

Effects of Exercise Experienced in the Life Stages on Climacteric Symptoms for Females

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Abstract The purpose of this study is to investigate the effects of exercise experienced in the life stages on climacteric symptoms for females after menopause. Four-hundred and eight postmenopausal women completed a questionnaire. The results were as follows: (1) Mean age at menopause \pm standard deviation was 50.1 ± 0.5 and did not show a significant relationship with the degree of exercise in the life stages. (2) The degree of climacteric symptoms had a significant relationship, or a tendency toward a significant relationship, with the degree of exercise in and after the 40's; and the greater the degree of exercise, the lesser the degree of climacteric symptoms. (3) Kupperman's index was found to be, or tended to be, significantly related to the degree of exercise in and after the 30's. Those who exercised heavily in their 30's showed a significantly lower Kupperman's index. Those who answered that they had exercised "moderately" in their "40's to menopause" and "menopause to 60 years old" tended to have the lowest index. (4) Exercise experience in the life stages was negatively correlated, in particular, to psychosomatic symptoms among the 3 climacteric symptom categories. This negative correlation tended to be higher in those who answered that they had done "less exercise" in and after their 30's. (5) A significant relationship was noted between the degree of exercise in the 30's and "weakness" in Kupperman's index, and between exercise in and after the 40's and "nervousness" and "melancholia". Therefore, it is suggested that exercising "moderately" from the subjective viewpoint in the climacteric period may alleviate psychosomatic symptoms. *J Physiol Anthropol* 19 (4): 181-189, 2000 <http://www.jstage.jst.go.jp/en/>

Keywords: exercise, life stage, climacteric symptom

Introduction

At present, the average life span of Japanese women is 84.01 years (Ministry of Health and Welfare, 1999). It has been anticipated that by 2000 about 48% of the female

population in Japan will have reached age 65 or older (Sasaki and Iwasaki, 1990). However, because the age for menopause is fixed even if the life span is extended, the population layer called the climacteric generation is forecast to surely increase in the future. To help this generation maintain health and prevent diseases, great expectations are placed on exercise. When considering the quality of life (QOL) for middle-aged and older women, exercise is likely to become increasingly important.

During the climacteric period, which is defined as "the stage of transition from the reproductive period to the sterile period", the so-called climacteric disorder syndrome appears (Japan Society of Obstetrics and Gynecology, 1997). The main complaint of this syndrome is unidentified complaints with primarily autonomic imbalance, regardless of organic changes. It is thought that the climacteric disorder occurs when the endocrine circumstantial change that accompanies the aging of the ovary is combined with psychological factors, which are based on the individual's personality and the social and cultural environment (Satou et al., 1992).

Moderate exercise has been known to be effective in alleviating and preventing postmenopausal osteoporosis (Sinaki and Offord, 1988) and heart disease (Bovens et al., 1993). However, there have been very few studies about the influence of exercise on climacteric symptoms (Kawakubo and Motoki, 1995; Sindo et al., 1976), and especially few in relation to the psychological effects of exercise (Slaven and Lee, 1994). At the same time, when examining women's sports activities, there is a necessity to consider the life cycle peculiar to women, because sports participation by women is strongly related to their roles in the life stages, such as delivery, child-rearing and so on (Ezashi, 1988; Verhoef and Love, 1992).

Generally, the effect of exercise often develops with its continuation. For example, women who have exercise experience in the past tend to be higher in postmenopausal bone mineral density than those who do not have such experience (Watanabe et al., 1992). Moreover, it has been shown that climacteric symptoms were lower in those experiencing sports activities in their 30's (Kouno, 1998).

Thus, there is a possibility that not only present exercise but a history of exercise in the life stages is related to climacteric symptoms. Therefore, the purpose of this study was to examine postmenopausal women as far as (1) whether exercise experience in the life stages influences menopausal age, (2) whether exercise experience in the life stages reduces climacteric symptoms, and (3) which climacteric symptoms are influenced by exercise experience in the life stages.

