

A study on psycho-physiological load of female workers who are engaged in VDT work

Keun Sang Park

Dept. of Industrial Engineering,
College of Technology, Kon-kuk University

ABSTRACT

A series of experiments was carried out while using totally six female subjects in order to evaluate their psycho-physiological variations during their work with VDT both subjectively and objectively compared to those of ordinary office type work and speech communication type work. The results led by the experiment were as follows; the effects with data input work on the subjects from the view point of psychological load was larger than those with the ordinary office work. Oral communication between subjects gave the positive effects upon each subjects to reduce their psychological and mental burden.

Key word : *VDT work, Female worker, Accommodation time, Heart rate, CFF*

1. INTRODUCTION

The application of VDT systems into work places in various kinds of industries has rapidly been spreading in the past few years in proportion to the evolution of micro-electronics [1]. But, on the other hand various fatigue or health problems for VDT workers to be solved have also become serious [2]. Japan industrial Safety Health Association has announced and published and encouraged to adopt the guidelines of occupational Health in VDT operation since 1985 that covers working environment, work practice, Maintenance of VDT equipment and furniture and control of the working environment [3]. Various kinds of improvement for activities VDT work environment have been carrying out among big industries since then. Namely, they are buying new chairs for VDT work, or new VDT-related products with lower noise level and smaller sized, or tables, or glare prevention screen on CRT, preparing wider working area or improving visual environment including increase in illumination level, education of VDT workers in terms of health care and health care system of mental disorders or eye related.

For these reasons, work load on workers caused by the VDT works is changeable depending on the content of tasks they must do. We, therefore, should take those factors into consideration when we plan to build up the optimum working environment for VDT workers. The main purpose of this study is to compare and evaluate psycho-physiological load of VDT workers who are engaged in two different types of work such as data input and information guidance with that of ordinal clerical works.

2. METHODS

All subjects for the experiments consisted of healthy women whose visual sufficient skills in all works used for the series of experiments. The average age of the in total 6 middle-aged women was 34.8 years. 3 of them used spectacles for myopia. As for the contents of the work for the experiments, the following three different kinds of tasks were given to the subjects. (1) Clerical work in which the subject must post the information for the experimental use directly to a ledger. (2) Data input work in which the subject must put the inquiry information into the computer with using keyboard and write the answer displayed on the CRT screen to a ledger. (3) Information offering work in which the subject must receive an experimental inquiry via receiver from a customer, input it into computer to get its correct answer for the customer, that is obtainable from the CRT screen, and respond to the customer. Work intensities between the three experimental conditions were programmed to be equal. The total amount of work and errors were checked by the words written on the ledger and was recorded automatically in the computer memories.

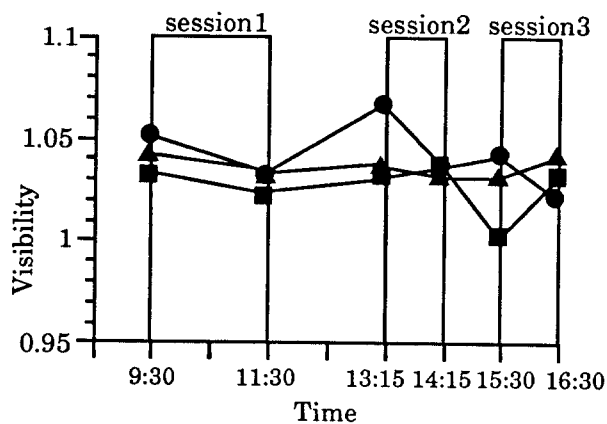
One continuous work time setting up were two hours and an hour. Each subject was requested to perform one work period of two hours work with 105 minutes as lunch rest in the morning and two work periods of one hour work with 75 minutes as rest interval in the afternoon, so that the total CRT display work time per a day was 240 minutes for both experiments with 80 minutes rest. 14 inches conversational mode CRT display with Chinese characters input was used in this study. The luminance of character was 135 cd/m² and of background was approximately 35 cd/m². The contrast between character and background was 3.8:1. The display polarity was classified into the following groups, namely, green letters on dark background and orange letters on dark background for negative picture, and black letters on light background for positive picture. The illuminance on the CRT display was 200 lx and that on the key board was 550 lx.

