

RESISTANCE EXERCISE TO IMPROVE IMMUNE OF ELDERLY IN NEWNORMAL ERA: REVIEW LITERATURE

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ABSTRACT

Introduction – The high rate of transmission of Covid-19 in Indonesia has brought enormous changes to society, especially with the applied of new normal regulation. New normal regulation requires the public to continue carrying out their usual activities by implementing health protocols. The elderly are a population with high risk of covid-19 transmission. Various efforts can be made to maintain the immune system in the new normal era, one of them is by doing exercise. One of the exercises that can be done by the elderly is resistance exercise.

Purpose – The purpose of this study was to identify the effect of resistance exercise to increase immunity in the elderly based on evidence based.

Methodology/Approach – This study is a literature study that summarizes some relevant literature on the same theme. Literature search using 3 databases: Pubmed, Pedro and BMC Central. Key words used in the literature search included: "immune system", "resistance exercise" and "elderly".

Findings – Based on the results of the literature review, it was found that resistance exercise can increase immunity in the elderly. The form of resistance exercise are: horizontal leg press, knee extension, knee flexion, horizontal supine, triceps extension pulley, biceps curl, sitting row, plantar flexion, shoulder press, hip flexion-extension.

Originality/ Value/ Implication – The elderly can perform resistance exercise regularly to increase immune system during new normal era.

Keywords: resistance exercise, immune system, elderly

INTRODUCTION

The COVID-19 pandemic that began in late 2019 has created widespread anxiety and confusion around the world. The reason is now the virus has spread in almost all parts of the world, including in Indonesia.

The spread of the corona virus in Indonesia has reached approximately 194,109 people of which 8,025 people died and 138,575 people were declared cured as of September 6, 2020 (WHO, 2020).

Living side by side in the midst of the virus, people must continue to fight the spread of the corona virus while carrying out their activities as usual. The activities carried out are different from before the corona pandemic. Activities carried out must adhere to the health protocols that have been set by the government such as maintaining distance, wearing masks, avoiding crowds, and washing hand diligently. This new pattern of life is known as the new normal (Rumba *et al.*, 2020).

New Normal is a term that is defined as a change in behaviour to continue carrying out normal activities, while still implementing health protocols to prevent the transmission of Covid-19. The principle of the new normal is to be able to adapt to the pattern of life, while ensuring that the body's immune system does not decrease. One way to increase the body's immunity in the new normal era is by doing exercise (Rumba *et al.*, 2020).

Exercise can help to increase immunity in the new normal era so it can minimize the transmission of the corona virus. Exercise can be done anywhere and anytime, exercise can also be done by all people. Maintaining the immune system of the elderly is something that needs to be considered. This is related to the condition of the elderly who are at high risk of being infected with COVID-19. This is caused by increasing age, there will be some declines and changes in the body's functional, psychological and decreased immunity (Feriandi, 2020). One of the exercises that can be given to the elderly is resistance exercise. Resistance exercise is a type of active exercise that causes static and dynamic muscle contractions that are held by external forces both manually and mechanically (Kisner and Colby, 2012).

LITERATURE REVIEW

Elderly

A person can be said to be elderly if he has reached the age of more than 60 years. An elderly person will experience several changes in his body, one of which is the loss of the ability of the tissue to repair and defend the body against infection and damage. This can be referred to as a degenerative disease, where the loss of the ability to function results in the accumulation of metabolic and structural distortions (Sunaryo et al., 2016).

New Normal

The term new normal means the new normal which refers to the English word. The term was originally used when the financial situation in the economy and business was in 1998 and 2008, and in 2020 it refers to the global disease problem, namely Covid-19. The new normal signifies a difference in carrying out activities that must be carried out by everyone which was previously abnormal or unusual into a new habit in carrying out daily activities (Mahardhani, 2020).

Effects of Covid-19 on the Elderly

The effects that can occur in the elderly can be viewed from several aspects. On the psychological aspect, it is in line with the government's efforts to reduce the spread of the virus by providing a stay at home policy. The policy cannot be predicted when it will end so that the elderly will tend to feel bored, stressed, anxious, and confused because they cannot do activities freely anymore. Increasing age will affect the body's physiological system in the elderly, so that it becomes one of the comorbidities of this virus. If the elderly are unable to adjust or cope with these circumstances and situations, it can cause the immune system or immunity to decrease and be more easily infected with viruses (Feriandi, 2020).

