AN EXPERIMENTAL STUDY OF THE PSYCHOLOGICAL EFFECTS OF MICROBREAKS AND BREAKS WITH STRETCHING AND DEEP BREATHING (BSDB) ON HYPERTENSION IN VISUAL DISPLAY TERMINALS OPERATION WORK

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(1998年9月30日　受理)

Owing to the high prevalence of word processor and personal computers, a variety of health disturbances, such as the so-called computer related disorder (CRD), cumulative trauma disorder (CTD), repetitive strain injury (RSI) and the like, are observed in the workplace. The physical symptoms arising from these disturbances are asthenopia, headache, stiff shoulders, and pains in the elbows, wrists, back, waist and other parts of the body. Emotional disturbances, such as anxiety and impatience, psychosomatic disorders such as anorexia nervosa, peptic ulcers, essential hypertension and psychological disorders, such as depression are sometimes observed in these situations.

Microbreaks, a short break with a few seconds' muscular relaxation with the hands on the desk or on the lap every 30 seconds during computer operation work have proved effective in reducing pains around the neck or shoulders (Peper et al., 1994).

Hess (1997) revealed that carpal tunnel syndrome in VDT work are observed chiefly in the early stages and is likely to grow worse due to work related stress which goes unnoticed, especially when the work hours exceed four hours a day. Takahashi (1994) reports that physical symptoms, such as visual dysfunction, aches in the eyes, necks, and arms were seen in VDT operators in a travel agency. In 1994, Peper et al. studied the change of EMG in trapezius observed during three kinds of operations: those with microbreaks followed by psychological stress, ordinary ones, and images of stress only, and concluded that a microbreak alone failured to decrease the level of EMG, and psychological stress reduction in both business and family life appears to play more impotant role than microbreaks. Peper et al. (1997) also suggested that breaks may be important, as a survey of university employees complaining of repetitive strain injury revealed that 85% of them had no breaks in their VDT operation work.

Changes in EMG roading in trapezius and deltoid muscular during computer operation work revealed that operators who were unaware of their own muscular tension tend to suffer from disturbances such as pain (Peper et al., 1997; Harvey & Peper, 1997). In addition to ergonomic

arrangement, the learning of an adequate combination of breaks and operation is important (Taylor, 1993).

A follow up study of 12 months post training the effects of coping skills on university employees with symptoms resulting from VDT work, found training still effective in 44% of those surveyed. The effectveness was as; follows microbreaks, 37.5%; ergonomic coping, 25%; relaxation, 25%; breathing, 19% (Shumay, 1997). Lee (1991) compared the efficacies of 123 kinds of exercises for alleviating the tension of a variety of skeletal muscles in VDT operation work, demonstrating that musculer stretching and relaxation were effective on the back, legs, neck, shoulders, and arms with exercises on shoulders and arms proving to be particularly effective.

The literature mentioned above suggests that microbreaks can affect a variety of aspects of VDT operation work. The purpose of this study was (1) to assess the differences in the physiological changes brought about by two kinds of breaks, and (2) to compare the differences of the effects between microbreaks and breaks with stretching and deep breathing (BSDB).

STUDY I

The purpose of Study I was to survey the duration of the experience, the combination of operation and breaks, and the physical complaints in VDT operation work.

Methods

Subjects

157 freshmen (99 males and 58 females) of a university were used. All participants were computer users in classroom and / or at home. The mean age was 18.7 years (range 18 to 22).

Procedure

The questionnaire contained inquires concerning 11 physical complaints: headaches, stiff shoulders, eye strain, pain in the back, arms, waist, neck, hands, elbows, fingers, wrists, as well as questions concerning: sex, age, duration of computer use, time used per day, take breaks or not, length of breaks and interval time of breaks. Ss were required to answer each item in one of 2 ways: "yes" or "no".

Results

The mean duration of the Ss' experiences in VDT operation work was 14.6 months. The mean

time of operation was 56.6 minutes a day. Ss had a break with an average time of 14 minutes for every 51.7 minutes of operation. Table 1 shows the results of the chi-square test for breaks before and after their work. Ss' self-rated breaks were found to have no significant effect on 11 physical complaints ; headache (χ^2 = 0.11), stiff shoulder (χ^2 = 0.09), eye strain (χ^2 = 0.07), pain in back (χ^2 = 0.24), pain in arm (χ^2 = 0.10), pain in waist (χ^2 = 0.04), pain in neck (χ^2 = 0.23), pain in hands (χ^2 = 0.07), pain in elbows (χ^2 = 1.22), pain in fingers (χ^2 = 0.22), painin wrists (χ^2 = 0.06), Clearly further specified and controlled ways of taking breaks were needed for decreasing physical complaints.

