

Physical Activity, Sleep Quality and Physical Fitness of the Elderly Who Live in Nursing Homes

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Abstract: The aging process can cause a reduction in physiological function. Being older means a 30-50% decrease in physical fitness for the elderly. Factors related to elderly fitness are associated with the Giant Geriatric Syndrome including physical activity and sleep quality. This research is intended to explain the relationship of physical activity and sleep quality with the level of physical fitness of the elderly who live in nursing homes. This research used a descriptive correlational design with a cross-sectional approach. The population was the elderly with a Barthel score > 60. Sample size was 102 respondents with total sampling. The variables were physical activity, sleep quality and physical fitness. The instrument used was a 24 hours activity recall questionnaire, Pittsburg Sleep Quality Index. Physical fitness was measured using a six minutes walking test, five times sit to stand test, chair sit and reach test and body mass index. Data analysis used chi square $\alpha \leq 0,05$. The results showed that there was a significant correlation between physical activity and sleep quality and physical fitness ($p=0,001$). Physical activity in the category of moderate to hard activity and good sleep quality can improve physical fitness in the elderly because the physical fitness results from metabolism that occurs in the sleep cycle. It can be concluded that physical activity and sleep quality had the effect of maintaining physical fitness.

1 BACKGROUND

The aging process causes changes in the physiological condition of the body and affects physical fitness. Physical fitness is the body's ability to perform daily activities without causing excessive fatigue, and still have the energy reserves to rest or do the work suddenly (Francesco Landi, Riccardo Calvani, Anna Picca, Matteo Tosato & Emanuela D'Angelo, Elisabetta Serafini, Roberto Bernabei, 2018; Junaidi, 2011). The elderly are said to demonstrate fitness if they have strong muscles so that the risk of falls can be reduced, the cardiopulmonary ability is good and be marked with VO₂. Max height and pulse breakdown, body flexibility is good, body composition is ideal, they are able to perform physical activity independently, the body's endurance is good and they have adequate sleep (Afriwardi, 2008; Nugraheni, 2013). The elderly aged > 60 years old who are still fit will improve their physiological capabilities and can retard the degenerative process. However, the fact is that in the community the age increase can reduce

the body's physical fitness by 30%-50% (Akmal, 2012).

The factors causing impaired fitness in the elderly include a problem related to the Giant Geriatric Syndrome, namely immobility, inanition (malnutrition), instability (imbalance), immunodeficiency (decreased endurance), and insomnia (sleep disorder) (Darmojo, 2015). The previous study on the physical fitness of the elderly by Zelvy (2014) showed that nutrition, health status and also exercise have a strong relationship with the physical fitness of the elderly who live in nursing homes. The study related to other factors such as physical activity and the need to sleep, but to achieve a good quality of life the elderly need three components, namely activities, food, and rest.

The elderly population in Indonesia ranked fifth in the world in 2015, which increased 15.5% from 2014 and is estimated to reach 35 million in 2035 (Ministry of Health of the Republic of Indonesia, 2016). An increasing elderly population will impact on the health status of the country. Based on physical fitness indicators proposed by Afriwardi (2008) and Nugraheni (2013) it is shown that the

physical fitness of the elderly in Indonesia is still lacking, as evidenced by morbidity still being high. Elderly morbidity in 2012 was 24.77% in urban and 28.62% in rural areas. This is supported by the percentage of elderly who have health complaints during the years 2012 – 2015, the average reached 47.17% of the total elderly in Indonesia (Ministry of Health of the Republic of Indonesia, 2016). The morbidity among the elderly in East Java reached 26.93% with a top rank in Surabaya city reaching 35.99% in 2015 (Health Office of Surabaya). The condition of the less fit made 11.90% of elderly in a state of complete dependence (total care). The American Community Survey also supports that 28% of the elderly aged > 65 years have limitation in activities so they need full assistance (total care) (Administration of Aging, 2013).

The results of a preliminary study carried out in one of Surabaya's nursing homes in April 2017 showed the morbidity of the elderly reaching 85%. This condition is also accompanied by heavy dependency of the elderly (40.38%) and total dependency of elderly 19.23% (Barthel index \leq 60). The total of elderly (59.61%) in nursing homes is not included in the independent category, so it is difficult to perform activities that improve fitness. The results of preliminary data obtained from measurements of fitness that are accumulated based on the scale of Guttman (Zelvya, 2014), show 20 elderly who lived in nursing homes, 8 elderly in a fit condition and 12 elderly in un-fit condition. 20 elderly as a whole say they could not sleep soundly and perform fewer daily activities, so they only sit and lie down.