Resistance Exercise

Resistance exercise is an effective exercise method to develop muscle fitness using strength or weight bearing. Weight training will cause the muscles to contract, good muscle strength can be achieved if the muscles contract continuously and repeatedly which can exceed the power that stimulates the muscles. Resistance exercise as one of the rehabilitation programs when a person experiences functional disorders and provides benefits in improving motor work abilities, preventing or reducing the risk of disease and injury, increasing flexibility, agility, and resilience (Mardhika, 2017).

Effect of Resistance Exercise on Immunity

Light physical activity with the aim of maintaining and improving the immune system as a non-pharmacologic strategy that can be used as an alternative during stay at home, because these activities can be done at home without having to leave the house. Light physical

exercise is a safe and effective mode of intervention to prevent immunosenescence. Although there is no scientific evidence regarding the effect of physical exercise on SARS-CoV-2, in general exercise has an impact on the normal functioning of the immune system. Several studies have shown that exercise or physical exercise can protect the host from many viruses such as influenza, rhinovirus from infection with the common cold, and herpes virus (Ranasinghe, Ozemek, and Arena, 2020).

Physical exercise can affect psychologically in the elderly, some of which can reduce anxiety and pressure, increase energy levels and improve socialization and sleep quality, improve sleep patterns. Recent research studies have shown that repetitive or chronic exercise has a positive impact on the function of the cardiorespiratory system, improves balance, coordination and flexibility, and increases muscle mass and strength (Feriandi, 2020).

A person who exercises regularly with someone who is inactive has a different immune system. This is because moderate to vigorous physical exercise with a duration of less than 60 minutes stimulates the ongoing exchange and spread of immune cell subtypes and is highly active between the circulation and peripheral tissues (e.g. mucosal surfaces including respiratory and intestinal epithelium), which carry out immune surveillance. and strengthens the innate immune response. Basically any exercise can increase the anti-pathogenic activation of tissue macrophages by increasing the recirculation of immunoglobulins, anti-inflammatory cytokines, neutrophils, immature B cells and the influx of Natural Killer cells, and CD+8+ T cells. There will be an over-regulation of inflammation in the respiratory tract mediated by several pathways. Exercise >6 months has been shown to prevent age-related immune dysfunction or immunosenescence, low-grade chronic inflammation, and increase the effectiveness of the "flu" vaccination in the elderly without harmful side effects (Ranasinghe, Ozemek, and Arena, 2020).

METHOD

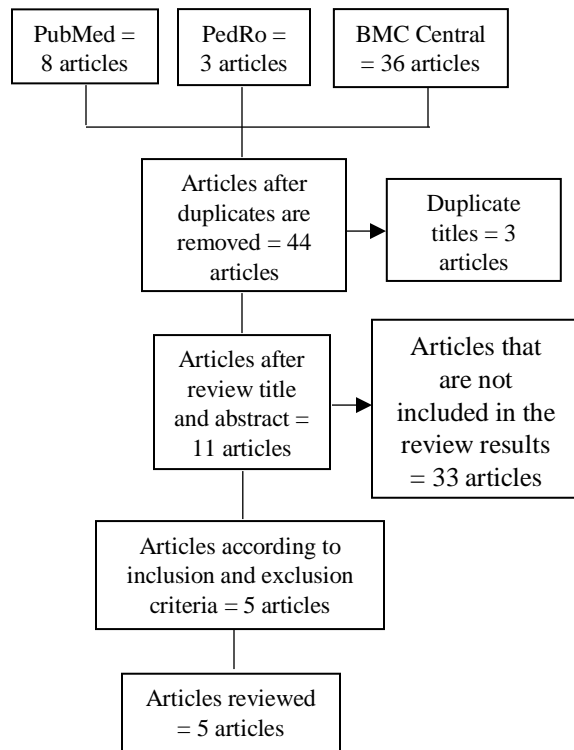
This research is a literature study that summarizes some relevant literature with the same theme. Literature search using 3 databases, namely Pubmed, Pedro and BMC Central. The keywords used in the literature search included: "immune system", "resistance exercise" and "elderly". The literature used is article published from 2010 to 2020. All literature where then re-selected using the inclusion and exclusion criteria in this study as follows:

A. Inclusion criteria

1. Artikel published in 2010-2020
2. Full text articles in English

3. Experimental research articles
 4. Research respondents are elderly
 5. Article discusses the effect of exercise to increase immunity
- B. Exclusion criteria
1. Articles which are literature studies
 2. The contents of the article that contains the addition of supplements to help boost immunity
 3. Respondents are elderly who have a history of disease

The schema of the literature search and selection process from “PubMed”, PedRo” and “BMC Central” database is described as follows:



screening were 11 articles. The process is continued by screening articles that are in accordance with the research objectives and producing 5 articles that will be reviewed. The articles reviewed are research articles from Santiago *et al* (2018), Cordova *et al* (2011), Isanejad *et al* (2018), Fahlman, M.M *et al* (2019) and Rodriguez-Miguel *et al* (2014).

