

Homebased Exercise Training (Knee Exercise) to Increase Physical Performance of Elderly with Osteoarthritis di Kota Gresik

Rita Rahmawati¹, Siti Nur Qomariah²

¹Lecturer Medical Surgical and Community Nursing, Health Faculty, Gresik University, Gresik, Indonesia

²Lecturer Management Nursing, Health Faculty, Gresik University, Gresik, Indonesia

Corresponding author:

RR : ners.ritarahmawati@gmail.com

SNQ : snurq18@gmail.com

ABSTRACT

Introduction

Osteoarthritis (OA) is a chronic disease that attacks the cartilage of joints and tissues with symptoms of pain, stiffness and function of the joints. Management of chronic diseases such as OA includes increased physical performance in the elderly. The purpose of this study was to examine the effects of Home Based Exercise Training (HBET) to physical performance.

Methods

This study used quasy experimental with one group pre-post test design approach. Data were collected from elderly with oateathritis in Puskesmas Alun-Alun Gresik. Respondent were recruited by using consecutive sampling technique, consisted of 26 respondents who met inclusion criteria. Respondent who were assigned to HBET group performed 3 weeks of knee exercise. Test Timed Up and Go (TUG) was used to assess physical performance.

Results

Paired t-test showed a significant result with $p < 0.0001$ for physical performance.

Conclusions

Elderly with Osteoarthritis who received HBET showed improvements in physical performance.

Keywords

Homebased Exercise Training; Knee Exercise; Physical Performance; Osteoarthritis

BACKGROUND

Osteoarthritis is a degenerative joint disease due to biochemical breakdown of cartilage articular (hyaline) in the synovial knee joint so that the cartilage of the joint is damaged (Quintana, 2008). This disorder develops slowly, is asymmetrical and non-inflammatory, characterized by the presence of joint cartilage degeneration and the formation of new bone (osteophytes) on the periphery of the joint (Stanley & Beare, 2007). One symptom of knee osteoarthritis is knee pain. The presence of knee pain causes a person to be afraid to engage in activities or movements that reduce their quality of life. A person with osteoarthritis pain will develop joint and muscle dysfunction so that they will experience limited movement, decreased muscle strength and balance. About 18% experience difficulties and limitations in activities, loss of work capacity function and decreased quality of life (Reis, et al., 2014). Therefore, measurement of quality of life is a measurement that is relevant and important in assessing physical, social, emotional conditions which are as a result of suffering from OA (Miller, II, & Block, 2013)

OA prevalence in Indonesia, reaching 5% at the age of <40 years, 30% at the age of 40-60 years, and 65% at the age of > 61 years (Sharon, 2011). OA Patients at Alun-alun Health Center in Gresik Subdistrict In March-April 2017 the average of the last 3 months was 100 people with various ages ranging from adult to elderly, with domicile outside or inside the city of Gresik. Based on preliminary studies not all patients follow exercise recommendations at home.

Recommended non-pharmacological therapies include exercise / knee training. Other types of exercise that can be carried out are home exercise, Range of Motion (ROM),

strengthening exercises / strengthening exercises including quadriceps and hamstring exercises and aerobics such as walking, cycling, swimming (Dewi, 2009). The purpose of this exercise is to improve joint function, increase joint strength, protect joints from damage by reducing stress on the joints, prevent disability and improve physical fitness. This exercise is certainly adjusted to the conditions and abilities of the patient (Dewi, 2009). Thomas's research shows that simple home based exercise programs can produce significant pain reduction in two years. The program is suitable for primary care (Thomas, et al., 2002). This study aims to determine the effect of home based exercise training on quality of life and patient performance

METHODS

The research design used was quasi experiment (one group pre-post test design). The type of this research is to reveal the causal relationship by involving one group of subjects. The subject group was observed before intervention, then observed again after intervention (Nursalam, 2014).

