



Original Research

Effect Light-Intensity on Sleep Quality in Elderly

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ABSTRACT

Background: Bedroom lighting is accused of being one of the factors causing changes in the quality of sleep in the elderly. Modifying the power of room lighting is an alternative to improving the sleep quality of the elderly. The aim of the study is to determine the effect of lighting intensity on the sleep quality of elderly.

Methods: A quantitative study with a quasi-experimental control group design. Amount of sample is 40 responden and choosen used random sampling. Quality of sleep measure by Pittsburgh Sleep Quality Index (PSQI) and light-intensity measure used a luxmeter. the intervention group received lights with an intensity of 5, 10, 15, 20 watts, where the respondents were treated every day for 4 days with these light intensities. The Shapiro-Wilk test was used to test the normality of the data, while paired T test used to analyze the conditions before and after in the control and treatment groups. Independent sample t-test used to compare the sleep quality of the control and treatment groups.

Results: There was no difference in sleep quality in the control group (0.15) between before and after the study, but there was a difference in sleep quality in the intervention group (0.00). There were differences in sleep quality between the control and treatment groups after the intervention was given (0.01).

Conclusion: The intensity of the light has an effect on the sleep quality of the elderly, where the lower the intensity of the light, the better the quality of sleep. Elderly should sleep on level lighting intensity less than 5 watt.

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INTRODUCTION

In elderly patients, if they have poor sleep quality, they are at high risk of having a stroke. The best way to prevent stroke is to improve sleep quality. The number of hours of sleep affects the level of risk of stroke (Song et al., 2023) Physical activity affects mental health which will also affect the quality of sleep and quality of life. Elderly who have good physical activity habits so that quality of life, quality of sleep increases (Yuan et al., 2020a).

The average human spends about 6-8 hours sleeping. Sleep is an important process in recovering from physical and psychological fatigue in humans (Yan et al., 2022). Factors that affect the quality of sleep in the elderly, namely were reduced at

higher air temperature, relative humidity and CO₂ concentration (Yan et al., 2022).

Many studies regarding efforts to improve sleep quality of elderly both pharmacological and non-pharmacological. Her & Cho (2021) reported that aromatherapy can improve sleep quality and reduce anxiety, depression, stress, pain, and fatigue in adults and elderly people (Shree Ganesh, Subramanya, Rao M, & Udupa, 2021). also reported that yoga as a daily practice regimen to improve sleep quality in elderly population.

Increasing age as an elderly person will experience various kinds of changes in the body such as physiological changes, functional changes, cognitive changes, and psychosocial changes. Data from WHO, elderly people over 60 years of age in the world are expected to approximately double from 12% to 22%. In Indonesia in 2021 the largest number of elderly people will be DIY with a percentage of 15.52%, Central Java 14.17%. Surakarta has 12.16% of the total population with a life expectancy of 77.22 years. Elderly people experience physiological changes including dry skin, thinning hair, decreased hearing, decreased blood pressure and heart rate. One of the physiological changes that often occurs is the quality of sleep in the elderly. Complaints of insomnia in the elderly are often related to problems with the quality of the elderly's sleep.

The prevalence of elderly people with sleep disorders in 2020 reached around 67%. Meanwhile, in Indonesia, sleep disorders attack around 50% of elderly people aged >60 years. Environmental factors are one of the obstacles to the quality of the elderly's sleep, which usually occurs in elderly people's homes that are less clean, inappropriate lighting conditions such as the level of strength of the bedroom lighting used, in the elderly community many people do not know the correct use of resting light. Lighting is an important factor in determining sleep quality. Lighting has four standards and their units which include: the first is light flow (luminous flux), the second is light intensity (luminous intensity), the third is illuminance, and the fourth is luminance. Measuring light intensity uses a luxmeter as a measuring tool in a room for the light coming on an object. The daily lighting requirements for room lighting vary, one of which is in the bedroom, namely 150 lux (small room) with different types of lamps and wattages between 5-20 watts.