Method

Subjects and procedure

The subjects were 408 postmenopausal women aged from the 40's to the 60's and living in Fukuoka Prefecture, Japan. Table 1 shows the number of subjects. The survey was conducted by a questionnaire method. The questionnaire consisted of three items: 1) age, 2) exercise experience in five life stages (the teens (10-19), the 20's, the 30's, the 40's to menopause, and menopause to 60), and 3) the climacteric symptoms and the degree to which the subject felt them. For item 2), the life stages were divided into approximately 10-year ranges. The average menarche age in Japan is 11-12 (Hinobayasi, 1990; Moriyama, 1982); the sports participation of women is affected by life events such as marriage, pregnancy, delivery, and child-rearing (Ezashi, 1988); and the normal menopausal age is 43-54 (Japan Society of Obstetrics and Gynecology, 1997) while climacteric symptoms are affected by changes in menopausal condition, i.e., the activity of the endocrine system in relation to female genital function. Considering that the question of exercise experience in these life stages asked about the past, three choices of answers were prepared for the degree of exercise: "heavy exercise", "moderate exercise", and "less exercise". Moreover, the subjects who chose "heavy exercise" and "moderate exercise" were asked about the intensity, duration and frequency of exercise using the activity index (Sharkey, 1990) (Table 2). The activity index was made by Sharkey to evaluate a daily physical activity level. Exercise volume was calculated by (intensity) \times (duration) \times (frequency) of exercise, and was divided into 3 classes of 0-14, 15-49 and 50-100, using the classification by Hashimoto (1995). Item 3), and the degree of climacteric symptoms had four choices of answers: "none", "slight", "moderate" and "severe". Moreover, to grasp each symptom in detail, the subjects who had climacteric symptoms were further questioned using Kupperman's menopausal index (Kupperman et al., 1953). Kupperman's index is shown in Table 3. With this index, each of the various climacteric symptoms is expressed in scores and divided broadly into 3 categories: vasomotor symptoms, motor symptoms and psychosomatic symptoms (Koyama, 1994). For the degrees of climacteric symptoms, the scores were 0 for "none", 1 for "slight", 2 for "moderate"

Table 1 Number of subjects

Age (years)	number
40-44	3
45-49	10
50-54	61
55-59	107
60-64	133
65-69	94
Total	408

Table 2 The activity index

	Score	Daily activity
Intensity	④	Heavy breathing and perspiration
	③	Moderately heavy
	②	Moderate
	①	Light
Duration	⑤	Over 90 min.
	④	60 to 90 min.
	③	30 to 60 min.
	②	15 to 30 min.
	①	Under 15 min.
Frequency	⑤	Daily or almost daily
	④	3 to 4 times a week
	③	1 to 2 times a week
	②	Few times a month
	①	Less than once a month
Volume = Intensity score \times Duration score \times Frequency score		
	③	50 to 100
	②	15 to 49
	①	under 14

and 3 for "marked". The scores were multiplied by the coefficient and the totals were added. The usual practice is that a sum of 15 or more means a climacteric disorder is probable (Suzuki and Abe, 1971). As the objective evaluation of the degrees of symptoms is made possible (Mesaki, 1992), Kupperman's index is widely used for obstetrical and gynecological diagnosis and treatment (Akiyama, 1995).

Statistics

In statistics using the Spearman rank correlation coefficient, significant positive correlations were confirmed between the degree of exercise and exercise intensity, duration and frequency reported by the subjects. The relationships between the degree of climacteric symptoms and exercise experience in the life stages were examined using the χ^2 test. The relationships between exercise experience in the life stages and menopausal age, and between exercise experience in the life stages and Kupperman's index were examined using one-way analysis of variance. We adopted a level of significance of less than 0.05 and also less than 0.1 as showing a tendency of significance.

Table 3 Kupperman's index

Symptom	3 categories of symptom	Factor	Severity	Numerical conversion
(1) Vasomotor	Vasomotor	4	none=0	Factor × Severity
(2) Paresthesia	Psychosomatic	2	slight=1	
(3) Insomnia	Psychosomatic	2	moderate=2	
(4) Nervousness	Psychosomatic	2	marked=3	
(5) Melancholia	Psychosomatic	1		
(6) Vertigo	Psychosomatic	1		
(7) Weakness (Fatigue)	Psychosomatic	1		
(8) Arthralgia and Myalgia	Motorial	1		
(9) Headaches	Psychosomatic	1		
(10) Palpitation	Vasomotor	1		
(11) Formication	Psychosomatic	1		
				Sum

Results

Exercise experience in the life stages and menopausal age

The menopausal age of the subjects was 50.1 ± 0.5 and showed no significant relationship with exercise experience in any of the life stages.

Exercise experience in the life stages and climacteric symptoms

Table 4 shows the relationship between exercise experience in the life stages and the degree of the climacteric symptoms. The degree of climacteric symptoms was significantly related to the degree of exercise in "menopause to 60 years old" and showed a tendency toward a significant relationship with the degree of exercise in "the 40's to menopause". This also showed a tendency toward a significant relationship with volume of exercise in "the 40's to menopause" and "menopause to 60 years old", and a significant relationship with duration of exercise in "the 40's to menopause". Figure 1 depicts the details of the relationship between degree of exercise in "the 40's to menopause" and "menopause to 60 years old" and the degree of climacteric symptoms. In both life stages, the higher the degree of exercise, the lower the degree of climacteric symptoms. However, among those who answered having exercised "heavily", many felt "severe" climacteric symptoms, and it was lowest in those who answered having "exercised moderately". Table 5 shows the relationship between exercise experience in the life stages and Kupperman's index. A significant relationship or a tendency toward a significant relationship was found between Kupperman's index and degree of exercise in and after the 30's. Figure 2 shows the details of these relationships. In "the 30's", the higher the degree of exercise, the lower the Kupperman's index. However, in "the 40's to menopause" and "menopause to 60 years old", those who reported having exercised "moderately"