Table 1 Results of Chi-square Test of Physical Complaints in VDT Operation Work

Physical complaints	with breaks n	with no breaks n	χ^2 score
Headaches	46	30	0.11 n. s.
Stiff shoulders	60	40	0.09 n. s.
Eye strain	77	47	0.07 n. s.
Pain in back	45	31	0.24 n. s.
Pain in arms	31	21	0.10 n. s.
Pain in waist	58	35	0.04 n. s.
Pain in neck	69	41	0.23 n. s.
Pain in hands	29	19	0.07 n. s.
Pain in elbows	9	9	1.22 n. s.
Pain in fingers	19	10	0.22 n. s.
Pain in wrists	7	5	0.06 n. s.

STUDY Ⅱ

The purpose of Study Ⅱ was to examine the differences of physiological changes (diastolic blood pressure : DBP, systolic blood pressure : SBP, and heart rate : HR) resulting from two kinds of specified breaks, microbreaks and breaks with stretch and deep breathing (BSDB), and compare the differences of the effects between the two.

Method

Subjects

24 freshmen, sophomores, and juniors (9 males and 15 females) were chosen at random from university. All participants were computer users as in Study Ⅰ. The mean age was 20.3 years (range 18 to 22).

Procedure

Ss were divided into three groups at random : Experimental group 1, consisted of 7 Ss (2 male and 5 female), the mean age was 19.6 years. Experimental group 2, also consisted of 7 Ss (5 male and 2 female), with a mean age of 20.8 years. The Control group had 10 Ss (3 male and. 7 female) with a mean age of 20.5 years. Each group of Ss were given the following instruction by experimenter, "Please continue to enter the following numeric data by operating the keyboard until my signal to stop".

1) Exp.gr. 1 : "Do 30 minutes' of entery, taking 1 minute of BSDB every 10 minutes. During the BSDB ; Stand up, shrug your shoulders backward and forward in a circular motion 6 times Keep your arms as straight as possible and raise them up over the head 3 times while breathing deeply".
2) Exp. gr 2 : "Do 30 minutes' data of entry, take few seconds' microbreak with your hands resting on the desk every 30 seconds.
3) Cont. gr. : Ss performed 30 minutes' continuous entry data without breaks or exercise.

Ss entered digits into a personal computer. Physiological changes (diastolic blood pressure, systolic blood pressure, heart rate) before and after the operation for all groups were recorded with a digital type Automated Sphygomonanometer (Omron, HEM–90 P).

Results

Two factor analysis of variance (3 groups among : microbreak, BSDB, control × 2 groups within : pre–, post–) was made. In the systolic blood pressure (SBP), the interaction effect was found to be significant ($F(2, 21) = 7.54$, $p < .05$). the SBP of Experimental group 1 (BSDB) was significantly lower than that of the Control group ($F = 0.0018$, $p < .05$) and the SBP of Experimental group 2 (microbreaks), was also significantly lower than that of the Control group ($F = 0.0092$, $p < .05$) as shown in Fig 1. No significant interaction or main effects, however, were found in the diastolic blood pressure (DBP) ($F(2, 21) = 1.99$, n. s.) and the HR ($F(2, 21) = 0.44$, n. s.)

Table 2 Physiological Changes in Breaks

	Ex. Gr. 1		Ex. Gr. 2		Cont. Gr.	
	Pre	Post	Pre	Post	Pre	Post
DBP mm / Hg	73.7	67.1	76.7	80.3	63.0	78.3
SBP mm / Hg	115.1	108.1	132.0	128.4	105.0	115.5
HR bpm	75.4	72.8	72.6	73.2	65.9	65.7