The physical fitness will have an impact on the physiological condition of the elderly. The poor physical fitness speeds up the degenerative process, increasing morbidity, increasing fall incidents, and decreasing life expectancy, with many not reaching the age of 70 (Junaidi, 2011).

Growing old can not be avoided, but growing old healthily is a need of everyone. Healthy ageing is the concept that has a purpose of making the elderly period healthy. Healthy ageing is influenced by the endogenous aging factor from the body and the exogenous aging factor from environment and life style. The elderly who achieve a healthy ageing condition will have an old age of higher quality and free from pathological conditions (Darmojo, 2015). Healthy ageing will help the elderly become more able to perform activities, so they become more healthy, fit, and able to prevent the occurrence of disease. Based on the existing phenomenon, researchers consider it necessary to conduct research

on other variables that represent the factor influencing elderly fitness. In accordance with the Giant Geriatric Syndrome other factors that need to be considered are the condition of limited movement (immobility) and sleep disorders (insomnia), so the researchers are interested in conducting research on the relationship of physical activity and sleep quality with physical fitness of the elderly who live in nursing homes.

2 METHODS

The design used in this research is correlation descriptive with a cross-sectional approach. The overall population of elderly in UPTD Griya Wredha Jambangan Surabaya, Social Welfare Institution of Hargo Dedali Elderly and Anugrah's Nursing Home, Surabaya is as many as 175 people. The target population based on elderly characteristics with Barthel index > 60 is 108 people. The affordable population who can be reached by researchers is limited in time to 2017 and place so there are 102 people. This population is in accordance with the criteria having verbal communication, no psychiatric disorder, MMSE score (Mini Mental Status Examination) \geq 17 and no heart disease, stroke, and malignancy. The sample size in this study is 102 elderly obtained with a total sampling technique.

The independent variables in this study are physical activity and sleep quality, dependent variable is elderly physical fitness. The instruments were questionnaires, one 24-hours in activity recall to measure physical activity and a Pittsburgh Sleep Quality Index (PSQI) questionnaire to measure sleep quality of the elderly. The physical fitness variable of the elderly was measured using six minutes walk distance test, five times sit to stand test, chair sit and reach test and bpd mass index (IMT).

Analysis of data used in this study is Chi Square (χ^2) test.

3 RESULTS

A total of 35 respondents (34,3%) had mild physical activity, 56 respondents (54,9%) had good sleep quality, and 53 respondents (52%) in fitness condition (Table 1).

25 respondents (24.6%) did mild physical activity at the level unfit. While 32 respondents (31.4%) did moderate physical activity at the level of fitness (Table 2). The elderly in the category of

moderate and hard physical activity had higher physical fitness compared to the elderly in category of very mild and mild physical fitness. The result of the analysis of the chi square test showed $p = 0.000$, so there is a significant relationship between physical activity with physical fitness of the elderly who live in nursing homes.

The elderly with poor sleep quality had more un-fitness, while the elderly with good sleep had more fitness. The analysis result of the chi square test showed $p = 0.000$ meaning there was a relationship between sleep quality and physical fitness of the elderly who live in nursing homes.

4 DISCUSSION

4.1 The Relationship of Physical Activities and Physical Fitness

Physical activity and physical fitness among those living in nursing homes had a significant relationship. Physical activity in the very mild and mild categories show the elderly to be unfit, and otherwise physical activity in the moderate and hard categories made the elderly fit. The regular physical activity related to FITT (frequency, intensity, type, and time) will make the body more healthy and fit. Physical activity has an impact on physical health by increasing cardiovascular endurance. Cardiovascular endurance in a well condition will keep the function of the cardiac muscle, respiratory, and vascular

This was in line with a study by Junaidi (2011)

Table 1: The data of Physical Activity, Sleep Quality and Physical Fitness of the Elderly in Nursing Homes.

	n	%
Physical Activity		
Very Mild	28	27.5
Mild	35	34.3
Moderate	35	34.3
Hard	4	3.9
Sleep Quality		
Good	56	54.9
Poor	46	45.1
Physical Fitness		
Fitness	53	52
Un- fitness	49	48

systems intact. Physical activity also strengthens the body's muscles, maintains balance, and body flexibility of the elderly and maintains body composition (Francesco Landi, Riccardo Calvani, Anna Picca, Matteo Tosato & Emanuela D'Angelo, Elisabetta Serafini, Roberto Bernabei, 2018; Junaidi, 2011).