tended to show the lowest index. Table 6 shows the relationship between exercise experience in the life stages and the three symptom categories in Kupperman's index. As for the vasomotor symptoms, a tendency toward a significant relationship was found with degree of exercise in "the 20's" and "menopause to 60 years old", and with exercise intensity and frequency during "the 30's". For the psychosomatic symptoms, a tendency toward a significant relationship was shown with the degree of exercise in and after the 30's. A significant relationship was also recognized with the duration of exercise in and after the 40's. Figure 3 shows the details of the relationship between the degree of exercise in and after the 30's and the psychosomatic symptoms, in which a relationship was noted. Those who had a higher degree of exercise in "the 30's" showed a lower score. However, the subjects who answered having exercised "moderately" in and after the 40's showed a tendency to score the lowest.

Table 7 shows the relationship between the degree of exercise in the life stages and the 11 symptoms in Kupperman's index. The degree of exercise in the life stages showed either a significant relationship or a tendency toward a significant relationship in the symptoms of "paresthesia", "insomnia", "nervousness", "melancholia", "weakness" and "palpitation". Figure 4 shows the details of these significant relationships. As for the relationship between the degree of exercise in "the 30's" and "weakness," those who had a higher degree of exercise showed a lower degree of the symptom. However, for those who exercised "moderately" in and after the 40's, the symptom degree tended to be low.

Discussion

Exercise experience in the life stages and menopausal age

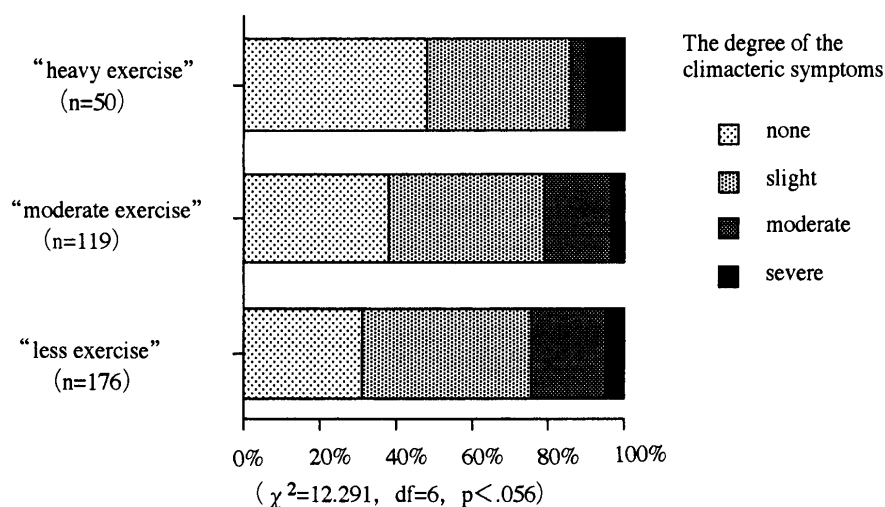
The menopause age (50.1 ± 0.5) in this study agreed with that of the previous study (Ichido et al., 1990). Unlike the menarche age, which is becoming younger, the

Table 4 Relationship between exercise experience in the life stages and the degree of the climacteric symptoms

Life stage	n*	Degree of exercise	Volume	Intensity	Duration	Frequency
The teens (10-19)	405					
The 20's	377					
The 30's	342					
The 40's to menopause	345	†	†		*	
Menopause to 60 years old	360	*	†			

†p<.10, *p<.05. *n means number of subjects who could complete questionnaire and use in the statistical treatment.

The degree of exercise in "the 40's to menopause"



The degree of exercise in "menopause to 60 years old"

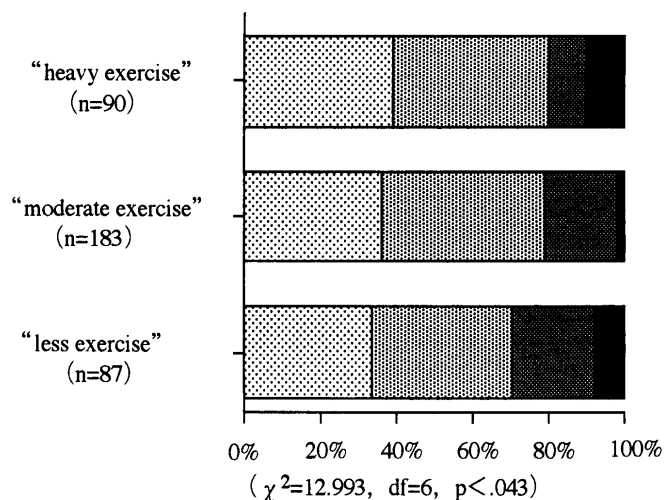


Fig. 1 Details of the relationship between the degree of exercise in "the 40's to menopause" and "menopause to 60 years old" and the degree of climacteric symptoms.

