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IMPACT OF COMBINED EXERCISE AND REFLEXOLOGY ON THE QUALITY OF SLEEP AMONG ELDERLY IN BOGOR, INDONESIA 2017

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ABSTRACT Pre- and post quasy experimental intervention without control to assess the impact of exercise and reflexology on quality of sleep among elderly of 60 to 72 years old live ini Puruseda village in Bogor district . The intervention was given twice a week for 5 weeks, consisted of moderate aerobic for 45 minutes and a reflexology of 100 minutes per session, respectively. Self-reported sleep quality using PSQI index score was measured, in which a PSI score ≤ 5 indicates good sleep quality. Sample of 15 were selected in which 87% was women. Results: Paired t-test showed a significant ($p<0.005$) mean difference of 3.73 (95%: 2.1, 5.4). All six of PSI components, i.e. quality, latency, efficiency, daytime disfunction, disturbance and duration, indicated an improved sleep quality after the intervention. Conclusion: Exercise and reflexology proves beneficial to elderly. The intervention could be a complementary approach to existing therapies for sleep problems.

KEYWORDS : Exercise, Reflexology, Psqi, Quality Of Sleep

INTRODUCTION

In the world, the elderly people older than 60 years old grow faster than other age groups (WHO, 2016). The number of elderly in Indonesia based on 2014 National Census reached 20.24 million or about 8.03% of the total population (MoHRI, 2016), increased from 7.59% in 2012. Their morbidity rate in 2014 was 25.05% (Central Bureau of Statistic, Indonesia, 2014).

Aging is an accumulated biological process in which various types of deteriorated changes occurring in cells and tissues, responsible for increased risk of illness and death (Tosato, et al, 2007), decreased muscle mass and increased fat mass (Wu & Liu, 2016), impaired functions (Gereber et al, 2016) and balance (Downs et al, 2014), sleep disorders (Livingston et al, 1993), decreased hormonal system in the body (Sherwin, 2006), as well as decreased quality of life (Gereber et al, 2016).

The weaknesses syndrome in the elderly is complex and includes some aspects of physiological and psychological impairment (Arantes et al, 2009; d'Orsi et al, 2011). One of the physiological impairment is sleep quality (Wang et al, 2016). Sleep quality is positively associated with consciousness (Visser et al, 2014), in which higher level of consciousness contributes to improved sleep by reducing cognitive dysfunction. Sleep disturbance among elderly is caused by fatigue, emotional distress, daytime sleep dysfunction and increased risk of falls that will in turn affect morbidity, mortality and quality of life (Chen et al, 2012).

Sleep disturbance and reduced sleep duration are very common among elderly and may be associated with risk factors affecting medical and psychological conditions, such as obesity, hypertension (Patel et al, 2014); decreased cognitive work, dementia and decreased memory capacity (Miyata et al, 2013); increased risk of all causes of death, cardiovascular and developing symptoms of diabetes mellitus (Tsou, 2011); reduced depression (Widiyawati, 2015).Sleep problems among adults may represent one of the community health problems in many developing countries, given the increasingly aging population at the global level (Strange et al, 2012). Methods to improve the quality of sleep other than taking medication are massage therapy (Rahmani et al, 2016), reflexology (Kheyri et al, 2016), and moderate intensity of exercise program (Kamrani et al, 2014).

The parameter widely used to measure sleep quality is the Pitsburgh Sleep Quality Index (Buysee et al, 1988), which assess sleep disorders, sleep quality and patterns. The questionnaire consists of nineteen questions to assess seven components: subjective sleep quality, sleep latency, sleep duration, sleep habits, sleep disturbances, medical treatment and sleep dysfunction during the day (Spira et al, 2012).

In Indonesia there have been no studies to measure sleep quality among elderly. This study aimed at proving that a combined intervention of aerobic exercise and reflexology improve the quality of sleep among elderly in Bogor District.