As to the environmental condition in the laboratory, indirect diffused light by rubber was adopted, thus preventing direct entrance of the light from the light source into the eyes of the subjects. In order to avoid the influence of direct sun light, all the windows of the laboratory were completely covered by thick curtains to block the sun light. The mean temperature and humidities in the laboratory were almost consistent throughout the experiments and 26.3°C, 46.4% at the point of subjects' shoulder, 25.5°C, 48.0% for their knee point respectively. The mean noise levels during their work were 43.4 phone for the clerical work and 45.3 phone for the other two VDT works.

The measurements of visual functions and fatigue of subjects were carried out before the experiment and between the continuous work. They were work intensity, visual acuity, near point and accommodation time (contraction and relaxation time), CFF towards white, red blue color, eye movements, heart rate and motion and time analysis including subsidiary behaviors.

3. RESULT AND DISCUSSION

In visual tasks such as VDT or clerical work, the maintenance of visual control functions for the accurate recognition of information is important. The control function of the near point was measured before and after three different kinds of tasks. Although there appeared only small difference between each tasks, a fall and the variation of control function of the near point were



■ clerical work (N=8) ● data input work (N=8)
▲ information guidance work (N=24)

Fig.1 Variations of the near point distance for the three different works.

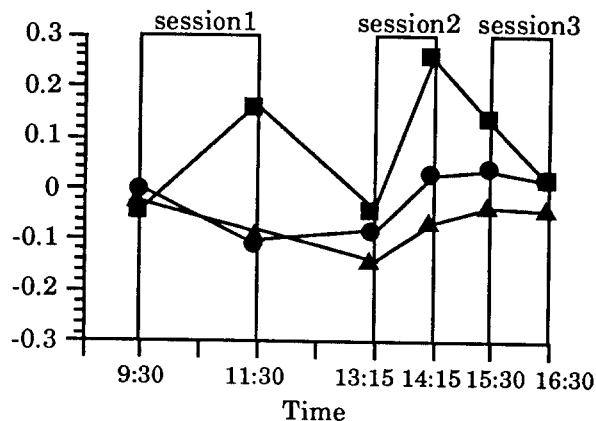
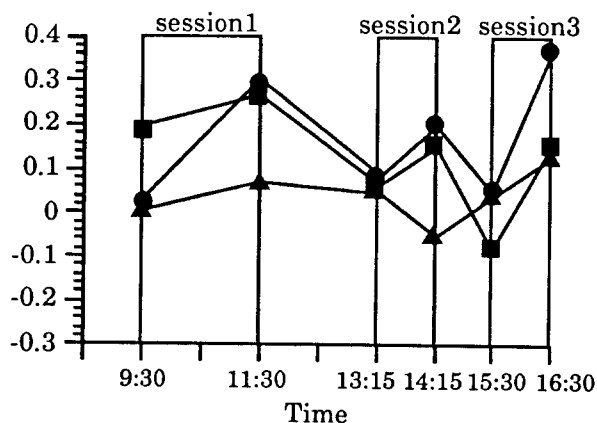


Fig.2 Variations of accommodation time(CT) for the three different works.

the greatest for the data input work, followed by the clerical work and then information offering work. The result of the comparison of three different polarities in terms of the different colors such as the green, orange and the black showed the orange as the least deterioration of visual function (Fig.1). Fig.2 and Fig.3 show the change rate of eye accommodation time (Fig.2 for the contraction time and Fig.3 for the relaxation time) of each type of works. The contraction time and its variation are the biggest in case of clerical work whereas the other two remaining fairly stable through the working times. The relaxation time for the different three conditions shows mostly increase after the working session and decrease after the rest hour.

When the variations of CFF values according to the difference of the work were determined, a



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Fig.3 Variations of accommodation time(RT) for the three different works.

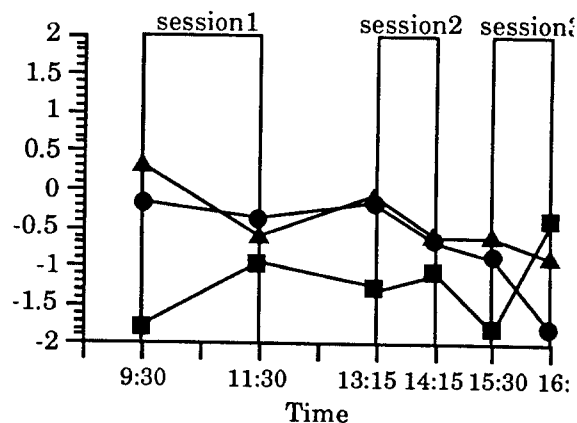


Fig.4 Variations of CFF value for the three different works.

