

The effectiveness of combined breathing exercises with Respiratory Muscle Stretching Exercises to increase chest expansion in the elderly

Mianti Nurrizky Sutejo¹, Virginia Eka Putri A. Baharudin², Dhea Pritasya Nanda Melip²

^aDepartement of Physiotherapy STIKES Telogorejo Semarang, Java Central, Semarang, Indonesia

^{bc} Departement of Physiotherapy STIKES Telogorejo Semarang, Java Central, Semarang, Indonesia

ARTICLE INFO

Article history:

Received 16 February 2023

Accepted 27 February 2023

Keywords:

Geriatric, Chest expansion, RMS,
Breathing exercise

ABSTRACT

Background: Aging is the stage that a person goes through from birth to old age. Some things that happen to older people cause them to enter a period of decline, weakness, gradual decline in social activity, and bring about enormous changes, starting with their cells and tissues and ending with their organ systems, including the respiratory system. Increase.

Material and Methods: This was a systematic review and meta-analysis. The data was obtained though journal screened by Science Direct database, PubMed database, and Google Scholar database with selecting articles published in 2012-2021. The keywords used were ("Respiratory Muscle Stretching Exercises" OR "breathing exercises") AND ("Older" AND "Elderly") AND chest expansion, AND "Randomized controlled Trial". Articles were colled by using PRISMA flow diagrams and analyzed using the revman 5.3 application.

Result : A meta-analysis based on 3 articles shows that respiratory muscle stretching exercise can increase thoracic expansion in the elderly who meet the inclusion criteria by 0.26 times compared to other interventions or no intervention. (SMD 0.26; 95% CI= -0.05 to 0.56; p=0.42). which has been adjusted according to calculations according to PRISMA analytical measurement standards

Conclusion : Prescribing RMSG for 4 weeks was beneficial in improving maximal chest exhalation and increase chest expansion in older.

Keywords: Geriatric, Chest expansion, RMS, Breathing exercise

INTRODUCTION

Introduction contains justification of the importance of Older people are defined by the United Nations as people who are over 60 years of age. however, families and communities often use other sociocultural references to determine age, including family status (grandparents), physical appearance, or age-related health conditions. The psychological and psychosocial toll of traumatic experiences, combined with poor nutrition and disease features, can result in refugees and IDPs 'aging' more rapidly than the resident population (UNHCR, 2018). Global population aging is one of the most important medical and social demographic problems worldwide. According to the World Health Organization (WHO), the definition of elderly is healthy aging as a process of maintaining functional abilities to enable well-being at an older age. Besides that, according to WHO, the age declared as elderly is above 60 years divided into several categories for the elderly (Rudnicka et al., 2020).

Globally, there are 703 million elder people who are aged 65 years or older in 2019. East and Southeast Asia is home to the largest number of elder people in the world population (260 million), followed by Europeans and North America (over 200 million)(United Nations, 2019). While the number of elder people in Indonesia has increased every year since 2007 by 18 million and is expected to continue to increase every year until 2025 (Multazam et al., 2021). It is known that the elderly experience a decrease in organ systems, including the skeletal system, cardio system, respiratory system, muscular system, and several other systems affiliated with the body. one of the disorders often found in the elderly is in the respiratory system, namely the respiratory muscles lose strength and become stiffness thereby reducing the activity of the cilia, and the muscles in the lungs lose elasticity so that the inhalation process becomes heavier, and the respiratory capacity maximal decrease and the depth of breath decreases (Putra, 2019).

The reduced strength of the muscles around the thorax causes a decrease in the inhalation process in the elderly. exercises that can be given related to complaints felt by respondents are respiratory muscle stretching and giving breathing exercise (Awachat et al., 2022).

Respiratory muscle stretching (RMS) has been advised as an intervention that is capable of reduce chest wall rigidity, as a result increasing its expansion and improving ventilatory patterns in patients with chronic

obstructive pulmonary disorder (Rattes et al., 2018). Breathing exercise is a method used to improve the quality of the path to the lungs and improve the process of inhalation and expiration of the lungs (Vieira et al., 2014).