The fit elderly had a level of activity above that of the un-fit. The un-fit elderly tend to prefer to sleep and sit, while the fit elderly will try to perform independent activities such as household chores (washing clothes, dishes, cooking, sweeping, cleaning room), making crafts and performing light activities (watching TV, listening to the radio, chatting, leisurely strolling, activities in the hall).

which states that people who have a good value VO2

Table 2: Cross Tabulation Physical Activity and Physical Fitness of the Elderly Variables in Nursing Home.

Physical Activity	Physical Fitness				Total	
	Un-Fitness		Fitness		N	%
	N	%	N	%		
Very Mild	25	24.6	3	2.9	28	27.5
Mild	21	20.6	14	13.7	35	34.3
Moderate	3	2.9	32	31.4	35	34.3
Hard	0	0	4	3.9	4	3.9
Total	49	48.1	53	51.9	102	100

Chi Square test p = 0.000

Table 3: Cross Tabulation Sleep Quality and Physical Fitness of the Elderly Variables in Nursing Home.

Sleep Quality	Physical Fitness				Total	
	Un-Fitness		Fitness		N	%
	N	%	N	%		
Poor	43	42.2	3	2.9	46	45.1
Good	6	5.9	50	49	56	54.9
Total	49	48.1	53	51.9	102	100

Chi Square test p = 0.000

Max (a distance > 320 metres) are able to perform more physical activity. However, based on the obtained data some fit elderly could not achieve a distance > 320 metres. The factors causing the elderly to stop the walking test after 6 minutes included dizziness, joint pain, and using walking aids. The elderly who did moderate-hard physical activity were more active and had more interaction than the elderly who did less physical activity, because their physical fitness condition was also different. This is in accordance with the study by Akmal (2012) which states that elderly with physical activity moderate-hard are more likely to participate in activities such as gymnastics routines. The result of the study was also consistent with the research by Alrushud, Rushton AB, Kanavaki AM et al. (2017) on elderly with obesity, which states that physical activity has a significant result in weight loss, so that the body composition remains ideal.

In accordance with the concept of healthy ageing for the elderly good physical activity will achieve a state of healthy ageing, which is achieved through active ageing, in various fields – cultural, economic determinant, social, spiritual and health. The active elderly will increase their quality of life, active participants enjoy well-being and are able to optimize the healthy body (Darmojo, 2015) Physical activity has an impact on physical fitness as evidenced by the significant relationship, in accordance with the concept of healthy ageing. According to the researcher achieving a healthy old age should be stimulated by factors that influence it, but the whole of the factors must be optimal in order to achieve the purpose. All of these factors meant belonging to endogenous aging and external factors. Physical activity acts as an external factor and will make the elderly more active. At the level of physical activity moderate and heavy the elderly become more active in moving than the elderly with physical activity very mild and mild. The increasing movement of the elderly's gestures will stimulate the muscles and they do not atrophy. The habit of regular activity during old age will maintain the body systems, ranging from cardiovascular system, respiration, and neuromuscular. If all the body systems are still functioning properly, the body will remain in a healthy condition and fit.

4.2 Relationship of Sleep Quality and Physical Fitness

Sleep quality and physical fitness in the elderly have a significant relationship. This is in accordance

with the results of a study showing that good quality sleep maintained 50 elderly (49%) in a fit condition, while for the elderly with poor quality sleep only 3 elderly (2.9%) were in a fit condition. This showed that good sleep quality has a greater impact on the elderly's physical fitness. This is in accordance with the indicators of elderly physical fitness by Nugraheni (2013), which were that physical fitness was good if having good sleep quality and adequate rest of at least 6-7 hours per day.

