



Implementation of Active Rest in Participatory Ergonomics Decrease Workload and Women Musculoskeletal Complaints of Parking in Mall Ramayana Denpasar



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Abstract

The women workers usually work more than 8 hours a day and are in static condition, especially in the parking lot. Such conditions give rise to (a) fatigue accumulation, (b) musculoskeletal disorders, (c) increased workload, and (d) decreased work productivity. The study used the same subject design (treatment by subject design) involving 8 workers. In this case, will be compared the average score of workload and musculoskeletal disorders between before and after treatment. The data analysis used is paired t-test with 5% significance level. Some of the findings in this study are: (1) physical work environment in the comfort category based on acclimatization of Indonesian people; (2) the attitude of the parking officer is relatively natural, since they are using an ergonomic work station in terms of the suitability between the work table and the height of the worker's elbow and the seat is already referred to the popliteal height; (3) there was a significant decrease of workload between before and after the implementation of active participatory ergonomic break of 3.41% ($p < 0.05$); and (4) there was a significant decrease of musculoskeletal disorder 41,63% ($p < 0,05$). Thus it can be concluded: (1) environmental conditions, attitudes and work positions and work stations that accompany the parking officers, in general, are in the ergonomic category, but static working conditions still need attention; (2) the application of active breaks through a participatory ergonomic approach can

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significantly reduce the workload of parking attendants ($p < 0.05$), this means that workload is getting lighter; and (3) the application of active rest through a participatory ergonomic approach can significantly reduce musculoskeletal disorders ($p < 0.05$), which means parking attendants become healthier especially those related to the musculoskeletal system.

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1. Introduction

One of a job at parking management in the Mall Ramayana is as a parking guard employee. It is actually part of the parking operation, which is enough to provide satisfaction and comfort in parking use lot. The duty of parking guard on the parking post both at the entrance and exit increases the workload of the women parking attendants. This happens due to they have to increase their working time. The initialing observation was found that they had started work at 08.30 am - 04.30 pm (for 8 hours).

Ergonomics is the science, technology, and art to harmonize the tools, workings, and environments on the ability, permissibility, and humans limitations, therefore, unlike to obtain working conditions and a healthy environment, safe, comfortable and efficient thus, in order to achieve the highest productivity (Manuaba, 1996), indispensable in an activity involving humans in it. Regarding ergonomics the negative impacts can be minimized the use of science and technology, due to with the ergonomics of various occupational diseases, accidents, pollution, poisoning, work dissatisfaction, human error, can be avoided or minimally suppressed (Manuaba, 1996).

Muscle disorders that occur in a certain organ can be traced using the *Nordic Body Map* which is basically made with the provisions of muscle groups that exist in the organ. Experts report that physical activity performed at work that is not ergonomic may cause muscle and joint injury or disruption. In addition, the work that is dominated by mental activity also has the potential to create musculoskeletal disorders. Ayoub (1996) reported that disorders of the musculoskeletal system are a major problem in an industry caused by (1) inadequate workplace, (2) repetitive activity, (3) design of equipment and equipment incompatible with the wearer, (4) inefficient work organization, (5) irregular break schedule and (5) unnatural work attitude. Bazroy, et.al. (2003) reported that 40.6% of workers in glass bottles factories in India who work repetitively have an injury or muscle disorder in the hands and wrists. Bhattacharjee, et.al. (2003) reported that musculoskeletal disorders ranked first among other occupational diseases that were influenced by individual characteristics (age over 30 years),

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wherein the workers who experienced the disorder were 44.9%. Evelyn (1996) reported that 63% of the workers complained a pain in the neck, shoulders, back, and waist caused by the static working. According to the report, female workers who work as employers are at risk of musculoskeletal disorders because they generally work in the static conditions. Through the application of active rest is expected that they can move more dynamically and consequently muscle disorders can be avoided. This is in accordance with the opinion by Nala (1994) which stated that a natural work attitude which causes dynamic muscle contraction (isotonic) in a large number of the human body muscular systems results in: (a) less energy or energy in the same effort (b) workload lighter, (c) the fatigue does not occur quickly and (d) after working, the muscle requires a shorter recovery time.