The purpose of this study was to analyze the effect of Home Based Exercise Training on the quality of life and physical performance of osteoarthritis patients. The dependent variable physical performance questionnaire uses a timed up and go (TUG) test, where TUG is a simple, fast and inexpensive functional mobility test. According to The International Classification of Functioning, Disability and Health (ICF), the TUG test measures the domain of activity, changes and maintains body position and walking (Eekhoof, 2001)

The instrument used for the dependent variable in this study is the timed up and go (TUG) test, where TUG is a simple, fast, and inexpensive functional mobility test. According to The International Classification of Functioning, Disability and Health (ICF), the TUG test measures the domain of activity, changes and maintains body position and walking (Eekhoof et al., 2001). TUG tests consist of basic movements needed for mobility in activities everyday, namely standing from a chair, walking 3 meters, turning 180o, walking back towards the chair, and sitting back (Nordin et al., 2006).

The assessment of the TUG test score is based on the time needed to complete the TUG test activity, in seconds (ratio scale). The TUG score shows a level of independence, if a TUG score of 10 seconds or less shows total independence with or without aids for ambulation or transfer. If a TUG score of 11-20 seconds shows independent for the main transfer with or without a walker, be independent to transfer to the bathroom, or climb stairs and leave the house alone. If a TUG score of 30 seconds or more indicates the subject needs help, it depends on most activities

RESULTS

Univariate Analysis

Univariate analysis was carried out to obtain descriptive characteristics of respondents. The results of the analysis are frequency distribution, percentage, mean, median, and standard deviation. Variables with categorical data are analyzed using frequency distributions, percentages or proportions. Variables with numerical data were analyzed using mean, median, standard deviation and maximum values. Univariate analysis in this study is the characteristics of respondents which include education, employment.

Bivariate analysis

Bivariate analysis is intended to determine the effect and compare treatment and control groups. The statistical test used depends on normal data. Therefore, it has been done first to test the normality of the data using Shapiro Wilk.

The result of the significance of statistical calculations is seen by the degree of significance 0.05 if $p < 0.05$ then H_0 is rejected and the hypothesis is accepted. This means that there is an influence of HBET on physical performance.

Table 1 Analysis of differences in the intensity of HBET training on physical performance

Variable	Analysis
The physical performance of the low intensity exercise group	ANOVA
Physical performance A group of moderate intensity exercises	
Physical performance of high intensity exercise groups	

The results of the significance of statistical calculations are seen with the significance level 5 0.05 if $p < 0.05$ then H_0 is rejected and the hypothesis is accepted. This means that there is a difference in the intensity of HBET training on physical performance

Characteristics of respondent data

Table 2 Distribution of characteristics of respondents in the elderly at the Puskesmas Alun-alun Gresik

No	Characteristics	Parameter	Frekuensi (f)	Percentage (%)
1	Education	Elementary school	3	11,5
		Middle school	1	3,8
		High school	14	53,8
		College	8	30,8
2	Work	unemployed	15	57,6%
		entrepreneurs	11	42,3
		Government employees	0	0
		TNI/POLRI	-	-
		other	-	-

Table 2 shows that the elderly respondents in Puskesmas alun-alun Gresik mostly have general high school level education 8 (30.8%). A small percentage have a secondary school level 1 (3.8%). Most of the respondents' jobs were unemployed 13 (57.6%) and a small percentage worked as entrepreneurs 11 (42.3%).

The Influence of Home Based Exercise Training on the physical performance of the elderly with osteoarthritis in thePuskesmas alun-alun Gresik

Before statistical tests are conducted to determine the effect of Home Based Exercise Training on physical performance, it is necessary to test the normality of the data. Following are the results of data normality tests that include physical performance, elderly who suffer from osteoarthritis in the first measurement (pre test) and second measurement data (post test).

Table 3 Results of normality tests on physical performance.

