on the experimental group compared to the control group. For future research, it is hoped that if you want to use the same DNS exercise, choose a different dose from this study so that you can see the difference in results and have a newer reference from a different dose.

Keywords: *osteoarthritis, pain, dynamic neuromuscular stabilization exercise*

1. Introduction

Osteoarthritis is a joint disorder that is less common than other types of joint disorders. The prevalence of osteoarthritis in Asia will double, from 6.8% to 16.2%. In 2012, the Ministry of Health of the Republic of Indonesia categorized the number of osteoarthritis sufferers, with the result that approximately 11.5% of Indonesians suffer from osteoarthritis. This means that for every 10 residents in Indonesia, there is one person with osteoarthritis (Iqomi & Abdurrachman, 2021).

A study on the prevalence of Genu osteoarthritis among 7,577 respondents in America found that the prevalence of Genu osteoarthritis was 12.2%, with women (14.9%) higher than men (8.7%), followed by an increase in age. As for the prevalence of osteoarthritis in Indonesia, it reached 5% at the age of < 40 years, 30% at the age of 40-60 years, and 65% at > 61

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years. osteoarthritis is a non-inflammatory degenerative joint disease that occurs in mobile and weight-bearing joints and typically involves the destruction of the articular cartilage and the formation of new bone (osteophytes) at the bone margin due to biochemical, metabolic, and pathophysiological changes in the articular cartilage and subchondral bone (Pratama, 2019).

A pattern of muscle imbalance is seen clinically in osteoarthritis. Quadriceps weakness has been identified as a cause of osteoarthritis at the genu, a finding that links muscle imbalance and osteoarthritis. In fact, there is a 64% lower risk of genu osteoarthritis when the quadriceps are strong (Page et al., 2020).

Dynamic Neuromuscular Stabilization (DNS) is an exercise protocol that has recently attracted the attention of researchers in the field of chronic pain inhibition (Ghagholestani et al., 2022). The DNS approach aims to take advantage of the brain's plasticity and reactivate the patient's natural, latent movement patterns. Gentle pressure is applied to the body while the patient lies in an ideal position. This stimulates global motor responses, minimizes muscle imbalances, relieves painful muscle spasms, improves spinal stability, and promotes postural awareness. Repetition of the DNS exercises should help normalize spinal stability and make it automatic. DNS affects the entire musculoskeletal system and central nervous system, which can be affected by pain, injury, damage, or repetitive strain (Kobesova et al., 2020).

2. Method

This type of research is quantitative research or pseudo-experimentation (quasi experimental), which aims to determine the effectiveness of dynamic neuromuscular stabilization exercise on pain reduction in the elderly with genu osteoarthritis at PKU Muhammadiyah Hospital Jatinom Klaten. This study used a quasi-experimental research design with pre-post test non-equivalent control group design, which means measurements are taken before treatment (pre-test) and after treatment (post-test). The effectiveness of the treatment was evaluated by comparing the values before and after the test. Test instruments in the form of pain scores, pain location (one knee or both knees), and history of falls.

The location of this study was PKU Muhammadiyah Jatinom Klaten Hospital, and it was conducted around February–March 2023. The targeted population was Genu osteoarthritis patients at PKU Muhammadiyah Jatinom Hospital Klaten, with the purposive sampling method as a method to obtain samples. Inclusion criteria were female grade I and grade II genu osteoarthritis patients aged 60–70 years who had had physiotherapy < 3 years. Exclusion criteria were pathological abnormalities in the knee, the presence of deformities in the lower extremity, using a walker, and obese patients.

In this study, used closed questionnaires, a three-part questionnaire was used to collect data. The first part is a statement about the object of the study, and the second part is informed consent as consent to being the subject of the study. The third part is a questionnaire about the characteristics of the respondents.

The intervention was given to the intervention group of 25 respondents. For the dose given to dynamic neuromuscular stabilisation, the recommended dose is 2 times a week, each session is 5 minutes for 4 weeks. DNS Baby Rock 30-60 seconds and Squat 30-50 seconds with 3 repetitions. To increase the effectiveness of the exercises during the training period, the principle of overload increases the number of repetitions and the type of training used.

3. Result and Discussion

This research was conducted at PKU Muhammadiyah Jatinom Hospital Klaten, on February 21 - March 23, 2023. This research aims to determine the effectiveness of dynamic neuromuscular stabilization exercise on reducing pain in the elderly with osteoarthritis genu in PKU Muhammadiyah Jatinom Klaten Hospital. The research subjects used were 50 subjects with genu osteoarthritis at PKU Muhammadiyah Jatinom Hospital Klaten, which were taken in accordance with the inclusion and exclusion criteria and then divided into 2 groups, namely 25 subjects as an experimental group given the treatment of dynamic neuromuscular stabilization exercise and 25 subjects as a control group who were given intervention from the hospital in the form of infrared.