A limited number of studies have investigated the effects of the lighting-intensity on the sleep quality of elderly subjects. Aim of study is to determine the effect of lamp light intensity on sleep quality in the elderly.

MATERIALS AND METHOD

The quasi-experiment prepost test design with a control group that does not function fully in controlling external variables that influence the research. Research with a nonequivalent control group design is an approach with a pre-post test selected based on inclusion and exclusion criteria which will then be compared between the intervention and control groups.

The population in this study were all elderly people in the Kentingan Jebres Surakarta area located in RW 36 aged 60-90 years, totaling 56 people. Sample criteria include Inclusion Criteria are research subjects who represent the research sample that meets the requirements as a sample. The inclusion criteria in this study were: 1) Elderly people who were willing to be respondents, 2) Elderly people aged ≥ 60 years, 3) Elderly people who had lights in their bedroom, 4) Elderly people who had their own bedroom. Exclusion criteria are research subjects who do not represent the sample because they do not meet the requirements as a sample such as ethical obstacles, refusing to be a

respondent or circumstances that make it impossible. The exclusion criteria in this study were: 1) Elderly people who have dementia, 2) Elderly people who are not willing to be respondents, 3) Elderly people who take sleeping pills, 4) Elderly people who sleep with their families. Meanwhile, sampling in this study used the Solvin formula.

RESULTS

The results of the normality and homogeneity test analysis showed that the data were normally distributed and paired group tests were carried out, namely the paired-test and unpaired groups, namely the independent t-test. The results of the analysis of the paired T-test consisted of 20 respondents, the mean of the intervention group before and after at 5 watt intensity was 7.25 and 5.35 with standard deviation 3.416 and 2.300 and p value 0.01, at 10 watt intensity 7.25 and 8.20 with standard deviation 3.416 and 3.105 and p value 0.25, at 15 watt intensity 7.25, and 9.40 with standard deviation 3,416 and 2,761 and p value 0.00 and at 20 watt intensity 7.25 and 10.10 with standard deviation 3,416 and 2,447 and p value 0.00 so it can be concluded that there is an influence on improving the quality of sleep in the elderly using lamp light intensity of 5, 15 and 10 watts.

Based on the low average sleep quality of the elderly, there is a light intensity of 5 watts which is reinforced by a short distance between the data distribution (standard deviation) and the average (mean) compared to the standard deviation and average of other light intensities. The results of the analysis of the paired T-test consisted of 20 respondents, the mean of the control group before and after the intensity of post test 1, namely 8.40 and 8.45 with a standard deviation of 2.683 and 3.170 and a p value of 0.83, for the intensity of post test 2, namely 8.40 and 9.20 with a standard deviation of 2.683 and 3.792 and p value 0.09, intensity of post test 3 namely 8.40 and 9.40 with standard deviation 2.683 and 3.362 and p value 0.01, intensity of post test 4 namely 8.40 and 8.90 with standard deviation 2.683 and 3.161 and p value 0.13 so it can be concluded that there is an influence on post test intensity 3 which uses the light intensity of the lamp that is usually used. This cannot be used as a benchmark because the average sleep quality for each elderly person is not much different due to the use of the same light between pre and post in the control group.

The results of the analysis of the Independent t-test consisted of 40 respondents, the mean of intervention and control group 1 was 5.35 and 8.45 with a standard deviation of 2.300 and 3.170 and a p value of 0.00, intervention and control group 2 were 8.20 and 9.20 with a standard deviation of 3.105 and 3.792 and a p value 0.37, intervention and control group 3, namely 9.40 and 9.40 with a standard deviation of 3.362 and 3.362 and p value 1.00, intervention and control group 4, namely 10.10 and 8.90 with a standard deviation of 2.447 and 3.161 and p value 0.18. It can be concluded that there is a difference in the intervention group and control. The results of the N-Gain Score test analysis consisted of 20 respondents, the average of the intervention group (pre-post 1) was 0.31 or 31%, the intervention group (pre-post 2) had an average of -0.15 or -15%, the intervention group (pre-post 3) mean of -0.35 or -35% and the intervention group (pre-post 4) mean of -0.46 or -46% so it can be concluded that the Normalized gain score is in the medium category in pre-post intervention 1 namely, the light intensity of a 5 watt lamp with the interpretation category in N-Gain Percent is included in the ineffective category.

