MEASUREMENT NURSES PHYSICAL AND MENTAL WORKLOAD IN MENTAL HOSPITAL AND ITS IMPLICATION

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ABSTRACT

Dr. Soeharto Heerdjan is one of government mental hospital which focuses handling patient with psychological problem. Causing the high responsibility to their patients, the nurses were demanded having strong physical and mental endurance.

This research was aimed to measure physical and mental workload. As result of preliminary study by interview, the nurses felt stressed and exhausted because they often handle struggling patient and facing patient with different characteristic.This condition led to uncomfort situation causing unperformed worker.

Physical workload was measured by recording heart beat for each single event treatment in morning and afternoon shift. Based on measurement, physical workload was categorized as moderate. Mental workload was measured by two multi-dimentional workload scale methods which were NASA-TLX and SWAT considering unsimilar aspect measurement. Measurement was conducted for three different shift, which were morning, afternoon, ad night shift. . Based on NASA TLX method, the average mental workload for morning, afternoon and night shift consecutively were 77.19 (High), 78.81 (High), and 75.25 (High). For SWAT method, the score for all shift was categorized as medium.

The hospital management gave their response for this result and asked for simply solution to reduce their nurses mental workload. After discussion, the management was agree to try simply brain gym application and showed good improvement on decreasing mental workload and a little bit reducing heart beat. This facts was strengthen by nurses testimony that they could increase their concentration and decrease frustration level.

Keywords : Physical Workload, Mental Workload, NASA TLX, SWAT, Brain Gym

Introduction

Dr. Soeharto Heerdjan is one of government mental hospital which focuses handling patient with psychological problem. Causing the high responsibility to their patients, the nurses were demanded having strong physical and mental endurance. The most difficult section was razzly and panicky (gaduh gelisah) handling patient section. These patients had characteristics as very labil and uncontrolled emotion,unconscious condition and going wild frequently.

Inevitably this challenging situation triggered some complaints, uncomfortable and stressful feeling. Based preliminary interview with head of nurse, it was stated that many of the nurses felt stress condition.This condition led to uncomfort situation causing unperformed worker. The preliminary questionnaire distributed to the nurses indicated that 87% nurses in razzly and panicky handling patient section felt stress and the effect is depicted in figure 1. Some reasons

stated as the cause of stress were handling struggling patient and facing patient with different characteristic.

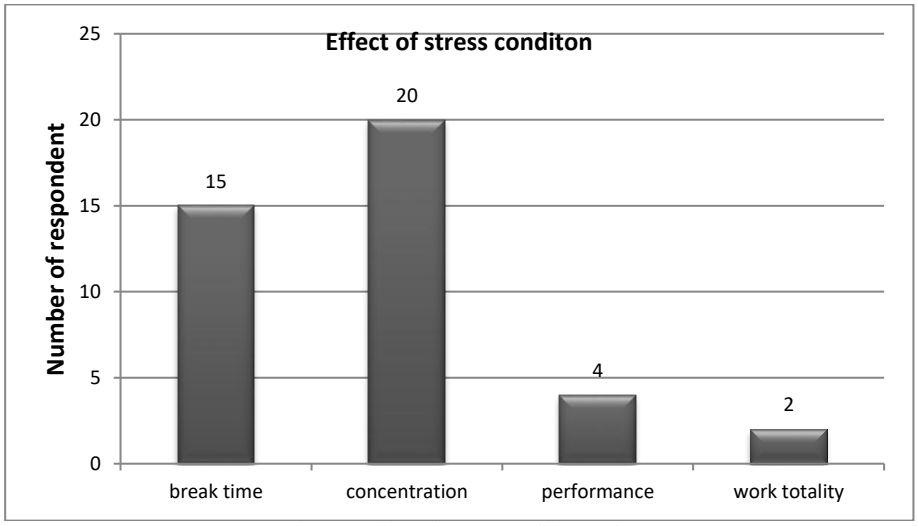

Figure 1 Effect of Stress Condition to the Nurses

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

Methods

Physical workload was measured by polar meter to detect the heart pulse in every 5 minute duration. Detecting heart pulse was chosen by because its procedure simplicity. The measurement was carried out to the 3 nurses each in morning and noon shift. The night shift was not included because prohibition by the institution.

For mental workload, the measurement using NASA-TLX and SWAT 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). Rubio et.al, (2004) and Charlton and O'Brien (2002) suggest to use NASA-TLX method for mental workload measuruement because its high sensitivity

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

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

6	MN / TN	
7	MN / P	
8	MN / E	

14	P / FL	
15	E / FL	

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 2.

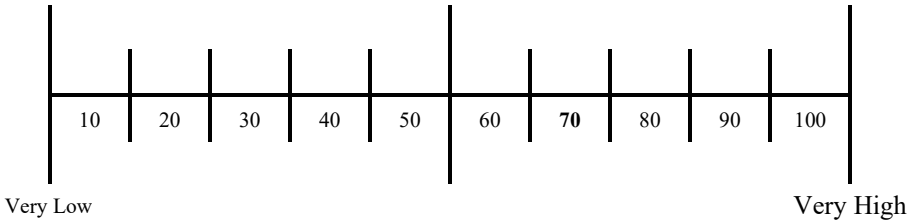

Figure 2 Rating Step

Here are the step 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.