METHODS

The study design is a pre- and post quasi experimental design without control. The target population was elderly aged 60 – 72 years lived in Puraseda village. This study aimed at assessing the impact of combined exercise and reflexology on the quality of sleep, and was conducted in 5 weeks from April to May 2017. This study was part of a larger study on "The Effect of Various Intervention on Complementary Therapy on Wellness among Elderly" in Bogor District. The sample was randomly selected based on criteria of inclusion other than age, i.e. live in the village more than 3 years, and communicative. It excluded those who were unable to mobilize independently, and have serious health problems, such as heart diseases as diagnosed by doctor.The sample size was calculated using the following formula.

$$n = 2Sp^2 \frac{[z_{1-\alpha/2} + z_{1-\beta}]^2}{[\mu 1 - \mu 2)} \; ; \; Sp^2 = \frac{[(n1-1)\,S1^2 + (n2-1)S2^2}{(n1-1)+(n2-1)};$$

$$n = \frac{2 \times 38{,}11\,[1{,}96+0{,}84]^2}{57{,}91} = 10{,}32$$

The sample size (n) was 10,32 and to anticipated the drop out, the sample size was doubled to become 20. S_1 and S_2 are the SDs from previous two studies; $Z_{1-\alpha/2}$ value is= 1.96; $Z_{1-\beta}$ is the study power of 80%; μ_1 and μ_2 were means of the previous two studies, namely -4.3 obtained from Papageorgiou et al (2016) and 3.31 obtained from Ghazavi et al (2016).

All subjects signed the inform consent after recieving explanations about the nature and aims of the study. Drop out criteria was set up as absent 3 times from the prescribed sessions. The data was collected from all subjects, consisting of socio-economic, health condition and medical history, as well as the main outcome variables, i.e. the PSQI.

Intervention to all subjects was given, i.e. reflexology and aerobic exercise applicable for elderly people. Procedure of interventions are conducted according to a prescribed manual. Reflexology was given 2 sessions per week with 100 minutes per session for a total of 5 weeks. The intensity was strengthened Yin 30 times and weakened Yang 60 times, with a repetition per session. Pressure was applied as described elsewhere (Hendro et al, 2014), on opening point; core points for nerve and metablism, digestion, and closing points to enhance immunity. Aerobic exercise was executed after reflexology. It was given 2 times per week for a period of 5 weeks. The intensity of the exercise was 60 to 70% of maximum pulse, for 45 minutes per session. The exercise consists of single movements with 8 repetitions.

The outcome variable as described earlier, i.e. PSQI was measured pre- and post intervention. Cut-off point of the PSI score was 5, in which PSI score ≤5 indicates good sleep quality.

Univariate analysis was aimed at describing all variables collected. The bivariate analysis was done to test the impact of combined

reflexology and aerobic exercise on sleep quality and patterns, before and after the intervention.All analysis was executed using a trial version of SAS version 22.

RESULTS

The latest 2012 population census showed that Puraseda village had 7919 population, consisting of 4117 male and 3802 female from 2010 families. Elderly people consisted of 203 (age ranged 56 - 65 years), 88 (age ranged 65-75 years), and 42 people older than 75 years (CBS, Bogor, 2016). The sample consisted of two male (13.3%) and 13 female (86.7%). It is noticed that 5 people was drop out due to non-compliance of absent. The sample characteristics are seen in Table 1.

Table 1. Age characteristics of male and female subjects (n = 15)

Sex	Mean ± SD	Min	Max	95% CI
Age	63,1 ± 2,2	60	66	61,9-64,3
Male	62,5 ±3,5	60	65	30,7-94,2
Female	63,2 ± 2,1	60	66	61,9-64,5

As indicated by the PSQI, there was a significant effect of combined exercise and reflexology before and after the intervention on sleep quality as shown in Table 2. Improvements were seen in global PSQI score of less than 5 following 5 weeks treatments, indicating good overall sleep quality and patterns.