The results of the N-Gain Score test analysis consisted of 20 respondents, the average in the control group (pre-post 1) was -0.00 or -0%, the control group (pre-post 2) average was -0.10 or -10%, the control group (pre-post 3) has a mean of -0.14 or -14%,

the control group (pre-post 4) has a mean of -0.07 or -7% so it can be concluded that the Normalized Gain Score control group is included in the category low and falls into the category of interpretation of the effectiveness of N-Gain Percent as ineffective, namely the use of light that is normally used.

DISCUSSION

Based on the results of the analysis of the characteristics of age respondents from the two groups in this study, it shows that the age range for the intervention group and group is 60 to 80 years and 60 to 84 with a mean of 66.85 and 66.50, which is the elderly category. This is in line with the opinion of Siti (2008) in Article 1 paragraph 2,3,4 of Law No. 13 of 1998 (Thomas, 2016) regarding the health of the elderly as someone over 60 years of age (Thomas, 2016). This makes the elderly experience an aging process which is in line with the statement of the Indonesian Ministry of Health (2008) in Thomas (2016) that aging is a natural process that runs continuously, cannot be avoided and is continuous and causes anatomical, physiological and biochemical changes that affect function and ability. body as a whole (Thomas, 2016). So, the older a person gets, the more changes and complaints there will be in the body, one of which is changes in sleep which affect the sleep quality of the elderly.

Based on the results of the analysis of the characteristics of gender respondents in both groups, it was found that women experienced more problems, one of which was changes in sleep quality. This is in line with research conducted by Fajar Sidik and Mokhamad Arifin (2017), namely that there are more elderly women than men, as evidenced by the results of statistical data by Wreksoatmodjo, B. R (2013) that the number of elderly people in Indonesian Nursing Homes in 2002 was female. far more than 5830 for men compared to 2552 for men.

This shows that one of the factors is that women's life expectancy is longer, so that the problems of the elderly in general in Indonesia, such as problems with sleep quality, are dominated by women based on statistical data from STMIK Jakarta (Sidik, 2017). Based on the results of the frequency distribution analysis of elderly sleep quality before and after being given light intensity treatment, the average sleep quality increased with reduced sleep complaints when using a 5 watt lamp light intensity. This is in line with research by Anisa Furtakhul Janah, Upik Nurbaiti and Fianti (2020), namely recognizing the activities that will be carried out in a room so that you can pay attention to choosing the right light because the right lighting can increase comfort in the bedroom.

According to research by Anisa Furtakhul Janah, Upik Nurbiati and Fianti (2020), choosing the right and appropriate lamp for the bedroom will create a comfortable situation, namely the recommended position when the lamp is turned off or has a minimum lighting level. Based on the results of the frequency distribution analysis of the elderly's sleep quality before and after without treatment, the average did not show much improvement, so it can be concluded that there was no change in the elderly's sleep quality. This is in line with research by Parmonangan Manurung (2016) that sufficient or moderate bedroom lighting can affect the safety of elderly people who experience decreased balance, physical ability and vision, so lighting design is needed that is well designed and adapts to the needs of the elderly.

Bivariate Analysis: Before testing the two groups, normality and homogeneity tests are required to determine which test will be used after knowing the results. The results of the normality test in the pre-post intervention and control groups were normally distributed. Meanwhile, the results of the homogeneity test in the intervention and control

groups showed a homogeneous distribution in the pre-post test. The results of data analysis on elderly sleep quality which had a normal and homogeneous distribution, the next stage was carried out for paired tests, namely paired-tests and unpaired tests, namely independent sample t-tests. Based on the results of the paired-test analysis, it was found that the light intensity of the lamps that had an influence on the sleep quality of the elderly were 5, 15 and 20 watt lamps with p values of 0.01, 0.00 and 0.00, which can be concluded that H_0 was rejected and H_a was accepted.