In the present research will be studied some problems included: (1) how high is the decreasing workload of the women parking officer at Mall Ramayana Denpasar after applied active rest ergonomically participant?; (2) how high is the decrease of the musculoskeletal disorder of the women parking attendant at Mall Ramayana Denpasar after applied active rest ergonomically participatory?; (3) what are the constraints faced by the implementation of active participatory ergonomic rest in the workplace of the women parking attendants at Mall Ramayana Denpasar?; and (4) whether alternative workable solutions are related to the constraints faced in implementing active participatory ergonomic rest in the workplace of the women parking attendants at the Mall Ramayana in Denpasar?

Based on the above problems, the objectives to be achieved in this research are: (1) in order to know the effect of active participatory ergonomic rest on the workload of women parking attendant at Mall Ramayana Denpasar; (2) in order to determine the effect of active participatory ergonomic rest on the musculoskeletal disorders of women parking attendants at Mall Ramayana in Denpasar; (3) in order to find out the worker's responses to the implementation of active participatory ergonomic rest in their workplace in relation to prevention of musculoskeletal disorders and decreased workload; (4) in order to explore the constraints faced with the implementation of participatory ergonomic active rest in women parking attendants at Mall Ramayana in Denpasar; and (5) in order to find alternative solutions related to the constraints faced in the application of participatory ergonomic active rest to women parking attendants at Mall Ramayana in Denpasar.

2. Research Method

Research subjects are women worker who works as woman parking attendants at Mall Ramayana Denpasar. In the present research, it is divided into two variables: (1) the independent variable is the application of active rest ergonomically participant and (2) dependent variable is a workload and musculoskeletal disorder of women parking attendant. This study included experimental research using the same subject design (treatment by subject design) or pre and post-test group design. The population in this study is all workers in the Mall Ramayana Denpasar which number about eight people. The data obtained were mean score of the musculoskeletal system disorder and change of pulse between before and after the treatment. In this case, the pre-treatment score will be compared with post-treatment active and post-treatment. The data were analyzed by paired t-test at 5% significance level.

3. Results and Analysis

It is viewed from the physical work environment was the average wet temperature before treatment was 26,00° C, dry temperature 29.33° C and relative humidity 78.67%. Whereas, the environmental conditions after treatment, the average wet temperature 26.17 o C, dry temperature 29.67 o C, and relative humidity 77.33%. This condition is assumed to have no effect on the result of research due to between before and after treatment condition of the work environment remain comparable ($p > 0,05$). It is seen from the relative humidity turns out in the comfortable category whereas the dry temperature before the higher treatment is 1.33° C of the comfortable category and after the higher treatment of 1.67° C for the comfort

category. This is in accordance with the opinion by Manuaba (1998) which stated that the area is comfortable for Indonesian, dry temperature ranges from 22 - 28 ° C and its relative humidity between 70 - 80%.

The average of lighting intensity before treatment is 216,67 lux and after treatment is 233,33 lux, also in the ergonomic category, according to Manuaba (1999) stated that lighting intensity 200 - 500 lux make people happy to work in that place. The intensity of lighting is assumed to have no effect on the result of research because the average of lighting intensity before and after treatment is not significantly different ($p > 0,05$).