Table 2.Total PSQI score and seven components of sleep quality before and afterintervention of combined exercise and reflexology (n=15)

Sleep Quality	**Mean ± SD**	**Min**	**Max**	**95% CI (Low, Upper**
Total PSQI Score				
Pre	7.4 ± 2.9	2	12	5.8 , 9.0
Post	3.7 ± 1.5	2	8	2.8, 4.5
Subjective Sleep Quality				
Pre	1.2 ± 0.7	0	2	0.8,1.5
Post	0.7 ± 0.4	0	1	0.5, 0.9
Sleep Latency				
Pre	1.2 ± 0.8	0	3	0.7, 1.7
Post	0.6 ± 0.7	0	2	0.6, 1.0
Habitual Sleep Efficiency				
Pre	0.07 ± 0.3	0	1	-0.8, 0.2
Post	0 ± 0	0	0	0
Sleep Disturbance				
Pre	1.9 ± 0.4	1	3	1.7, 2.2
Post	1.3 ± 0.5	1	2	1.0, 1.6
Daytime dysfunction				
Pre	0.9 ± 0.8	0	2	0.4, 1.4
Post	0.07 ± 0.2	0	1	-0.1, 0.2
Sleep Duration				
Pre	1.4 ± 1.1	0	3	0.8, 2.0
Post	0.7 ± 0.4	0	1	0.5, 0.9
Use of Medication				
Pre	0.7 ± 0.9	0	3	0.1, 1.2
Post	0.2 ± 0.7	0	3	-0.2, 0.6

This result was supported by other evidence from all seven components which was less than 5 following a combined exercise and reflexology, proving good overall sleep quality, as seen in Table 3.

Table 3. Results of paired t-test of PSQI score and its components before & after intervention of combined exercise & reflexology among elderly in Puraseda village (n=15)

PSQI Components	Sleep patterns	Mean diff ± SD	SE Mean diff	95% CI		$t_{(df=14)}$	Sig (2-tail)
				Lower	Upper		
Component 1	Sleep quality	1.1 ± 1.7	0.45	0.09	2.04	2.36	0.033
Component 2	Sleep latency	0.6 ± 1.1	0.29	-0.02	1.22	2.07	0.05
Component 3	Sleep efficiency	0.07 ± 0.3	0.07	-0.07	0.21	1	0.33 *
Component 4	Sleep disturbance 1	5.7 ± 3.3	0.85	3.91	7.55	6.76	0.00
Component 5	Sleep disturbance 2	0.6 ± 0.6	0.16	0.25	0.95	3.67	0.003
Component 6	Daytime dysfunction	0.9 ± 0.9	0.26	0.32	1.41	3.39	0.004
TOTAL PSQI		3.7 ± 2.9	0.76	2.09	5.37	4.880	0.00

As showed in the table, a significant improvements in each of the seven components was a valid and strong evidence that the intervention exerted a beneficial effect on sleep quality and patterns, except habitual sleep efficiency which did not show a significant change.

DISCUSSION

Results of this study indicated significant impact of combined exercise and reflexology on sleep quality among elderly. The results was supported by other study conducted (Valizadeh et al, 2015; Li et al, 2004) which showed that reflexology significantly affected 2 components of sleep patterns, i.e. subjective sleep quality and delayed sleep. Reflexology has a sedative effect to ease the tension on nerve (Hall, 1997; Vegar & Hussain, 2012), capable of stimulating nerve cells in the body to reduce tension and creates relax state in reducing depression (Rahmani et al, 2016;Widiyawati, 2015). It is due to the release of endorphin in the body which acts similar to morphin functioning to relax and also regenerate dying cells (Hendro et al, 2014).

On the other hand, significant results of exercise on sleep quality was supported by other study (Kamrani et al, 2014), which showed that moderate aerobic exercise conducted for 8 weeks showed to improve the quality of sleep and its components. The tudy on Baduanjin exercise (Chen et al, 2012) conducted for 12 weeks showed significant impact to improve total quality of sleep and its components, which was believed that it is capable of stimulating metabolism, enhancing the circulation of Qi energy though nerve channels to the whole body to reduce stress.