This is in line with the results of research by Anisa Furtakhul Janah, Upik Nurbaiti and Fianti (2020) which shows that there is an influence on the use of light intensity and a person's comfort level with yellow lamps being more comfortable to use in the bedroom according to the results of the questionnaire, likewise round lamps are more suitable for use for the bedroom compared to spiral and essential. The research results of Fajar Sidik and Mokhamad Arifin (2017) show that there is a relationship between room lighting during sleep and the sleep quality of the elderly. Using dark lighting can improve the sleep quality of individuals, especially the elderly. Based on the results of the paired-test in the control group, it was found that there was an influence when filling out the questionnaire to measure the sleep quality of the elderly using the intensity of light that is usually used, namely when filling in the third questionnaire, so it can be concluded that H_0 was accepted and H_a was rejected. From these results, it can be concluded that apart from environmental factors, there are other factors that cause elderly people to experience disturbances in sleep patterns apart from the dependent and independent variables studied, so further research is needed on other disturbing factors.

This is in line with the results of research by Irwina Angelia Silvanasa r i (2012), namely that it is necessary to assess sleep quality in the card for health (KMS) for the elderly so that problems with symptoms of sleep quality disorders in the elderly can be identified and treated early. One factor in changes in sleep quality is the living environment, especially the intensity of light, which can affect the sleep quality of the elderly. The results of Parmonangan Manurung's research (2016) are that the design of the space where the elderly live in the interior lighting at the Peradan Padudan Nursing Home must be considered which has an impact on the comfort of the elderly. Based on the results of the unpaired test, it was found that there was a difference between the intervention and control groups, namely when using a 5 watt lamp, so it could be concluded that H_0 was rejected and H_a was accepted.

This is in line with the research results of Anisa Furtakhul Janah, Upik Nurbaiti and Fianti (2020) showing that there are differences in light intensity tested with color variations, namely Yellow, Red, Green and Blue which provide comfort for a person's bed when using a lamp. yellow in color and has a variety of shapes, namely round, spiral and essential which are suitable for someone's bedroom when using a round lamp shape. The research results of Fajar Sidik and Mokhamad Arifin (2017) show that choosing the right lights in the bedroom is generally used for sleeping in the most comfortable condition, namely when the lights are turned off or at the minimum lighting level, it can improve the sleep quality of the elderly.

The results of Parmanongan Manurung's research (2016) show that interior lighting in nursing homes does not evenly meet the lighting needs of the elderly, which is still considered adequate or moderate by the elderly living there, so it requires a room lighting design that suits the needs of the elderly in their sleeping rooms. Based on the results of the paired-test analysis, it was found that there was an influence on the three levels of lamp light intensity, namely 5, 15 and 20 watts. From these results, further tests need to

be carried out to determine the gain score so that the results can be categorized into high, medium and low at the same time. categorize the effectiveness interpretation into the categories of ineffective, less effective, quite effective or effective. Based on the results of the Normalized gain score analysis test, those with moderate and ineffective scores were in the intervention group when using 5 watt light intensity. This ineffectiveness can be overcome by testing confounding variables because in the paired test there was an influence in the control group when using the light intensity that is usually used so that in this study the presence of other factors (disturbing factors) that the researchers did not test became a problem in the sleep quality of the elderly.

CONCLUSION

Based on the results of data analysis, it can be concluded that the use of light intensity influences the level of sleep quality of the elderly. Lamps with a light intensity of 5 watts with the same type, shape and color can improve the sleep quality of the elderly. This is supported by the results of the questionnaire which states that the number of elderly people's sleep quality has increased and fewer people experience complaints in their sleep after being given the intervention in the mild category.

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