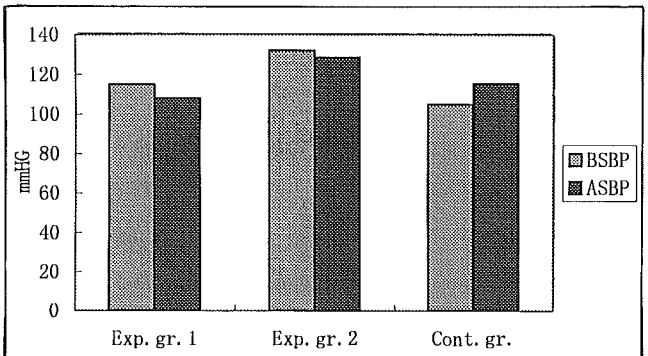

Fig. 1 Changes of Systolic Blood Pressure
BSBP : systolic blood pressure before work
ASBP : systolic blood pressure after work

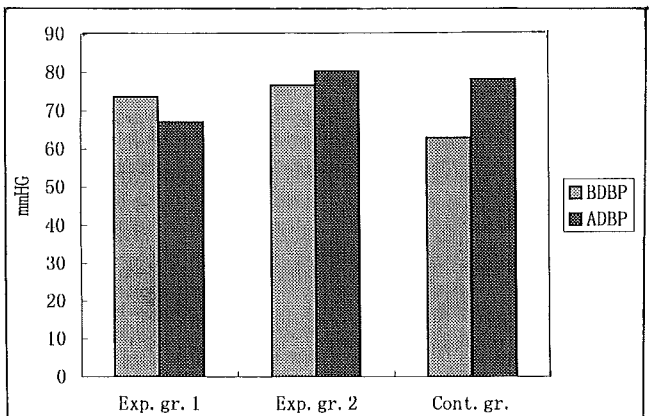

Fig. 2 Changes of Diastolic Blood Pressure
BDBP : diastolic blood pressure before work
ADBP : diastolic blood pressure after work

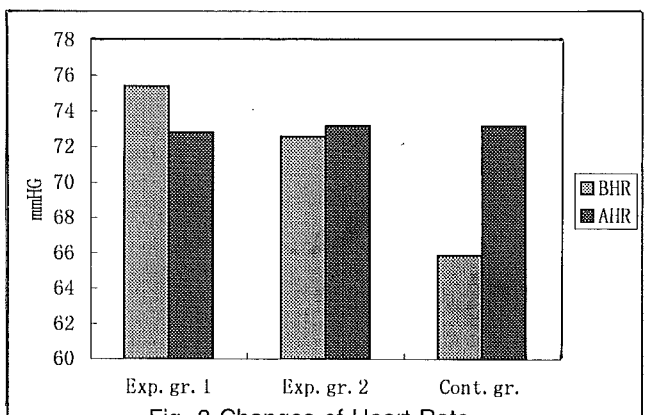

Fig. 3 Changes of Heart Rate
BHR : heart rate before work
AHR : heart rate after work

(Fig. 2 and 3).

Discussion

The physical complains of the subjects from study one are shown in Table 1. These mostly originated from muscle tension. And taking was not found to relax the muscles. Computer users had were found to take breaks every 51.7 minutes. The authors feel that computer users must have awareness of their own physical status during computer operation and mouse use before complains arise, and should learn appropriate work and rest patterns. Peper et al. (1997) suggested that breaks without exerecise, microbreaks or relaxation and breathing are not sufficient to release muscle tension.

In study Ⅱ, results of the Experimental Group 1 (BSDB) showed that SBP was significantly decreased following computer work, DBP and HR were also decreased but not significant. This result supports the Peper' study and research by Lee (1991) that breaks with stretching can reduce muscle tension. Result from Experimental Group 2 (microbreaks) show that the SBP was also significantly decreased following work. but that the DBP and HR were not decreased. This result supports Shumay' study (Shumy, 1997).

Ergonomics and work style are important to prevent CRI, CTD and RSI. However work and rest patterns and adequate rest methods are also sufficient to reduce the risk of injury. These result suggest that BSDB and Microbreaks are effective in reducing physical complaints such as muscle tension which occurs during work.

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(Received September 30, 1998)

A survey of the self-rated breaks and physical complaints of undergraduate computer users in VDT operation work showed no significant relations between the two (Study Ⅰ), and further specified ways of breaks for physical complaints were needed. The subsequent experimental study (Study Ⅱ) of the effects of microbreaks (Peper, 1992) and breaks with stretching and deep breathing (BSDB) on physical and psychophysiological conditions revealed that both proved effective in decreasing systolic blood pressure (SBP) but not in diastolic blood pressure (DBP).