Variable		Shapiro-Wilk (Sig.)
Physical performance	<i>Pre test</i>	0,455
	<i>Post test</i>	0,055

Table 3 shows that the variables of physical performance of the intervention group had a normal distribution with $p > 0.05$. Data normality test results show that the data distribution for physical performance variables is normal, so using parametric tests. The parametric test used in this study is paired t-test

Effect of Home Based Exercise Training on physical performance

Table 4 Effect of Home Based Exercise Training on the physical performance of elderly people with osteoarthritis in Puskesmas Alun-alun Gresik

Variabel		N	Rerata	SD	P
Performa Fisik	<i>Pre test</i>	26	21,61	0,69	
	<i>Post test</i>	26	16,60	2,46	<0,0001

Table 4 shows the changes in the patient's physical performance between the pre-test and post-test after getting the Home Based Exercise Training intervention. The results of statistical tests using paired t-test obtained $p < 0.0001$ which means that there is an influence of Home Based Exercise Training on physical performance before and after the intervention. The measurement results indicate the improvement in the physical performance of respondents who were originally on pre test requires the travel time of the TUG test with an average of 21.61 seconds to mean 16.60 seconds at the post test after the Home Based Exercise Training intervention.

Effect of Home Based Exercise Training on physical performance based on exercise intensity

Table 5 Effect of Home Based Exercise Training on physical performance based on exercise intensity

Variabel	Exercise intensity									p
	low			Medium			High			
	N	average	SD	N	average	SD	N	average	SD	
Performa fisik (t)	5	-3,24	0,49	12	-3,85	1,40	9	-7,46	1,26	0,000

DISCUSSION

The results showed that there was an increase in physical performance and quality of life, there was also a decrease in the level of fatigue in the intervention Home Based Exercise group training. The results of bivariate analysis through paired t-tests on physical performance, fatigue and quality of life show a significant effect of HBET between pre and post test. ANOVA analysis shows a significant difference between the intensity of HBET training on physical performance.

Home Based Exercise Training is effective in improving physical performance in elderly patients suffering from osteoarthritis. The results of this study are consistent with studies in osteoarthritis patients who carried out home-based exercises conducted by Bruce-Brand et al (2012) which states that Home-based resistance training is an acceptable alternative to exercise therapy in the management of knee OA, producing similar improvements in functional capacity. Exercise on foot is an important self-care or self-care activity that can counteract some of the effects of illness, therapy and activity intolerance (Winningham, 2000). For people who suffer from chronic diseases, one of the actions of self care is reflected in obeying the lifestyle and carrying out the recommended daily activities (Larsen & Lubkin, 2009).

According to Orem's self-care theory model, self-care agency is the ability or strength possessed by individuals to carry out self-care so that humans can have the ability to care for themselves (Allgood & Tomy, 2006). Self care agency refers to the complex ability to carry out self care so that it needs to be improved by individuals through learning, knowledge, motivation and skills (Taylor & Renpenning, 2011).

In accordance with the principle of Orem's self-care theory that is oriented towards the independence of patients according to their abilities and circumstances, giving walking exercises can be carried out independently and safely to elderly patients with osteoarthritis. Patients are expected to be able to meet physiological needs in the form of optimal physical conditions on an ongoing basis and achieve independence in overcoming existing health problems. In accordance with the results of this study, what nurses can do is teach self-care techniques, for example using exercise program diaries and provide pulse monitoring education in activity regulation so that nurses can help patients develop exercises safely.

Nurses can act as a nursing agency that functions to overcome complaints that occur by optimizing the ability of the client to care for himself (DeLaune & Ledner, 2002). In the opinion of researchers, non-pharmacological therapies such as exercise can be used as one of the management to deal with pain and improve the function of affected joints. Therefore nurses need to provide health education, train patients to do exercises, provide counseling and monitor the exercises. Thus, elderly patients with osteoarthritis are able to exercise independently and sustainably.

Effect of Home Based Exercise Training on the physical performance of elderly patients with osteoarthritis

The results of research on the physical performance of respondents prior to Home Based Exercise Training (HBET) showed that the average pre-test of the Timed Up and Go test was taken in 21.61 seconds. This shows that the physical performance of respondents is in the partial dependent category. The average measurement results during the post test decreased travel time to 16.60 seconds which is included in the category of good mobilization. Statistical test results show that there is a significant effect of Home Based Exercise Training (HBET) on the physical performance of elderly patients with osteoarthritis. The results above show that HBET is able to improve the physical performance of osteoarthritis patients.