Sleep is one of the basic needs for maintaining health and functioning of the body's cells (Miller, 2012). According to Mubarak, Indrawati and Susanto (2015) during sleep regeneration of damaged cells occurs, with immune enhancement, repairation of the brain's neurons and recovery of the body's energy that has been used during a full day. This was consistent with the results of a study showing that respondents having good quality sleep also had good fitness. The good sleep quality increased the cell regeneration activity, resulting in better fitness when waking the next day.

When an individual sleeps well the body's metabolism for repairing damaged cells also occurs releasing hormones from the pons and brainstem (Bulbar Synchronizing Regional) (Anita D. Christie, Seery & Jane A. Kent, 2016). The hormones released are serotonin, melatonin, endorphin dan enkephalin. Serotonin hormone functions to regulate body temperature, appetite, sleep quality, memory, mood, and circulatory function. Melatonin is associated with circadian rhythm. Endorphin results in euphoria, repressing pain so helping in cell regeneration, and Enkephalin inhibits pain impulse through a prostaglandin inhibitor (Khasanah & Hidayati, 2012). When an individual has good quality sleep, then the stages of the sleep cycle will be fulfilled both NREM and REM. The hormone secretion of sleep if occurring properly will impact to regenerate cells during sleep. The body feels fresh the next morning if experiencing good sleep quality.

Conversely, poor quality sleep will mean the elderly's physical condition is not fresh the next morning, they will be drowsy interfering with daily activities. Based on the results of interviews and recall questionnaire PSQI, the poor sleep quality of the elderly is caused by unfavorable environment conditions, frequent wakening, insomnia and not being able to go back to sleep after wakening in the night. This is in accordance with the theory that the elderly's sleep pattern will change, namely shortening NREM III and REM, so the elderly will be easy awakened. If the elderly fail to gain good sleep quality, hormone secretion will be inhibited

and the regeneration process will be occur. This makes the body un-fit the next day.

In accordance with the concept of healthy ageing, one factor that allows the elderly to achieve healthy aging is that of endogenous aging, namely sleep pattern. Elderly sleep patterns consist of several cycles of NREM and REM. The good sleep cycle will also allow good sleep quality. During quality sleep metabolism of cell regeneration will occur increasing the body's energy, the damaged cells will regenerate and hormone secretion will occur from the bulbar synchronizing region helping the metabolic process of the body. Cell metabolism and energy recovery that impact on the elderly's bodily health can actualize the healthy ageing condition (Darmojo, 2015).

The healthy ageing concept can be demonstrated by the author through two respondents, one has good sleep quality and is fit (respondent 30H) and the other one has poor sleep quality and is unfit (respondent 32H). During interviews respondent 30H had given a greeting first, looked cheerful, did a lot of activities and did not seem sleepy. Respondent 30H did not have any sleep disorder, so he/she was subjectively assessing sleep very well. While respondent 32H looked more lazy, un-cheerful, there were bags under the eyes, irritability, and drowsiness. During the interview, the respondent said that it was difficult to sleep every night because he was remembering his granddaughter, he often awakened at night due to frequent dreaming and wanting to go to the bathroom. Based on these two examples, it can be proved that there is a significant relationship between sleep quality and physical fitness of the elderly. The elderly with good sleep quality will be more fit, and otherwise the elderly with poor sleep quality will not be fit. The un-fitness of the body is due to the process of repairing body cells while sleeping being impaired causing difficulty in maintaining physical activity. While sleeping, the body will work to repair the body's energy metabolism, the energy that has been used during a full long day will be recovered again, the fatigue will be improved, so that the elderly feel fresh when waking the next day. The maintaining of physical activity that stimulates the elderly body muscles will maintain the ability to still perform independent activity, so the elderly will become more healthy and fit.

5 CONCLUSIONS

The physical activity of the elderly who lived in nursing homes is mostly mild and moderate. The physical activity and physical fitness of the elderly have a significant relationship. If physical activity is in the category level of very mild and mild, the elderly will be in an unfit condition. But if the physical activity is moderate and hard, the elderly are in a fit condition. Sleep quality of the elderly in nursing homes is mostly shows good. Good sleep quality will have an impact on repairing the body systems and restoring the elderly energy. Sleep quality and physical fitness of the elderly who live in nursing homes had a significant relationship. The elderly with good sleep quality will become fit and the elderly with the poor sleep quality will become unfit.

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