The data from the review results are displayed in a table with descriptions of the author's name, year of research type of exercise, exercise dose, respondents and results of exercise. The table of data processing results is as follows:

RESULTS AND DISCUSSION

This study uses a qualitative method with a literature review approach. The literature search process was obtained from 3 databases, namely PubMed, Pedro, and BMC Central. Literature search using keywords "immune system", "resistance exercise" and "elderly". The initial search results obtained 47 articles which were then continued by eliminating duplicate articles and leaving 44 articles. The next process is the screening of titles and abstracts in accordance with the inclusion and exclusion criteria of the study. The results of the title and abstract

Table 1. Review results

Author and Year	Type of Exercise	Respondent	Dose	Results
(Santiago <i>et al.</i> , 2018)	<i>sitting leg press, sitting supine, knee extension, pulley (back), lying down, knee flexion, low pulley elbow flexion, seated leg press, and pulley elbow extension.</i>	19 elderly, experimental group = 9 control group = 10	Frequency: 3x/week, Intensity : 8 - 12 rep Time : 50 minutes	- IL6 serum concentration has decreased - Serum concentration TNF- undergoes - Serum CRP concentration experienced decreased
(Córdova <i>et al.</i> , 2011)	<i>horizontal leg press, knee extension, knee flexion, horizontal supine, pulley triceps extension, biceps curl, sitting row, plantar flexion and abdominals.</i>	54 elderly, experimental group = 28, control group = 26	Frequency: 3x/week for 8 months Intensity: 3 sets of 12 reps per workout Time : 50 minutes	- levels of IL-6, TNF- and IFN-in circulation increased
(Isanejad, Samadi and Amini, 2018)	Theraband exercises such as shoulder press, scapular elevation, leg press, hip flexion, plantar flexion.	18 elderly, experimental group = 10, control group = 8	Frequency: 3x/week, for 8 weeks Time : 45-50 minutes	- TGF- decreased and immune system increased
(Fahlman, MM <i>et al.</i> , 2019)	<i>Hip extension flexion, hip abduction adduction, dorsiflexion, leg extension, leg curl</i>	29 seniors Experimental group = 15, control group = 14	Frequency : 3x/week, for 10 weeks Intensity : 3 sets of 8 rep	- Increases lymphocyte proliferation
(Rodríguez-Miguel <i>et al.</i> , 2014)	<i>Leg press, biceps curl, pecdeck</i>	26 seniors Experimental group = 16, control group = 10	Frequency: 2x/week, for 8 weeks	- regulation of TLR4 basal basal expression decreased - HSP60 decreased - CRP decreased

Discussion

Santiago *et al* (2018) conducted a study using a sample of 19 elderly who were divided into 2 groups, an experimental group of 9 elderly and a control group of 10 elderly. The experimental group was given resistance exercises which included *sitting leg press, sitting supine, knee extension, pulley (back), lying down, knee flexion, low pulley elbow flexion, seated leg press, and pulley elbow extension*. Exercises are carried out 3 times a week, with each training session consisting of 2 sets, per set of 8-12 repetitions for 8

weeks. The duration of each exercise is about 50 minutes. In the resistance training group, there was a statistically significant decrease from 38.43 ± 9.48 pg/mL to 11.76 ± 5.19 pg/mL (P. 0.01) in serum interleukin-6 levels. Serum TNF-alpha levels, there was a statistically significant difference, compared to the resistance training groups in Pre (66.27 ± 10.31 pg/mL) and Post (37.85 ± 9.05 pg/mL). In the molecular analysis of TNF-alpha gene expression, there was a statistically significant decrease (P. 0.007) between Pre (0.010 ± 0.01 ng/ml) and Post ($0.0002 \pm$

0.0001 ng/ml). CRP data, in the endurance training group, there was a statistically significant decrease, between Pre ($2.04 \pm 0.32\text{mg/L}$) and Post ($0.90 \pm 0.22\text{mg/L}$). Endurance training showed changes in TNF-alpha gene expression in elderly women, as well as decreased serum levels of interleukin-6, TNF-alpha, and CRP.