Unnatural work attitude can act as the cause of various disorders of the skeletal muscle system (Occhipinti, et al, 1991; Hagg, 1991; Haslegrave, 1991). In order to overcome the problem, we need to know the criteria of ideal work attitude in doing an activity or job, among others: (1) muscle that works very little static; (2) in performing the tasks by hand is done easily and naturally; (3) relatively small muscular effort can be maintained; (4) a changing or dynamic work attitude is better than a relaxed static working attitude; and (5) static working attitudes relax better than static strained static attitudes (Pheasant, 1991). Ergonomic working principle, to avoid the risk of injury include: (1) use a power as efficiently as possible, unnecessary burden must be reduced or eliminated, weight calculation based on weight and if necessary use the lever as a tool; (2) working attitude of sitting, standing and squatting should be adjusted to ergonomic principles; (3) the five senses can be used as a control device, if the limbs have to rest (do not be forced) and when hungry or thirsty must eat or drink (not to hold); and (4) the heart is used as a parameter measured by pulse per minute i.e. no more than the maximum amount allowed. In this study, it was found that the working attitude of the artillery was relatively natural, since they had used an ergonomic workstation in terms of the suitability between the work table and the height of the worker's elbow and the seat was already referred to the popliteal height. However, the problem is the attitude of static work done in a relatively long time. For that improvement is done in the application of active rest in ergonomic participatory efforts to make the static muscle contraction that occurs in the static work attitude can be changed into dynamic muscle contraction that occurs in active rest. In this case, Nala (1994) stated that unnatural work attitudes cause static (isometric) muscle contraction in a large number of human body muscle systems and static muscle contractions may result: (a) the power or energy required is higher in the same effort (b) the pulse rises higher, (c) quickly feels tired and (d) after work, the muscle requires a longer recovery time.

It is observed from the resting pulse, it turns out the above data indicates that the resting pulse between before and after the repair is not significantly different ($p > 0.05$). That means, the workload of the sandbar before performing the activity is assumed to be the same between before and after the treatment. The workload on the sanding process is dominated by physical activity and is supported by the mental activity expressed through changes in the frequency of the working pulse. In this case, Adiputra (1998) stated that the workload based on the causal factors are divided into two: (a) external workload (stressor) caused by external factors including task, organization and environment and (b) internal workload i.e. workload caused by individual factors that are somatic include sex, age, body size, health condition and nutritional status and that is psychic include motivation, perception, desire, and others. The pulse frequency during activity is used as the basis for the assessment of the physical workload due to the average change in pulse rate during activity is linearly correlated with oxygen demand (Rodahl, 1989). Related to the opinion in this study found that the average workload of women parking officer before the repair is 95.68 dpm (SB = 5,53). Through the implementation of active participatory ergonomic rest, the average workload can be reduced to 90.50 dpm. After analyzed by *t-paired* test, it turns out that the change is significant with *t* value is 7,865 ($p < 0,05$). It is shown from the percentage decrease in workload was between before and after the implementation of active rest ergonomically participative decreased by 5.41%. The findings are supported by reports of researchers: (a)

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Boregowda, et.al. (1997) reported that activity accompanied by mental stress increased mean the pulse rate by 16.80 beats per minute for men and 18.70 beats per minute in women ($p < 0.01$), (b) Sutajaya (1998) reported that improvements in working conditions decreased the working rate by 24.86% ($p < 0.05$), and (c) Singarsa (2000) reported that standing behavior with terracing systems could reduce the workload of the medium category (104.69 dpm) into the lightweight category (97.48 dpm).

In the present study found that the musculoskeletal disorders in the sanding process before the improvement increased by 35.58% between before and after work. After the implementation of active rest in ergonomic participatory is able to reduce the musculoskeletal disorders 51.79% ($p < 0.05$). These findings are supported by several studies conducted by the researchers, among others: (1) Nora Azmi and Martita Maretani (2001) reported that the prevalence of the subjective complaints of the musculoskeletal disorders suffered by workers in garment CV. PM. is upper neck pain (58.33%), the pain in the lower neck (54.17%), the right leg pain (50%), the pain in the right thigh and left calf (45.83%), left (43.06%), right leg pain (36.11%), right knee pain (34.72%), left leg pain (33.33%), pain in the right ankle and waist (31, 94%), the pain in the left ankle (30.56%), the pain in the left knee and back (29.17%) arising from unusual position and working attitude, (2) Erlangga, E and Iftikar, S (2001) stated that the musculoskeletal disorder is a cumulative occupational accident phenomenon that is often caused by unnatural work positions and attitudes due to they are not noticed between the anthropometry of workers with the high work field, (3) Yassierli and Iftikar, S (2000) that in human work will position itself following the existing system design and this often leads to a position and attitude of working that is not and (4) Diwyastra (2000) reported that crafters in Semana Village, 80% complained of back pain and 100% low back pain caused by work stooping and sitting cross-legged for a relatively long time.