Product = rating x weight factor…….. (1)

2) Calculating WWL (*Weighted Workload*)

WWL = ∑ Product……..……..(2)

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

Mean of WWL = WWL / 15…….(3)

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

Table 2 Categorized Mental Workload

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

In order to complete the subjective mental workload measurement, SWAT was used to reach different aspect measurement. SWAT was developed by Reid and Nygren at *Armstrong Aerospace Medical Research Laboratory* in 1981 with basically conjoint scaling.The descriptor defined was time load, mental effort load, and psychological stress load. There are two steps of SWAT method which are s*cala development* and *event scoring*. The first step is used to prepare the subject with this method especially with descriptor of each factor reflecting their point of view of the load. Meanwhile the next step is the scoring of experienced workload by the subject when execute the activities during the experiment(Reid. Gary B.,1989;9).

The final score shows the magnitude of workload (Reid, Potter & Blesser,1988) :

1. 0 - 40, categorized *Lower Load*
2. 41-60, categorized *Medium Load*
3. 61-100, categorized *Over Load*

Methods chosen for lowering mental workload was brain gym. *Brain Gym is a series of simple exercise developed by* Paul E. Dennison, Dr. Phill and his wife Gail E. Dennison. 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 spiritful, creative and also improving concentration ability.
5) Feeling healthier
6) Improving study and work achievement.

Brain gym practice was chosen by the respondents after participatory ergonomics approach with grup discussion.After three kind of choice offered (yoga, brain gym, and laugh therapy) because its simplicity, most of the respondents chose brain gym.

Result and Discussion

Heart Pulse

The measurement for heart pulse is available in table 3. From the table can be seen that even there was no changing in workload category (still moderate), but there was a slightly changing (reducing) in heartpulse.

Table 3 Heartpulse Measurement Before and After Brain Gym Exercise

		Before			After		
Shift	**Activity**	**Heartpulse**	**Workload Category**	**Workload (Per Shift)**	**Heartpulse**	**Workload Category**	**Workload (Per Shift)**
Morning	Briefing and shif t take over from night to morning	101	Light	Moderate	99	Light	Moderate
	Patient inspection	104	Light		103	Light	
	Exercise monitoring	127	Moderate		121	Moderate	
	Nursing Training	127	Moderate		120	Moderate	
	Giving meal	116	Moderate		113	Moderate	
	Giving medicine	120	Moderate		115	Moderate	
	Recording documentation	114	Moderate		110	Moderate	
	Preparing for shift takeover	113	Moderate		112	Moderate	
Noon	Briefing and shif t take over from morning to noon	101	Light	Moderate	98	Light	Moderate
	Patient inspection	105	Light		101	Light	
	Greeting Doctor Visiting	128	Moderate		122	Moderate	
	Interaction and Communication	129	Moderate		122	Moderate	
	Giving meal	124	Moderate		119	Moderate	
	Giving medicine	125	Moderate		119	Moderate	
	Recording documentation	121	Moderate		118	Moderate	
	Preparing for shift takeover	118	Moderate		115	Moderate	

NASA TLX

Table 4 shows result of NASA TLX measurement before and after brain gym exercise. With the comparison the value, it is explained that there were the reducing the mean of WWL after brain gym practice.

Table 4 NASA TLX Measurement Result Before and After Brain Gym

Faktor	Morning		Noon		Night	
	Before	After	Before	After	Before	After
PN	146,96	133,04	203,04	133,48	137,39	126,09
MN	287,83	165,65	239,57	173,04	195,65	140
TN	196,52	175,65	197,83	168,26	257,83	197,39
PN	166,52	183,48	171,74	190	153,91	193,91
E	146,52	165,22	164,78	175,22	181,3	167,39
FL	213,48	146,96	205,22	147,83	202,61	133,91
mean WWL	**77,19**	**64,67**	**78,81**	**65,85**	**75,25**	**63,91**

SWAT

Table 5 shows result of SWAT measurement before and after brain gym exercise. The effect of brain gym to the nurses can be seen especially ini morning and night shift with changing in workload category per activity as well as per shift.

Table 5 SWAT Measurement Result Before and After Brain Gym

Shift	**Aktivitas Kerja**	**Before**		**After**	
		Workload by activity	**Workload (per shift)**	**Workload by activity**	**Workload (per shift)**
Morning	Briefing and shif t take over from night to morning	Lower Load	Medium Load	Lower Load	Lower Load
	Patient inspection	Medium Load		Lower Load	
	Exercise monitoring	Medium Load		Lower Load	
	Nursing Training	Medium Load		Lower Load	
	Giving meal	Medium Load		Lower Load	
	Giving medicine	Medium Load		Medium Load	
	Recording documentation	Medium Load		Lower Load	
	Preparing for shift takeover	Lower Load		Lower Load	
Noon	Briefing and shif t take over from morning to noon	Medium Load	Medium Load	Lower Load	Medium Load
	Patient inspection	Medium Load		Medium Load	
	Greeting Doctor Visiting	Over Load		Over Load	
	Interaction and Communication	Over Load		Over Load	
	Giving meal	Medium Load		Medium Load	
	Giving medicine	Medium Load		Medium Load	
	Recording documentation	Medium Load		Lower Load	
	Preparing for shift takeover	Lower Load		Lower Load	
Night	Briefing and shif t take over from morning to noon	Lower Load	Medium Load	Lower Load	Lower Load
	Communication with patient	Medium Load		Medium Load	
	Alert to watch out the patient	Medium Load		Lower Load	
	Patient inspection	Medium Load		Lower Load	

Morning greeting	Lower Load		Lower Load	
Giving meal	Lower Load		Lower Load	
Giving medicine	Medium Load		Lower Load	
Preparing for shift takeover	Medium Load		Lower Load	

Conclusion

With comparison three indicators (heartpulse, NASA TLX, SWAT), it can be concluded especially for mental workload that the value can be reduced by simply practice ergonomics intervention like brain gym. This facts was strengthened by nurses testimony that they could increase their concentration and decrease frustration level.

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