Giving respiratory muscle stretching exercises and breathing exercises has the goal of increasing thoracic expansion within the elderly. in which exercising gives advantages in decreasing muscle stiffness in the thorax and increasing the procedure of inhalation and expiration in the lungs. Based on this statement, researchers are interested in conducting research related to this matter using meta-analysis and systematic review.

METHODS

1. Study Design

The study design used in this study was a systematic review and meta-analysis, using the PRISMA flow chart guidelines. The data was obtained though journal screened by Science Direct database , PubMed database, and Google Scholar database with selecting articles published in 2012-2021. The keywords used were (“Respiratory Muscle Stretching Exercises” OR “breathing exercises”) AND (“Older” AND “Elderly”) AND chest expansion, AND “Randomized controlled Trial”.

2. Inclusion Criteria

The inclusion criteria used in this study were based on full paper articles using a randomized controlled trial (RCT) research method, the size of the relationship used was following the Mean SD, for the interventions given were respiratory muscle stretching and breathing exercise, with research subjects aged > 60 years, willing to be a research sample, has complaints of stiffness in the thoracic muscles.

3. Exclusion criteria

In this study, the exclusion criteria were based on published articles other than English and Indonesian, and the elderly who had a history of complications had sensory disturbances..

4. Operational definition

Formulation of research conducted using PICO. The population is elderly with complaints of muscle stiffness in the thorax. The intervention

used respiratory muscle stretching, with comparison, namely exercise other than RMS and the intended outcome was an increase in thoracic expansion in the elderly.

Respiratory Muscle Stretching is an exercise that aims to stretch or lengthen the inspiratory muscles of the chest wall during inspiration and the expiratory muscles of the chest wall during expiration. This exercise is designed to reduce chest wall stiffness, thereby increasing the mobility of the thoracic wall (Patmawati, 2020).

Breathing Exercise is a breathing exercise method that is used to stretch the airway when doing inspiration. Breathing exercise has a classification that is divided into deep breathing exercises, purse lip breathing exercises, and other types. In this case, the breathing exercise given uses deep breathing exercises.

Thoracic expansion is an examination performed to see the quality of inspiratory and expiratory movements on each side of the chest

5. research instruments

The research device uses filtering to look the first-rate of research articles the usage of the critical Appraisal skill software (CASP).

6. Data analysis

Data analysis in this study used the review manager application (RevMan 5.3). Data were analyzed based on variations between studies by determining the use of fixed effect analysis models. This study uses I^2 to quantify dispersion. The results of the analysis obtained are data in the form of effect size values of study heterogeneity, where the results of the research that have been analyzed are then interpreted in the form of forest plots and funnel plots.

RESULT AND DISCUSSION

Result

Research-based on primary studies related to the effectiveness of respiratory muscle stretching (RMS) in increasing thoracic expansion in the elderly obtained five articles. The articles obtained included those from the Asian continent and the American continent. Then the respondents from each article obtained the results of less than 100 participants.

Searching for articles using the database has been described in the PRISMA flow diagram. Meanwhile, the quality assessment in this study used the clinical appraisal skill program (CASP). After quality assessment, five articles were obtained which were included in the meta-analysis quantitative synthesis process using RevMan 5.3.

There were 3 articles based on the results of the review which met the requirements as a source for a meta-analysis of the effectiveness of respiratory muscle stretching on increased thoracic expansion originating from the Asian and American continents consisting of Indonesia, Indians, and Brazil which obtained the meta-analysis results which were translated into forest plots and funnel plots.

a. Forest Plot

Interpretation results obtained from the meta-analysis process through the forest plot explained that as many as 3 articles reported that respiratory muscle stretching can increase thoracic expansion in the elderly compared to other interventions given (figure 2). The results obtained, there is high experimental heterogeneity ($I^2 = 0\%$), so the data is homogeneous. Using the fixed effect model in analyzing the data in the forest plot, it can be concluded that giving respiratory muscle exercise can increase lung expansion by 0.26 times compared to other interventions. This is also supported by the results of statistical calculations which are significant ($SMD = 0.26$; $95\% CI = -0.05$ to 0.56 ; $p = 0.10$).

b. Funnel Plot

Funnel plot is a plot that plots the estimated effect size of each study against an estimate of its precision, which is usually the standard error. The results of the funnel plot on respiratory muscle stretching based on the elaboration of Figure 3, which is to increase respiratory muscle stretching, shows perfect results with no bias which is marked by the distribution in each plot which has a standard error value of 0.6.