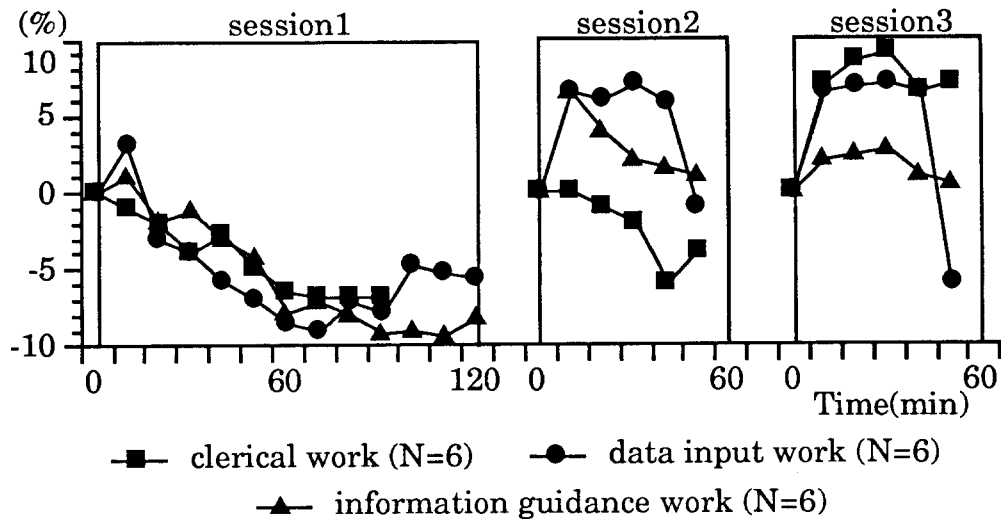


Fig.5 Variations of Heart rate for the three different works.

maximum fall of 2.1% was obtained for the data input work after the first working period that remains almost within the optimum range.

Especially, after the noon recess the maximum rate of increase reached nearly 2.0% indicating a clear resting effect. CFF value for the other two types of work showed gradual deterioration as the work hours proceeding but less values compared to the data input work (Fig.4).

Heart rate measurement is thought to be one of the effective ways of evaluating or working the variation of the psycho-physiological function of workers relating to the autonomic nervous systems. But, on the other hand it varies depending on many factors such as the individuals differences, working hour or time, working postures, body movements and etc.. Despite that, the pattern of heart rate variations for the three different works all showed gradual decrease during the first work, period in morning, then increase at the second and the third work period in the afternoon (Fig.5).

As for the subsidiary body movements for workers who are engaged in three different types of work, the results are as follows; Information guidance work shows the least occurrence with less of upper limb movements compared to the other two works. Data input work shows no subsidiary behaviors except for upper and lower limbs for the first 20 minutes after starting the work. No head movement can be seen in this type of work. Workers who are engaged in the information guidance work show rather frequent occurrence of subsidiary behaviors of all parts of the body from the beginning of the work. In spite that a slight increase of movements can be seen until the end of work they show not much difference between the first and the last period.

Relating to the subjective assessments of fatigue for the workers during their working hours, the results show that the rank orders among three groups of subjective feelings are group 1 as the biggest, group 2 as the second and group 3 as the least in case of clerical work. Due to our experiences, this type can typically be observed among workers who are engaged in neuro-sensory work night work.

Data input work shows the most frequent occurrence of group 1 symptoms, and the same occurrence rate for group 2 and group 3 symptoms. This type is typically seen among the workers who are engaged in muscular and neuro-sensory work. Information guidance work shows the

most frequent occurrence of group 1, then group 3 and finally group 2. This type can be observed among workers who are engaged in either psychological or muscular work. The contents of fatigue feelings observed in the experiments among all works are "Feel heavy in the head", "Become rigid or clumsy in motion", "Get tired in the whole body", and "Give a yawn". "Feel strained in the eyes" is observed particularly in clerical work and data input work when work is finished. "Unable to straighten up in the posture" is the least among information guidance workers whereas the most for clerical workers. "Feel brain hot or muddled" and "Feel thirstily" are frequently observed for data input workers and information guidance work.

5. CONCLUSIONS

In conclusion, (1) work load for data input workers is the highest among the 3 different work, (2) clear rest effect as well as last input can not be observe in case of data input work, (3) clear deterioration for various functions in particularly seen in the end of data input work.

Reasons of various VDT work related disorders are not simple at all but are very complexes. Although recommendations are set and proposed, improvements of VDT work environment have not so advanced.

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