Córdova *et al* (2011) conducted a study using a sample of 54 elderly who were divided into 2 groups, the RT group was 28 people and the control group was 26 people. The RT group received exercise treatment for 3 times a week, 3 sets of 12 repetitions per exercise with 1 minute rest for each set. The duration of each session is approximately 50 minutes, with a pre-warming of 10 minutes. The resistance exercises provided include *horizontal leg press, knee extension, knee flexion, horizontal supine, pulley triceps extension, biceps curl, sitting row, plantar flexion and abdominal*. The results of the study show the elderly who were given resistance training had lower serum levels of IL-6, TNF- and IFN- compared to the elderly in the control group.

Isanejad, Samadi and Amini (2018) conducted a study using a sample of 18 elderly who were divided into 2 groups, the experimental group $n = 10$ and the control group $n = 8$. Subjects in the experimental group performed resistance training for 8 weeks (three days per week). The duration of each session is about 45-50 minutes. Each training session begins with a 10-minute warm-up. Resistance training with theraband includes upper extremity exercises (shoulder press, scapular elevation, chest press, shoulder abduction, shoulder adduction) and lower extremity exercises (hip abduction, leg press, hip flexion, and plantar flexion) while the control group was not given any exercises and did activity as usual. Based on the results of the study, plasma TGF- β levels in the experimental group decreased significantly. Based on the evidence, resistance training can reduce inflammation.

Fahlaman, M.M *et al* (2019) conducted a study with a sample of 29 elderly who were divided into 2 groups, the experimental group was 15 people and the control group was 14 people. RE subjects performed three sets of leg extension, leg curl, plantarflexion, and dorsiflexion at 80% of 1 RM. The first and second sets of eight repetitions. Each RE subject also performs two sets of *hip extension flexion, hip abduction adduction, dorsiflexion, leg extension, leg curl*. Subjects rested at least 2 minutes between each set. Intensive exercise is often associated with changes in the percentage and number of post-exercise blood lymphocyte phenotypes and suppression of natural killer cell activity and the proliferative response of lymphocytes to mitogens. Endurance exercise had a suppressive effect on the proliferative response of lymphocytes to mitogens, with a decrease after

exercise the difference in NCMC between RE and C subjects, week 10 the values of the RE and C groups for lymphocyte proliferation were higher than the first week, where lymphocyte proliferation is a major component of the immune system.

Rodriguez-Miguel *et al* (2014) conducted a study with a sample of 26 elderly people who voluntarily participated in this study. Subjects were randomly assigned to a treatment group of 16 people and a control group of 10 people. Participants from the treatment group followed the resistance exercise program for 8 weeks, while the control group did their normal daily routine. Subjects from the treatment group completed 16 resistance training sessions for 8 weeks (2 sessions per week), with an initial warm-up of about 10 minutes. Subjects did three exercises, namely leg press, biceps curl, and pec deck. The number of repetitions per set and the load for the three exercises was gradually increased as follows: 3×8 , 3×10 , and 3×12 at 60% of 1 RM during weeks 1, 2, and 3, 3×8 , 3×10 , and 3×12 at 70% of 1RM during weeks 4, 5, and 6, and 3×8 , 3×10 at 80% of 1RM during weeks 7 and 8. The results obtained during an 8-week resistance training program downregulated TLR2 and TLR4 basal expression, inducing anti-inflammatory status in elderly subjects. Endurance training impacts the independent MyD88 and MyD88 pathways. Overall, current research suggests that resistance training is useful for inducing positive anti-inflammatory adaptation in the elderly.

CONCLUSION AND RECOMMENDATION

Conclusion

The results of a literature review of 5 research articles can be concluded that resistance exercise can improve the body's immune system. Exercise increases the anti-pathogenic activity of tissue macrophages in parallel with increased circulating immunoglobulins, anti-inflammatory cytokines, neutrophils, immature B cells, and influx of Natural Killer cells, and CD+8+ T cells.

The types of resistance exercises that can be done are: *sitting leg press, sitting supine, knee extension, pulley (back), lying down, knee flexion, low pulley elbow flexion, seated leg press, and pulley elbow extension, horizontal leg press, knee extension, knee flexion, horizontal supine, pulley triceps extension, biceps curl, sitting row, plantar flexion and abdominals*, theraband exercises such as shoulder press, scapular elevation, leg press, plantar flexion, hip extension flexion, hip abduction adduction, dorsiflexion, leg extension, leg curl, biceps curl, pec deck.

Recommendation

1. For the elderly
The elderly are asked to always maintain health by obeying health protocols when doing activities at home or outside the home. Reducing the risk of being exposed to the virus while maintaining the body's immunity by exercising at least for less than 60 minutes a day with light to moderate intensity for the elderly.
2. For physiotherapy
Provide education to the general public to always do physical activity at home, one of which is resistance exercise.