4. Conclusion

Regarding the findings, data analysis, and discussion above can be concluded (1) environmental condition, attitude and a work position, and workstation accompanying women parking attendant at Mall Ramayana Denpasar generally have been in the ergonomic category, but the static working condition still needs to get attention. (2) The application of active rest in participatory ergonomics can reduce the emery masseuse load about 5.41% ($p < 0.05$), this means the workload is getting lighter; and (3) the application of active ergonomic participant rest can reduce musculoskeletal disorders about 51.79% ($p < 0.05$), this means that workers become healthier especially those related to the musculoskeletal system.

Some suggestions that seem to be important in the present study are (1) to the women parking attendants, it is advisable to keep performing their activities in accordance with ergonomic rules due to it has been shown to significantly reduce workload and the musculoskeletal disorders; (2) to the company, it is advisable to keep the harmony of cooperation between the manager and the worker, due to this cooperation will greatly help the company's survival and the improvement will be maintained and implemented in a sustainable manner; and (3) to the parties concerned, it is advisable to monitor the working conditions of workers, in order to achieve the working conditions that ENASE (effective, comfortable, safe and healthy), due to this condition can improve one's performance, which later can improve the work quality.

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References

- Adiputra, N. 1998. Ergonomic Methodology. Study Program of Work Ergonomics, Post Graduate Program of Udayana University.
- Adiputra, N. 2000. Curative Ergonomics. Indonesian Ergonomic Journal Vol. I No. 1. June 2000: Ergonomic Studies Program Uphillology Physiology University of Bali.
- Arcentales, G. A. T., Lucas, M. A. P., Guerrero, J. A. C., & Gordín, R. G. (2017). Evaluation for the Reduction of NH₃ Contamination Risks. *International Journal of Life Sciences (IJLS)*, 1(2), 10-17.
- Arnawa, I. K., Sukerta, I. M., Martiningsih, N. G. A. E., & Astuti, P. S. (2017). Minapolitan Area Development Strategy: An Effort to Increase Fisherman Income, Gianyar Regency, Bali Indonesia. *International Journal of Life Sciences (IJLS)*, 1(2), 39-47.
- Carrivick, P.J.W., Andy H. Lee and Kelvin K.W. Yau. 2002. Effectiveness of a Participatory Workplace Risk Assessment Team in Reducing the Risk and Severity of Musculoskeletal Injury: *Journal of Occupational Health*. Vol. 44. No. 4. July. 2002.: Japan Society for Occupational Health.
- Dul, J. and B. Weerdmeester. 1993. Ergonomic for Beginners A Quick Reference Guide. London: Taylor & Francis.
- Gangopadhyay, S., Ray, A., Das, A., Das, T., Ghoshal, G., Banerjee, P., Bagchi, S. 2003. A Study on Upper Extremity Cumulative Trauma Disorder in Different Unorganized Sectors of West Bengal, India. *J. Occup. Health*, 45 (6,11): 351-357.
- Jain, P., Jain, A., Singhai, R., & Jain, S. (2017). Effect of Biodegradation and Non Degradable Substances in Environment. *International Journal of Life Sciences (IJLS)*, 1(1), 58-64.
- Jurado, W. C. C., Pérez, A. V. P., Quiroz, A. M. V., & Gámez, M. R. (2017). Environmental Impact On Electrical Networks Near The Manabita Litoral. *International Journal of Life Sciences (IJLS)*, 1(2), 18-27.