Self-care theory Orem explained that if a self-care agency is not comparable to self-care demand, there will be a self-care deficit in an individual (DeLaune & Ledner, 2002). Increasing self-care agency in individuals will increase a person's motivation to exercise according to the dose given, so that it will improve physical performance.

Most of the respondents completed the intervention with moderate intensity, even though as many as 9 respondents did Home Based Exercise Training with good intensity and only a small percentage did low intensity exercise. The benefits of exercise for the elderly include to facilitate blood circulation, strengthen muscles, prevent bone loss, reduce blood pressure, reduce bad cholesterol, and raise good cholesterol. Even exercise can also boost immunity, maintain muscle balance and coordination and can burn calories to reduce excess weight. (Junaidi, 2011).

Home Based Exercise Training is one of the interventions that nurses can do to improve the patient's self agency where before the respondent did HBET, the respondent was given information about understanding, benefits, things that must be considered during the exercise so that this would increase the ability of the respondents to identify and take decision as one way to improve self-care.

The best physical performance improvement was shown in the group of respondents who did good intensity exercise that was 7-9 times compared to the low and medium intensity groups ($p = 0,000$ in the Anova test). Physical exercise or activity produces psychological changes and good adaptation to the body (Anderson & Shivakumar, 2013). Exercises with the right intensity and consistency can affect the level of symptoms felt (Schwartz et al., 2001). The difference in intensity of exercise in respondents influences the physical adaptation that occurs. A person's ability to carry out health-related recommendations can affect the level of compliance in conducting HBET exercises.

CONCLUSIONS

Home Based Exercise Training can improve the physical performance of osteoarthritis patients in the knee joint. Home Based Exercise Training that is carried out routinely will affect mobility, exercise tolerance and muscle flexibility so as to improve physical performance.

List of abbreviations (optional section)

HBET : Homebased Exercise Training

OA : Osteoarthritis

Declarations

This research was supported by Directorate of Research and Community, Ministry of Research and Technology of Higher Education

Authors' contributions

First author was responsible for finding the appropriate journal translate it and write down the article. Second author was responsible for collecting data.

Authors' Information

Rita Rahmawati as first author and a lecture in University of Gresik with speciality community nursing and medical surgical nursing. Siti Nur Qomairah as second author and a lecture in University of Gresik speciality management in nursing.

Acknowledgements

The authors thank the Directorate of Research and Community, Ministry of Research and Technology of Higher Education. We wish to acknowledge all the participants who contributed to the completion of this article, all the respondent in Puskesmas Alun-alun Gresik East Java.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

Not Applicable

Competing interests

The author declare that it has no competing interests

Funding

Publication of this article was funded by Directorate of Research and Community, Ministry of Research and Technology of Higher Education

REFERENCES

1. Bruce-Brand et al.(2012) Effects of home-based resistance training and neuromuscular electrical stimulation in knee osteoarthritis: a randomized controlled trial. BMC Musculoskeletal Disorders 13:118.
2. Dekker, J. (2014). Exercise and Physical Functioning in Osteoarthritis Medical, Neuromuscular, and Behavioral Perspectives. New York: Springer Science+Bussiness Media.