REFERENCE

- Azizah, L. M. (2011). *Keperawatan Lanjut Usia*. Edisi Pertama. Graha Ilmu. Yogyakarta.
- Córdova, C., Jr, F. L-E-S., Pires, A. S., Souza, V. C., Brito, C. J., Moraes, C. F., Sposito, A. C. dan Nobrega, O. T. (2011). Long-Term Resistance Training Is Associated with Reduced Circulating Levels of IL-6, IFN-Gamma and TNF-Alpha in Elderly Women. *Neuroimmunomodulation*. 18(3):165–170. doi: 10.1159/000323396.
- Feriani, Y. 2020. Bunga Rampai Artikel Penyakit Virus Korona (COVID-19) Editor : Titik Respati, *Kopidpedia*, pp. 203–215. Available at: http://repository.unisba.ac.id:8080/xmlui/bitstream/handle/123456789/26743/fulltext_bc_16_feriani_kopidpedia_fk_p2_u_unisba_2020.pdf?sequence=1.
- Fahlman, M., Boardly, D., Flynn, M. G., Braun, W. A., Lambert, C. P. dan Bouillon, L. E. (2019). Effects of endurance training on selected parameters of immune function in elderly women. *Gerontology*. 46(2):97–104. doi: 10.1159/000022142.
- Isanejad, A., Samadi, A. dan Amini, H. (2018). The Effect of Resistance Training with Theraband on the Transforming Growth Factor- β in the Elderly Women. *Immunoregulation*. 1(2):81–86. doi: 10.32598/immunoregulation.1.2.75.
- Jakobson, J., Malm, C., Furberg, M., Ekelund, U. dan Svensson, M. (2020). Physical Activity During the Coronavirus (COVID-19) Pandemic: Prevention of a Decline in Metabolic and Immunological Functions. *Frontiers in Sports and Active Living*. 2(April), pp. 2018–2021. doi: 10.3389/fspor.2020.00057.
- Kisner, C. dan Colby, L. A. (2012). *Therapeutic Exercise Foundation and Techniques*. Sixth Edition. Philadelphia: F.A. Davis Company.
- Mahardhani dan ardhana J. (2020). *JPK : Jurnal Pancasila dan Kewarganegaraan*. 5(2):65–76. doi: 10.24269/jpk.v5.n2.2020.
- Mardhika, R. (2017). Pengaruh Latihan Resistance dan Pyometric Terhadap Persiapan Mental Persiapan Taktik Persiapan Teknik Persiapan Fisik. *Wahana*. Volume 68(1): 5–12. 1 Juni 2017.
- Pratiwi, R. M. (2018). Pengaruh Resistance Exercise Terhadap Perbaikan Neuropati Diabetikum, Ankle Brachial Index dan Kadar Glukosa Darah pada Pasien Diabetes Melitus Tipe 2. Halaman 1–206.
- Ranasinghe, C., Ozemek, C. dan Arena, R. (2020). Exercise and Well-Being During COVID 19 - Time to Boost Your Immunity. *Expert Review of Anti-Infective Therapy*. doi: 10.1080/14787210.2020.1794818.
- Rodriguez-Miguel, P., Fernandez-Gonzalo, R., Almar, M., Mejias, Y., Rivas, A., De Paz, J. A., Cuevas, M. J. dan Gallego-Gonzales, J. (2014). Role of Toll-like Receptor 2 and 4 Signaling Pathways on The Inflammatory Response to Resistance Training in Elderly Subjects. *Age*. 36(6):9734. doi: 10.1007/s11357-014-9734-0.
- Santiago, L. A. M., Neto, L. G. L., Pereira, G. B., Leite, R. D., Mostarda, C. T., Monzani, J. O. B., Sousa, W. R., Pinheiro, A. J. M. R. dan Navarro, F. (2018). Effects of Resistance Training on Immunoinflammatory Response, TNF-Alpha Gene Expression, and Body Composition in Elderly Women. *Journal of Aging Research*. 2018. doi: 10.1155/2018/1467025.
- Silveira, M. P., Fagundes, K. K., Bizuti, M. R., Starck, E., Rossi, R. C. dan Silvia, D. T. R. (2020). Physical Exercise as A Tool to Help The Immune System Against COVID-19: An Integrative Review of The Current Literature. *Clinical and Experimental Medicine*. 1-14. doi: 10.1007/s10238-020-00650-3.
- Supriyono, E. (2015). Aktivitas fisik keseimbangan guna mengurangi resiko jatuh pada lansia. 11.