Table 1. Characteristics of Respondents Based on Age and Pain

Category		(n)	(%)
Age			
	60-64	32	64.0
	65-70	18	36.0
NRS Score Before			
	≤ 6	47	94.0
	> 6	3	6.0
Total		50	100

Based on Table 1, most subjects were in the age range of 60–64 years, with a percentage of 64% compared to the age of 65–70 years, with a percentage of 36%.

The reason is that when the age exceeds 60, a process called degenerative arthritis starts, and the functional capacity of the cartilage protein decreases due to the decrease in the functional capacity of the cartilage protein and excessive stress on the knee joint, resulting in osteophytes that cause pain in the knee area (Paerunan et al., 2019).

According to Dhaifullah et al., (2023), age is one of the major factors in the development of knee OA, the incidence of which increases progressively as the individual ages. Increasing age leads to thinning of articular cartilage along with decreased muscle strength, which maintains knee stability.

Based on Table 1, the results of measuring NRS subjects before treatment show results ≤ 6 with a percentage of 94%, while results > 6 with a percentage of 6%.

According to Budiman & Widjaja (2020), it was found that the majority of osteoarthritis sufferers have moderate pain levels. This may be due to the high pain tolerance of the research subjects. According to Putra et al., (2022), pain is caused by the accumulation of metabolic residues of metabolic products called "P" substances that accumulate in the tissue. Meanwhile, according to Paerunan et al., (2019), pain can originate from stretching of the periosteum nerve fibers, hypertension intraosseous, joint capsule strain, intraarticular hypertension, ligament strain, subchondral bone microfracture, enthesopathy, bursitis and muscle spasm.

Table 3. Test results of the effect of the experimental group and control group

Mann Whitney	Category	*Z*	*Sig.(p)*
NRS Score	Experimental Control	-2.017	0.044

According to Table 4.4, the results of Mann Whitney's test on the difference of effect show that the post-treatment NRS value in the experimental and control groups has a significant value of 0.044 < 0.05, so Ha1 is accepted, allowing us to conclude that there is a difference in the effect between dynamic neuromuscular stabilization training and hospital infrared intervention on pain reduction in elderly persons with osteoarthritis.

According to Kobesova et al., (2020), repetition of the DNS exercises is then prescribed so that spinal stability becomes a habit and becomes automatic. DNS involves the entire musculoskeletal system and central nervous system, which can be affected by pain, trauma, injury, or excessive repetitive stress. According to the DNS method, each joint position depends on stabilizing muscle function and local and remote muscle coordination to ensure a neutral or centered joint position in the kinetic chain (Venkatesan et al., 2022).

In some DNS literature and associated with osteoarthritis, the mechanisms of DNS in reducing genu osteoarthritis pain are neuromuscular changes in aging, and knee osteoarthritis can affect dynamic postural control. Judging from the principle of DNS in reactivating the patient's natural motor patterns that are not active, stimulating the central nervous system and stimulating the control centers of movement in the brain to activate how our body should move, DNS emphasizes the importance of the sensory system in the development of global motor control (m. quadriceps). DNS recognizes that the sensory system provides the basis for the development of motor control and that the two systems are closely linked. The DNS approach involves the use of exercises and specific techniques to activate ideal stabilization functions at the subcortical level, which may improve sensorimotor function and overall movement quality.

4. Conclusion and Suggestion

Research entitled "The Effectiveness of Dynamic Neuromuscular Stabilization Exercise on Pain Reduction in Elderly with Genu Osteoarthritis at PKU Muhammadiyah Jatinom Klaten Hospital". Subjects who met the inclusion criteria were divided into 2 treatment groups,

namely group I for dynamic neuromuscular stabilization exercise and group II for hospital intervention in the form of infra-reduction. The treatment was given for eight meetings. The results showed a significance value of p = 0.025 (p < 0.05). It was concluded that the effectiveness of dynamic neuromuscular stabilization exercise significantly reduced pain in the elderly with genu osteoarthritis. This study proves that giving dynamic neuromuscular stabilization exercise movements twice a week treatment for 4 weeks can reduce pain in the elderly with genu osteoarthritis. To increase the effectiveness of exercises during the training period, the principle of overload increases the number of repetitions and the type of training used (Wardhani & Nisa, 2023)

Based on the research that has been done, there are several suggestions, namely that research subjects who experience knee pain can continue the DNS exercise at home. Physiotherapists at research institutions can use exercise in the form of DNS to reduce pain in osteoarthritis genu patients. And for further research, it is hoped that if you want to use the same DNS exercise, choose a dose that is different from this study to see the difference in results and have a new reference from a different dose.

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