- Manuaba, A. 1996. Utilization of Ergonomics and Physiology of Sport for Human Development and Indonesian Society Completely. Denpasar: Postgraduate Program in Ergonomics and Physiology of Sport.
- Manuaba, A. 1998. Ergonomic Implementation in the Framework of Improving Education Efforts and Rural Community Development. Denpasar: Rampai Lab. Faal FK. UNUD.
- Manuaba, A. 1998. Implementation of Ergonomic Occupational Health at Home Appliances. Denpasar: Rampai Lab. Faal FK. UNUD.
- Manuaba, A. 1998. Setting Body Temperature and "Water Intake". Denpasar: Rampai Lab. Faal FK UNUD.
- Monod, H., Garcia, M. 1996. Use of Physiological Criteria for Improving Physical Work Conditions. *J. Human Ergol.*, 25 (1,6): 29-38.
- Nala, N. 1994. Application of Appropriate Technology in Rural Areas. Denpasar: Institute of Community Service Udayana University.
- Ogu, G. I., & Orjiakor, P. I. (2017). Microbiological and Nutritional Qualities of Fermented Melon Seed Shells. *International Journal of Life Sciences (IJLS)*, 1(2), 1-9.
- Ogunsiji, A. S., & Ladanu, W. K. (2017). A Theoretical Study of Performance Measures in the Strategic and Corporate Entrepreneurship of Firms. *International Journal of Life Sciences (IJLS)*, 1(1), 49-57.
- Omer, A. M. (2017). Identifying, Developing, and Moving Sustainable Communities through Application of Bioenergy for Energy or Materials: Future Perspective through Energy Efficiency. *International Journal of Life Sciences (IJLS)*, 1(1), 9-39.
- Pheasant, S. 1991. Ergonomics, Work, and Health. London: Macmillan Academic Professional Ltd.
- Saxena, A. (2017). The Impact of Nutrition on the Overall Quality of Life Adolescent Girls are Living Across the City of Kota. *International Journal of Life Sciences (IJLS)*, 1(1), 40-48.
- Singh, D. (2017). Leaf Phenology of Cassia Sieberiana L. in KSUSTA Campus of Kebbi State, Nigeria. *International Journal of Life Sciences (IJLS)*, 1(1), 1-8.

Arnawa, I. K., Sukerta, I. M., Martiningsih, N. G. A. E., & Astuti, P. S. (2017). Minapolitan area development strategy: an effort to increase fisherman income, Gianyar regency, Bali Indonesia. International Journal of Life Sciences, 1(2), 39-47. <https://doi.org/10.21744/ijls.v1i2.40>

- Sulistiawati, N. P. A., Kartini, L., & Yuliantini, M. S. (2017). Identification of Development Phases and Changes Shoots Flowering Orange Siam Plants. *International Journal of Life Sciences (IJLS)*, 1(2), 28-38.
- Sutapa, I. K., Sutapa, I. N., & Susila, I. N. D. (2017). Implementation of Active Rest in Participatory Ergonomics Decrease Workload and Women Musculoskeletal Complaints of Parking in Mall Ramayana Denpasar. *International Journal of Life Sciences (IJLS)*, 1(2), 48-54.
- Tarwaka and Solihull Hadi, A.B. 2002. Human-Machine System Analysis and Ergonomic Problem Solving through Participatory Approach to Air Traffic Control Room Ngurah Rai Airport. *Proceedings National Industrial Engineering Conference: Department of Industrial Engineering Faculty of Engineering, University of Surabaya*.
- Velasco, A.L. 2002. Value Engineering as an Ergonomics Tool to Measure Benefits of Ergonomic Interventions. *The Indonesian Journal of Ergonomics*. Vol.3 No. 2 December 2002.
- Wulanyani, S.M. Rest and Music Arrangements Increase Productivity of Cigarette Linting Paper in CV. "X" Denpasar (thesis). Denpasar: Udayana University Graduate Program.

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