It was explained that exercise may improve sleep quality through mechanisms of energy transfer, endorphin release and thermoregulation (Yang et al, 2012; Li et al, 2004). It is widely known that thermoregu lation is an important aspect of homeostasis, namely regulation of core body temperature in a short time by controlling dissipation and heat absorption internally –vice versa (Vegar & Hussain, 2012). The benefits of exercise on sleep quality is its capability to increase the body temperature quickly followed by gradual decrease afterwards. It is the increase of core body temperature which stimulate the initiation of sleep by dissipation of heat regulated by hypothalamus (Kaur & Sharma, 2011).

Overall, the results of this study showed that there is a synergic mechanism between exercise and reflexology in improving sleep quality through physiological and nervous system. It has been proved that a combined intervention of reflexology and exercise for the elderly is beneficial for better sleep quality, which can be explained by aforementioned theories, as well as empirical evidences from other studies. For instance, the theory of Pommeranz dealing with function of endorphin hormone in reflexology, synergizes with theory of thermoregulation and homeostasis, as well as with TCM's theory of balance of flows of Qi in the body. Exercise is complex physiological process that affect sleep, including longer NREM and shorter REM period (Uchida et al, 2012).

CONCLUSIONS

The sleep quality indicated significant improvement due to combined interventions of exercise and reflexology. Six out of seven components of sleep quality as measured by PSQI score, except sleep efficiency have indicated a significant improvement. This conclusions are in accord with results of previous studies conducted in various parts of the world. Hence, the interventions could be recommended as a complementary approach to existing therapies for sleep problems among elderly population.

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References

1. World Health Organization (WHO). "Definition of an older or elderly person". Accessed on 29 April 2016. (http://www.who.int/healthinfo/survey/ageingdefnolder/en/).
2. MoHRI (Infodatin Pusat Data Dan Informasi, (2016). Situasi Lanjut Usia (Lansia) di

