

Simply Ergonomics Intervention For Reducing Nurses Mental Workload

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ABSTRACT

Preliminary study conducted in three hospitals in Jakarta illustrating that the nurses as part of medical services had experienced work related stress condition. The triggers to the stress were responsibility to medical patient's life, shiftwork condition, patient's characteristic, pressure from head section, pressure from medical patient's family, teamwork, work environment etc. These conditions led the nurses into high mental workload which can reduce their performance.

The next step of study was mental workload measurement using NASA-TLX with six descriptor (physical necessity, mentally necessity, time necessity, performance, effort and frustration level). The result from three different hospital showed that all the observed nurses from all shift (morning, noon and evening) had high mental workload indicated by score up 70 (scale 10-100). This finding led to find suitable ergonomics intervention to solve this condition.

Participatory ergonomics approach was applied to get best solution from stakeholder perception. Each hospital has chosen the different tools to reduce mental workload. The consideration was based on existing condition of company, cost, time consume, simplicity to apply and interest. The choice were simply yoga practice, brain gym and laugh therapy and changing shifwork.

Although each hospital with their own choice, the result of implementation showed that there was significant decreasing of mental workload score.

Keyword

Mental workload, NASA-TLX, simply ergonomics intervention, participatory ergonomics

1. INTRODUCTION

The nurse as an important part of the healthcare industry, was able to experience ergonomic risk associated with mental workload. Preliminary study conducted in three hospitals in Jakarta illustrating that the nurses as part of medical services had experienced work related stress condition. The level of stress can affect mental workload.

The 72 nurses as the object of this research come from different type of hospitals (government and private hospital, public and specialized hospital) and different section of hospital (type of disease and class of inpatient hospital room). Based on the preliminary questionnaire was indicated that more than 80% of the nurses stated that they had experienced work related stress condition.[1,5,8] A study from the National Institute for Occupational Safety and Health sets that nurse is a profession who set a very high risk to stress. Seyle in Kroemer [2] indicate the reasons why professional nurses have a very high risk of exposure to stress are that nurses have a duty and high responsibility on the safety of human life.

The triggers to the stress stated by the nurses were responsibility to medical patient's life, shiftwork condition, patient's characteristic, pressure from head section, pressure from medical patient's family, teamwork, work environment etc. These conditions led the nurses into high mental workload which can cause disruption of working concentration, disruption of health, pressured condition, uncomfortable situation and finally effect of working performance.

Based on the fact findings, this research was aimed to measure mental workload and design the ergonomics intervention to reduce the workload.

2. METHODS

Methods used in this research was divided into two, measurement and application of ergonomics intervention. Measurement was conducted to measure accurately mental workload meanwhile ergonomics intervention was practiced to reduce ergonomics risk which in this case was mental workload.

2.1 Mental Workload Measurement

Mental workload is measured using NASA-TLX methods. NASA TLX is the subjective measurement with multidimensional workload scale consists of six descriptors which are physical necessity (PN), mentally necessity (MN), time necessity (TN), performance (P), effort (E) and frustration level (FL). Reference [7] suggests to use NASA-TLX method for mental workload measurement because its high sensitivity

The measurement was carried out to the nurses in three shift, morning, noon and night. There are two steps in NASA-TLX methods which are *weighted* and *rating*.

2.1.1 Weighted Step

In weighted step, the respondent choose one the most important pair descriptor just like explained in table 1 and then become the weight for rating step.

Table 1 Weighted Step

No.	Pair	Choice
1	PN / MN	
2	PN / TN	
3	PN / P	
4	PN / E	
5	PN / FL	
6	MN / TN	
7	MN / P	
8	MN / E	

No.	Pair	Choice
9	MN / FL	
10	TN / P	
11	TN / E	
12	TN / FL	
13	P / E	
14	P / FL	
15	E / FL	

2.1.2 Rating Step

In rating step, respondent will give score for 1-100 for each descriptor based on what they feel about the load just like depicted in figure 1.

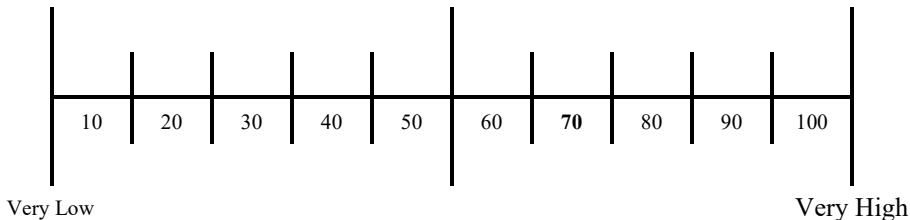


Figure 1 Rating Step

Here are the steps for rating step to get mean *weighted workload* :

1) Calculating the product value with multiply the rating with the weight for each descriptor. There are six product values for PN,MN,TN,P,E and FL.

$$\text{Product} = \text{rating} \times \text{weight factor} \quad (1)$$

2) Calculating WWL (*Weighted Workload*)

$$\text{WWL} = \sum \text{Product} \quad (2)$$

3) Calculating mean of WWL with dividing total value of WWL with total number of weight which is 15.

$$\text{Mean of WWL} = \text{WWL} / 15 \quad (3)$$

The category for mental workload based on value of WWL can be seen in table 2.

Table 2 Categorized Score of Mental Workload

Category	Scale
Very high	81-100
High	61 - 80
Moderate	41 - 60
Low	21 - 40
Very Low	0- 20

2.2 Ergonomics Intervention

Simply ergonomics intervention was chosen by the stakeholders as a part participatory ergonomics approach. Forming of group discussion involving the nurses and their supervisor (leader) was conducted as first step of the intervention design. Then some of the options offered to the stakeholder including their information. Categories of simply ergonomics intervention based on considerations, condition of the company, time consume, cost, ease of implementation and familiarity to the options (interest). Options offered were music therapy, laughter therapy, aromatherapy, yoga, brain gym and changing shiftwork. The options chosen were laughter therapy, yoga, brain gym and changing shiftwork.