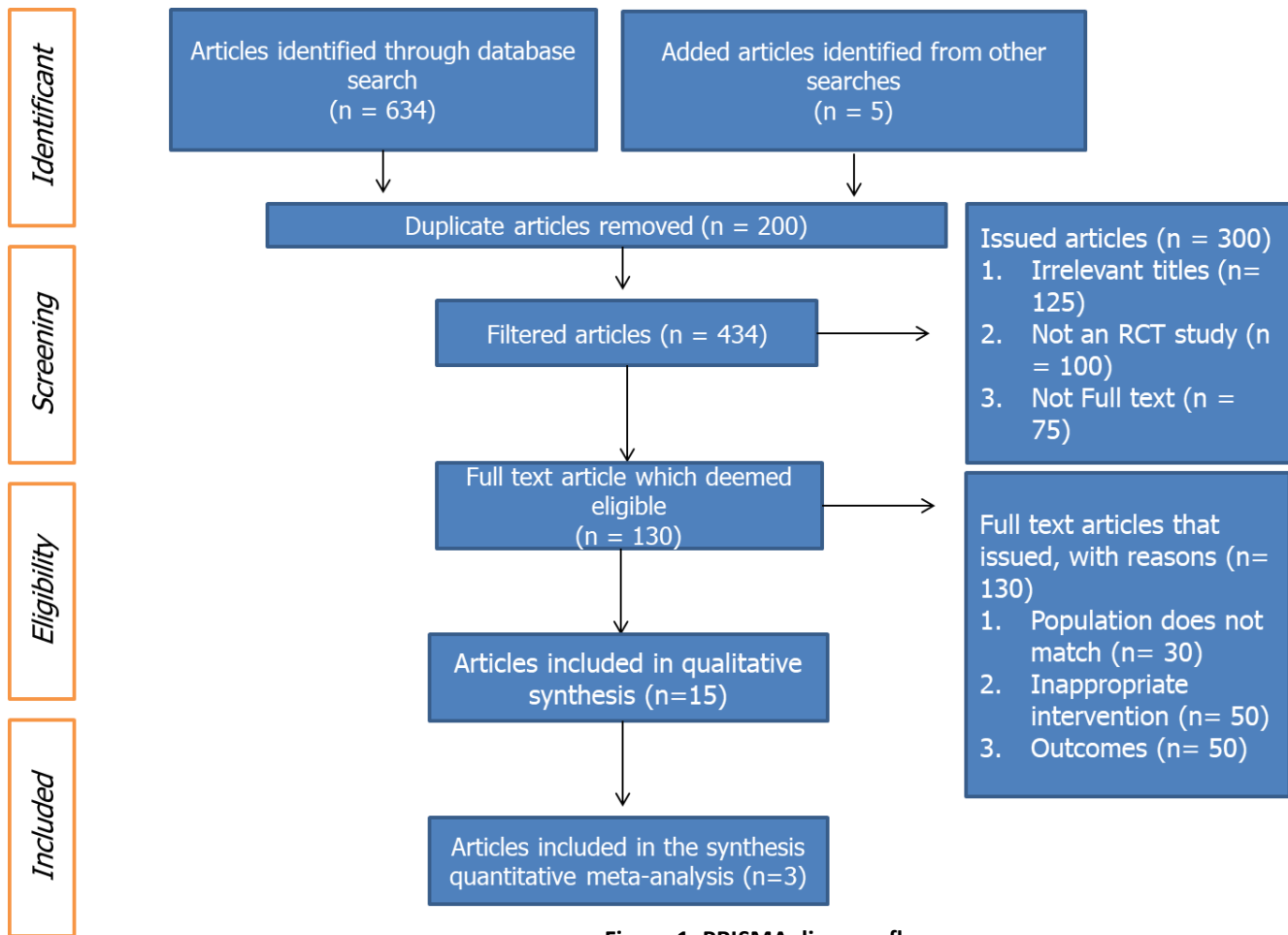


Figure 1. PRISMA diagram flow

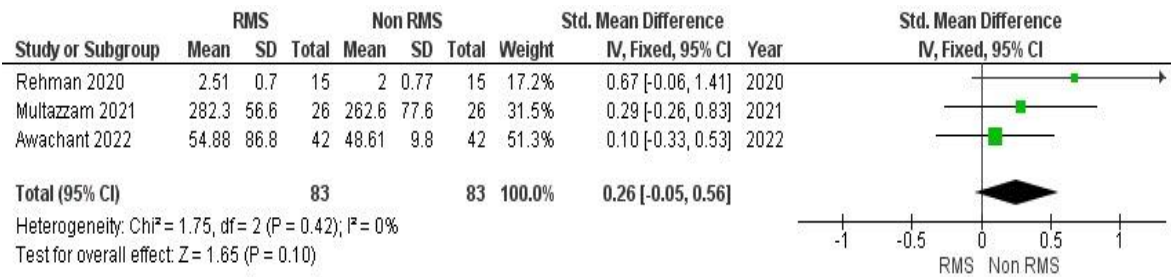


Figure 2. Forest Plot Respiratory Muscle Stretching to increase thoracic expansion

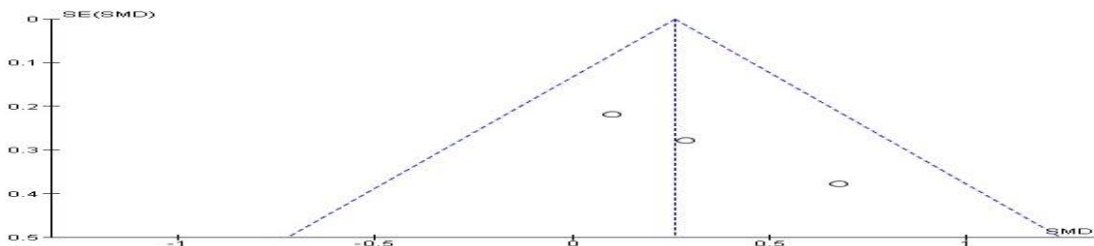


Figure 3. Funnel plot of Respiratory Muscle Stretching to increase thoracic expansion

Discussion

Disorders in the elderly are often found, one of which is the stiffness of the muscles in the thoracic region which causes discomfort in the elderly. The presence of muscle stiffness causes the process of inspiration and expiration of the respiratory system to decrease which causes the elderly to feel heavy when they are going to do the breathing process (Dos Santos et al., 2019). Decreased quality of the muscles in the thorax is caused by several factors, namely spasms in the chest muscles, pain, lack of physical activity, and several other factors (Salari et al., 2022)

Treatments that can be given are respiratory muscle stretching exercises and breathing exercises which aim to increase thoracic expansion, respiratory muscle stretch is given to stretch the inspiratory chest wall muscle groups during concept and expiratory chest wall muscle group all through expiration. respiratory muscle stretching has been advised as an intervention that is capable of reducing chest wall stress, consequently increasing its expansion and improving ventilatory styles in patients with the chronic obstructive pulmonary disorder. B Rupnar Ganesh, et

al concluded that 5 days of respiratory muscle stretch improves chest enlargement in and pulmonary characteristics of the aged populace (Sreejith & Praveena, 2022).

Based totally on his research argued that the advantages of performing respiratory muscle stretch gymnastics (RMSG) aim to reduce chest wall stiffness reduce shortness of breath and improve a person's quality of life. The observation additionally explained that RMSG indeed in particular designed to reduce chest wall stiffness or mainly at the respiratory muscles' chest wall (Multazam et al., 2021).

Goud and Ganesh (2017) mention at the age of 60 years, chest wall compliance is 20% lower than when they were in their 20s. Therefore, it is highly recommended do exercises that increase the flexibility of the respiratory muscles or reduce stiffness in the chest wall as well as increase lung recoil ability so that it can increasing vital capacity and lung function (Goud & Br, 2017).