Indonesia. Accessed date 4 Februari 2017. (http:// www. pusdatin. kemkes.go.id /folder/ view/01/structure-publikasi-pusdatin-info-datin.html)
3. Mustari, Andhie Surya., Rachmawati, Yeni., Nugroho, Sigit Wahyu. (2014). Statistik Penduduk Lanjut Usia 2014: Hasil Survei Sosial Ekonomi Nasional. Jakarta: Badan Pusat Statistik.
4. Tosato, M., Zamboni, V., Ferrini, A., & Cesari, M. (2007). The aging process and potential interventions to extend life expectancy. Clinical Interventions in Aging, 2(3), 401–412. https://doi.org/10.1007/s10522-008-9191-1
5. Wu, Y., Hwang, A., & Liu, L. (2016). Journal of Clinical Gerontology & Geriatrics Sex differences of sarcopenia in Asian populations : The implications in diagnosis and management. Journal of Clinical Gerontology & Geriatics, 7(2), 37–43. https://doi.org/10.1016/j.jcgg.2016.04.001
6. Downs, S., Marquez, J., & Chiarelli, P. (2014). Normative scores on the Berg Balance Scale decline after age 70 years in healthy community-dwelling people: A systematic review. Journal of Physiotherapy, 60(2), 85–89. https:// doi. org/10 .1016/j. jphys.2 014.01.002
7. Gerber, A. M., Botes, R., Mostert, A., Vorster, A., Buskens, E. (2016). A cohort study of elderly people in Bloemfontein, South Africa, to determine health-related quality of life and functional abilities. South African Medical Journal, 106(3), 298–301. https://doi.org/10.7196/SAMJ.2016.v106i3.10171
8. Livingston, G., Blizard, B., & Mann, A. (1993). Does sleep disturbance predict depression in elderly people? A study in inner London. British Journal of General Practice, 43(376), 445–448.
9. Sherwin, B. B. (2006). Estrogen And Cognitive Aging In Women. Neuroscience, 138, 1021–1026. https://doi.org/10.1016/j.neuroscience.2005.07.051
10. Arantes, P. M. M., Alencar, M. A., Dias, Rosangela C., Dias, Joao M D., & Pereira, L. S. M. (2009). Physical Therapy Treatment On Frailty Syndrome : Systematic Review. Rev Bras Fisioter, 13(5), 365–375.
11. Wang, Qun., Chair, Sek Ying., Wong, Eliza Mi Ling., & Li, Xiaomei. (2016). The Effects of Music Intervention on Sleep Quality. The Journal Of Alternative And Complementary Medicine, 0(0), 1–9. https://doi.org/10.1089/acm.2015.0304
12. Visser, P. L., Hirsch, J. K., Brown, K. W., Ryan, R., & Moynihan, A. (2014). Components of Sleep Quality as Mediators of the Relation Between Mindfulness and Subjective Vitality Among Older Adults. Mindfulness, 1–11. https://doi.org/10.1007/s12671-014-0311-5
13. Chen, M., Liu, H., Huang, H., & Chiou, A. (2012). The effect of a simple traditional exercise programme (Baduanjin exercise) on sleep quality of older adults : A randomized controlled trial. International Journal of Nursing Studies, 49(3), 265–273. https://doi.org/10.1016/j.ijnurstu.2011.09.009
14. Patel, S.R., Blackwell, T., Redline., Israel, S A., Cauley, J A., Hillier, TA., Lewis, CE., Orwoll, ES., Stefanick, ML., Taylor, BC., Yaffe, K., and Stone, KL. (2014). The Association Between Sleep Duration And Obesity In Older Adults. International Journal of Obesity, 38, pp.1159–1164.
15. Miyata, S., Noda, Akiko., Iwamoto, Kunihiro., Kawano, Naoko., Okuda, Masato And Ozaki, Norio. (2013). Poor Sleep Quality Impairs Cognitive Performance In Older Adults. Journal of Sleep Research, 22(5), pp.535–541
16. Tsou, M. T. (2011). Association Between Sleep Duration And Health Outcome In Elderly Taiwanese. International Journal of Gerontology, 5(4), pp.200–205. http://dx.doi.org/10.1016/j.ijge.2011.09.020.
17. Stranges S., Tigbe, William., Olivé, Francesc Xavier Gómez., Thorogood, Margaret, Kandala, Ngianga Bakwin. (2012). Sleep Problems: An Emerging Global Epidemic? Findings From The INDEPTH WHO-SAGE Study Among More Than 40,000 Older Adults From 8 Countries Across Africa And Asia. SLEEP, 35(8):1173-1181
18. Rahmani A., Naseri M., Salaree M M and Nehrir B. (2016). Comparing The Effect Of Foot Reflexology Massage, Foot Bath And Their Combination On Quality Of Sleep In Patients With Acute Coronary Syndrome. J Caring Sci; 5 (4): 299-306. doi:10.15171/ jcs.2016.031