2.2.1 Brain Gym

Brain Gym is a series of simple exercise developed by Paul E. Dennison, Dr. Phill and his wife Gail E. Dennison [2]. The effects of brain gym are :

- 1) Reducing emotionally stress and clearing the thinking process.
- 2) Improving relationship among people in workplace cause relaxing effect
- 3) Improving language and memorizing skill.
- 4) Making people more spiritual, creative and also improving concentration ability.
- 5) Feeling healthier
- 6) Improving study and work achievement.

Brain gym can activate three dimension of brain which are :

a. Lateral Dimension

To stimulate the left and right hemispheres. When these skills have been mastered, people will be able to process a linear code, written symbols with the two sides of the brain or from both directions : left to right or right to left which is the basic ability of academic success. The inability to stimulate the left and right brain hemispheres resulting learning disabilities or dyslexia.

b. Focusing Dimension

To stimulate the back of the brain or brainstem and the front of the brain (frontal lobes). The inability to stimulate the part will result in less able to express themselves and participate actively in the learning process, in other words known as lack of attention, lack of understanding, too late to talk or hyperactive.

c. Convergence Dimension

To stimulate limbic system (midbrain) associated with the emotions and the cerebrum (cerebral cortex) to think abstractly. The inability to stimulate the part will be marked by unfounded fear, tend to react "to fight or flee", or the inability to feel or express emotion.

There are some specific movement to activate each dimension of brain.

2.2.2 Laughter Therapy

Laughter therapy was created by dr. Madan Kataria on March 1995 [3]. The main aim of this therapy is eliminate the negative effects of stress which 70% become cause of disease. The other benefits of this therapy are anti stress manner, reducing depression and other psychosomatic disorder, strengthening the immune system, avoiding high blood pressure and heart disease, anti aging, etc. This therapy must be conducted systematically and required training and habituation.

2.2.3 Yoga

Yoga teaches the art of relaxation with a variety of movements to stretch each muscle[6]. Yoga relaxes the muscles throughout the body and the toes to the head, which when combined with breathing techniques properly can reduce stress on the body. In addition, yoga is also taught how to direct the energy into the body to create a sense of relaxation and improving concentration ability. The series of movements of the body postures (asanas) and if the breath (pranayama), if done on a regular basis has been shown to lead human beings to create an atmosphere of relaxation of highly qualified. Some movement posture (asanas) done in a good, true, and the concentration able to calm the nervous system of work-related stress, restoring adrenal function to normal levels and provide comfort to the body. Therefore yoga can be used to release or reduce the stress.

2.2.4 Shift Work Changing

Shift work is a method to set the 24 hour working time into several groups. There are several model of shiftwork such as three shift with 8 hour rotation (2-3), three shift with 2-2-2 rotation (2 days in the morning, 2 days in the noon, 2 days in the night, 2 days off) , three shift with 2-2-3 rotation, two shift with 3 days work and 3 days off and etc.

Organizational criteria by which to judge the suitability of shift systems include the number of shifts per day, the length of every shift, the times of the day during which no work is done, the coverage of the week by shifts and whether there is shift work on holidays. They all are known as independent variables. Meanwhile the dependent variable is the health of the shift worker, whether the shift regimes affect a person's physiological or psychological well-being.[4]

3. IMPLEMENTATION

3.1 Implementation Of Brain Gym

Brain gym was socialized with direction from instructor. The nurses were given chance to train before practicing by themselves. Brain gym was implemented three times a day in the early shift, break time and late shift work. Implementation was conducted in 7 days.

3.2 Implementation of Laughter Therapy

Laughter therapy was implemented in the beginning of work time for 15-20 minutes each time. The nurses in group applied a series of therapy. The most important thing of this therapy were willingness to laugh and eye contact. Implementation was conducted in 10 days.

3.3 Implementation of Yoga

Preferred yoga movement to practice was a movement that was easy to do in the workplace. The nurses were introduced to yoga by yoga instructor within two days of training. After the training the nurses

practiced the yoga by themselves in 14 days. There was a checklist form to control the nurses practicing yoga.

3.4 Implementation of Shift Work Changing

In the beginning, there was no specific model of practiced shift work. After discussion, management of the hospital was agree to apply shift work changing as an ergonomics intervention. The model of shift work that was possible to be applied was three shift with 2-2-2 rotation. Implementation was conducted in 14 days.

4. RESULT

Table 2 show comparison NASA-TLX score before and after implementation the chosen simply ergonomics intervention. There can not be concluded that specific shiftwork had highest mental workload. All kind of simply intervention can reduce NASA TLX score which means reducing mental workload

Table 3 Comparison Mental Workload Before and After Implementation

NASA TLX SCORE							
shift		Morning		noon		night	
Hospital	intervention	before	after	before	after	before	after
A	shift work, laughter therapy	73.89	57.79	74.91	58.51	77.01	59.12
B	brain gym	77.19	64.67	78.81	65.85	75.12	63.91
C	yoga	82.79	72.51	74.51	66.41	76.19	67.14

5. CONCLUSION

This study concludes that :

1. Most of the nurses had experienced mental workload in the level of high or very high.
2. Simply ergonomics intervention can reduce score of NASA TLX.
3. Although each hospital with their own choice, the result of implementation showed that there was significant decreasing of mental workload score

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