3. Dewi, S. (2009). *Osteoarthritis: Diagnosis, Penanganan dan Perawatan di Rumah*. Yogyakarta: Fitramaya.
4. Drouin, J 2002, *Aerobic exercise training effects on physical function, fatigue and mood, immune status, and oxidative stress in subjects undergoing radiation treatment for breast cancer*, Dissertation
5. Eekhoof, J. D. (2001). Short report: functional mobility assessment at home. *Can fam physician* 47 , 1205-7.
6. Gonzalez Sáenz de Tejada, M., Escobar, A., & Herdman, M. (2011). Adaptation and validation of the Osteoarthritis Knee and Hip Quality of Life (OAKHQOL) questionnaire for use in patients with osteoarthritis in Spain. *Cinical Rheumatology*, Vol 30, 1563-1575, doi:10.1007/s10067-011-1855-6.
7. Junaidi, Said. (2011). Pembinaan Fisik Lansia melalui Aktivitas Olahraga Jalan Kaki. *Jurnal Media ilmu Olahraga Indonesia*. Vol 1 Edisi 1. Juli 2011. ISSN:2088-6802
8. Kisner, C., & Cosby, L. (2007). *Therapeutic Exercise Foundation and Technique*. 5th ed. Philadelphia: F.A Davis Company.
9. Lin MR, Hwang HF, Hu MH, Wu HDI, Wang YW, Huang FC 2004, Psychometric comparisons of timed up and go, one leg stand, functional reach and tinetti balance measures in community dwelling older people, *J Am Geriatr Soc* 52: 1343-48
10. Mackinnon, LT, Richie, CB, Hooper, SL, Abernethy, PJ 2003, *Exercise management: concepts and professional practice*, USA : Human Kinetics
11. Miller, L., II, J., & Block, J. (2013). Quality of Life in Patients with Knee Osteoarthritis: A Commentary on Nonsurgical and Surgical Treatments. *The Open Orthopaedics Journals* 7, 619-23.
12. Misnaldiarly (2007). *Rematik: Asam urat-hiperurisemia, arthritis gout*. Jakarta: Populer Obor, hal: 33-40.
13. Misnaldiarly (2010). *Osteoarthritis, penyakit sendi pada orang dewasa dan anak*. Jakarta: Populer Obor, hal: 19-24.
14. Moskowitz, R., Roy, D., March, C., Joseph, A., & Victor, M. (2007). *Osteoarthritis diagnosis and medical/surgical management* 4th ed. Lippincot: William-wilkins.
15. Nordin E, Rosendahl E, Olsson LL 2006, Timed up and go test: reliability in older people dependent in activities of daily living-focus on cognitive state, *Phys Ther* 86: 646-55
16. Quintana, J. (2008). *Prevalence pf Knee and Hip Osteoarthritis and The Appropriateness of Joint Replacement in an Older Population*. Retrieved from PubMed.gov.: <http://www.ncbi.nlm.nih.gov/pubmed>
17. Rahl, R. (2010). Physical Activity and Health Guidelines: Recommendation for varoious ages. In *Fitness Levels, and Condition From 57 authoritative sources* (p. 191). USA: Human Kinetics.
18. Rat AC, P. J. (2006). Development and Testing of a Specific Quality-of-life questionnaire for Knee and Hip Osteoarthritis: OAKHQOL (Osteoarthritis of Knee Hip Quality of Life). *Joint Bone Spine*, 73; 697-704.
19. Rat, A., Coste, J., Pouchot, J., & et al. (2005). OAKHQOL: A New Instrument to Measure Quality of Life in Knee and Hip Osteoarthritis. *J Clinical Epidemiol*, 58;47-55.

20. Reis, J., Gomes, M., Neves, T., Petrella, M., Oliveira, R., & Abreu, D. (2014). Evaluation of Postural Control and Quality of Life in Elderly Women With Knee Osteoarthritis. *REVBASREUMATOL* 54 (3), 208-212.
21. Sharon, L. (2011). *Medical Surgical Nursing Assesment and Management of Clinical Problems Eight Edition*. USA: Elsevier Mosby.
22. Stanley, M., & Beare, P. (2007). *Buku Ajar Keperawatan Gerontik (Gerontological Nursing; A Health Promotion/Protection Approach) Edisi 2 (Juniarti, N & Kurnianingsih, S; alih bahasa)*. Jakarta: EGC.
23. Stitik, T., & Foye, P. (2005). In *Physical Medicine and Rehabilitation Principles and Practice* (pp. 764-785). Lippincot: Williams-Wilkins.
24. Thomas, K., Muir, K., Doherty, M., Jones, A., O'Reilly, S., & Basse, E. (2002). Home Based Exercise Programme for Knee Pain and Knee Osteoarthritis: Randomised Controlled Trial. *British Medical Journal (BMJ)*, 325 (7367), 752-757.
25. WHO. (1997). WHOQOL Measuring Quality of Life, Programme on Mental Health. In *division on Mental Health and Prevention of Substance Abuse*. Geneva: World Health Organization.