19. Kheyri, A., Bastani, F & Haghani, H. (2016). Effects Of Reflexology On Sleep Quality Of Elderly Women Undergoing Abdominal Surgery. Journal of Client-Centered Nursing Care; vol. 2, no. 1, pp. 11-18
20. Kamrani A. A. A., Shams A., Dehkordi P. S., Mohajeri R. (2014). The effect of low and moderate intensity aerobic exercises on sleep quality in elderly adult males. Pak J Med Sci, 30(2):417-421. doi: http://dx.doi.org/10.12669/pjms.302.4386
21. Buysee, D. J., Reynolds, C. F., & Monk, T. H. (1988). The Pittsburgh Sleep Quality: A New Instrument for Psychiatric Practice and Research. Psyciatry Research, 28, 193–213.
22. Spira, A. P., Beaudreau, S. A., Stone, K. L., Kezirian, E. J., Lui, L., Redline, S., Israel, S A., Ensurd, Kristie., Stewart, Anita. (2012). Reliability and Validity of the Pittsburgh Sleep Quality Index and the Epworth Sleepiness Scale in Older Men. Journal Of Gerontology: Medical Sciences, 67A(4), 433–439. https:// doi.org/ 10.1093/ gerona /glr172
23. Papageorgiou, F., Varvogli, L., Oikonomidi, T., Chrousos, G. P., & Darviri, C. (2016). An 8-Week Stress Management Program for Older Women: A Pilot Randomized Controlled Trial. Psychology, 7, 829-835.
24. Ghazavi, Z., Feshangchi, S., Alavi, M., Keshvari, M. (2016) Effect of a Family-Oriented Communication Skills Training Progam On Depression, Anxiety, and Stress In Older Adults: A Randomized Clinical Trial. Nurs Midwifery Stud; 5(1)
25. Hendro, G S dan Ariyanti, Yusti. (2014). Materi ajar: Ilmu Pijat Pengobatan Refleksi. Jakarta. KKNI
26. D'Orsi, Eleonora., Xavier, André Junqueira., Ramos, Luiz Roberto. (2011). Work, social support and leisure protect the elderly from functional loss : EPIDOSO Study. Rev Saúde Pública, 45(4).
27. Widiyawati, W. (2015). Influence Of Elderly Gymnastics To Reduce Depression In Elderly. International Journal Of Technology Enhancements And Emerging Engineering Research, 3(8), 90–94
28. Badan Pusat Statistik Kabupaten Bogor. (2016). Statistik Daerah Kecamatan Leuwiliang 2016. http://bogorkab.bps.go.id. BPS Kabupaten Bogor.
29. Valizadeh, L., Seyyedrasooli, A., Zamanazadeh, V., & Nasiri, K. (2015). Comparing the Effects of Reflexology and Footbath on Sleep Quality in the Elderly : A Controlled Clinical Trial. Iran Red Crescent Med J, 17(11), 1–8. https:/ /doi.org /10.5812/ ircmj.20111
30. Hall, Nicola. (1997). Pijat Refleksi Untuk Wanita: Apa Yang Perlu Diketahui dan Dilakukan. Jakarta. Arcan.
31. Rahmani A., Naseri M., Salaree M M and Nehrir B. (2016). Comparing The Effect Of Foot Reflexology Massage, Foot Bath And Their Combination On Quality Of Sleep In Patients With Acute Coronary Syndrome. J Caring Sci; 5 (4): 299-306. doi:1 0.1517 1/jcs.2016.031
32. Hendro,G S dan Ariyanti, Yusti. (2014). Materi ajar: Ilmu Pijat Pengobatan Refleksi. Jakarta. KKNI
33. Kamrani A. A. A., Shams A., Dehkordi P. S., Mohajeri R. (2014). The effect of low and moderate intensity aerobic exercises on sleep quality in elderly adult males. Pak J Med Sci, 30(2):417-421. doi: http://dx.doi.org/10.12669/pjms.302.4386
34. Yuio Huang, C., Chang, E., & Lai, H. (2016). Comparing the effects of music and exercise with music for older adults with insomnia. Applied Nursing Research, 32, 104–110. https://doi.org/10.1016/j.apnr.2016.06.009.
35. Yang, P H., Ho, K H., Chen, H C., & Chien, M Y. (2012). Exercise Training Improves Sleep Quality In Middle-Aged And Older Adults With Sleep Problem: A Systemic Review. Journal Of Physiotherapy, 58: 157-163.
36. Li, F., Fisher, Ã. K. J., Harmer, Ã. P., Irbe, D., Tearse, R. G., Weimer, C., & Bs, Ã. (2004). Tai Chi and Self-Rated Quality of Sleep and Daytime Sleepiness. J Am Geriatr Soc, 52, 892–900.
37. Veqar, Zubia and Hussain, M E. (2012). Sleep Quality Improvement and Exercise: A Review. International Journal of Scientific and Research Publications; (2) 8, 1-8.
38. Kaur, J., & Sharma, C. (2011). Exercise in Sleep Disorders. Delhi Psychiatry Journal, 14(1), 133–137.
39. Uchida, Sunao., Shioda, Kohei., Morita, Yuko., Kubota, Chie., Ganeko, Masashi & Takeda, Noriko. (2012). Exercise Effects On Sleep Physiology. Frontiers In Neuroly. 3:48, doi: 10.3389/fneur.2012.00048.