CONCLUSION

The provision of respiratory muscle stretching in the elderly to increase thoracic expansion has very good results. based on meta-analysis data, it was found that the p-value was very significant with a result of 0.05 which meant that giving the exercise was more effective than just giving breathing exercises to the respondent.

REFERENCES

- Awachat, A. C., Sahasrabudhe, P., Sancheti, P., & Shyam, A. (2022). Effect of Respiratory Muscle Stretch Gymnastics on Exercise Capacity in the Elderly – A Randomized Control Trial. *Indian Journal of Respiratory Care*, 11(2), 145–148. <https://doi.org/10.4103/ijrc.ijrc>
- Dos Santos, R. B., Fraga, A. S., Coriolano, M. das G. W. de S., Tiburtino, B. F., Lins, O. G.,

ACKNOWLEDGEMENT ()

Researchers would like to thank all those who have helped preparation of this article and also thanks to the database providers PubMed, Science Direct, and Google Scholar.

- Esteves, A. C. F., & Asano, N. M. J. (2019). Respiratory muscle strength and lung function in the stages of Parkinson's disease. *Jornal Brasileiro de Pneumologia*, 45(6), 1–6. <https://doi.org/10.1590/1806-3713/e20180148>
- Goud, A., & Br, G. (2017). Short term effects of respiratory muscle stretch gymnastics versus hold relax PNF on pulmonary functions and chest expansion in elderly individuals-a

- randomized clinical trial. *International Journal of Applied Research*, 3(7), 1018–1022. www.allresearchjournal.com
- Multazam, A., Sururul, H., Rakhmawati, N., & Hidayat, M. (2021). Pemberian Kombinasi Respiratory Muscle Stretch Gymnastic (RMSG) dengan Latihan Pernapasan Buteyko dalam Meningkatkan Ekspansi Dada dan Arus Puncak Ekspirasi pada Lansia. *PhysioHS*, 3(Desember), 101–107.
- Patmawati, M. (2020). *PENERAPAN PERNAFASAN RESPIRATORY MUSCLE STRETCHING (RMS) UNTUK MENINGKATKAN STATUS RESPIRASI PADA KELUARGA DENGAN ASMA*.
- Putra, W. S. (2019). *PENGARUH CHEST THERAPY TERHADAP SESAK NAFAS DAN EKSPANSI THORAK PASIEN DENGAN PNEUMONIA*.
- Rattes, C., Lima, S., Morais, C., Gonçalves, T., Bouwman, L., Galindo-filho, V. C., Parreira, V., & Aliverti, A. (2018). Respiratory Physiology & Neurobiology Respiratory muscles stretching acutely increases expansion in hemiparetic chest wall. *Respiratory Physiology & Neurobiology*, 254(March), 16–22. <https://doi.org/10.1016/j.resp.2018.03.015>
- Rudnicka, E., Napiera, P., Pod, A., Smolarczyk, R., & Grymowicz, M. (2020). The World Health Organization (WHO) approach to healthy ageing. *Elsevier*, 139(January), 6–11.
- Salari, N., Darvishi, N., Ahmadipanah, M., Shohaimi, S., & Mohammadi, M. (2022). Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. *Journal of Orthopaedic Surgery and Research*, 17(1), 1–13. <https://doi.org/10.1186/s13018-022-03222-1>
- Sreejith, A., & Praveena, D. (2022). *Effectiveness of Respiratory Muscle Stretch and Chest Mobility Exercise on Pulmonary Function and Chest Expansion in Elderly Population*. 11(2), 681–685. <https://doi.org/10.21275/SR22131105433>
- UNHCR. (2018). Emergency Handbook. In *4th Edition* (pp. 1–7).
- United Nations. (2019). *World Population Ageing*.
- Vieira, D. S. R., Mendes, L. P. S., & Elmiro, N. S. (2014). Breathing exercises: influence on breathing patterns and thoracoabdominal motion in healthy subjects. *Brazilian Journal Of Physical Therapy*, 18(6), 544–552.