menopause age is almost constant irrespective of differences in the times, the race, or the country (Frish et al., 1981; Ichido et al., 1990), but is slightly affected by life habits such as smoking and by the living environment (Satou et al., 1992). Shindo et al. (1976) reported that continual low-intensity exercise helped recovery of the

regular menstrual cycle and the normal menstrual blood loss for those with irregularity of menstruation or menopause. Exercise may also exhibit some effect on menopause age. In this study, however, the exercise experiences in the previous life stages did not relate significantly with menopause age.

Table 5 Relationship between exercise experience in the life stages and Kupperman's index

Life stage	n*	Degree of exercise	Volume	Intensity	Duration	Frequency
The teens (10-19)	179					
The 20's	170			†		
The 30's	152	*				
The 40's to menopause	159	†			†	
Menopause to 60 years old	161	†				

†p<.10, *p<.05. *n means number of subjects who could complete questionnaire and use in the statistical treatment.

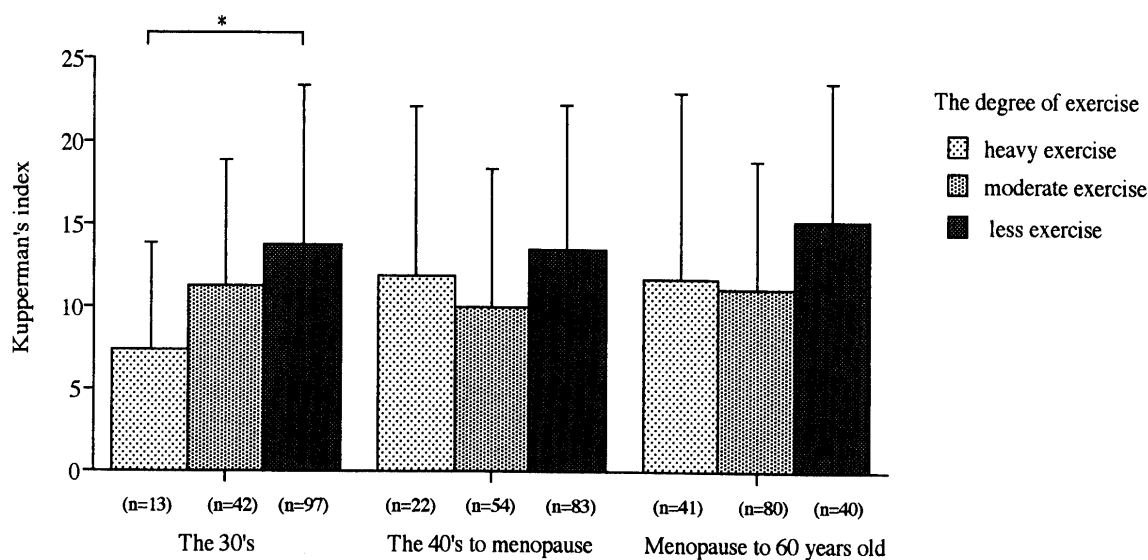


Fig. 2 Details of the relationship between the degree of exercise in and after 30's and Kupperman's index (*: p<0.05).

Exercise experience in the life stages and climacteric symptoms

In this study, the degree of climacteric symptoms did not significantly correlate with the degree of exercise during younger ages. So far, the bulk of research has focused on the teens in investigating the relationship of exercise in the life stages of women and the menses condition. For example, a significant relationship is well known between the degree of exercise in the teens and menarche age (Mesaki et al., 1984; Mesaki, 1992), and between hard training in the teens and the incidence of amenorrhea or dysmenorrhea (Mesaki et al., 1989). However, undergoing hard training in the teens seems not to have much influence on pregnancy and delivery in the 20's and the 30's (Iwata and Kubota, 1988; Sasaki and Iwasaki, 1990). Therefore, there is only a slight possibility of exercise experience in adolescence having much influence on the reproductive function afterwards, and it would be reasonable to assume that the current level of exercise plays a great role.

On the other hand, the degree of climacteric symptoms presented a relationship with the degree of exercise in and after the 40's, and was low in those who were exercising. For Kupperman's index, a relationship

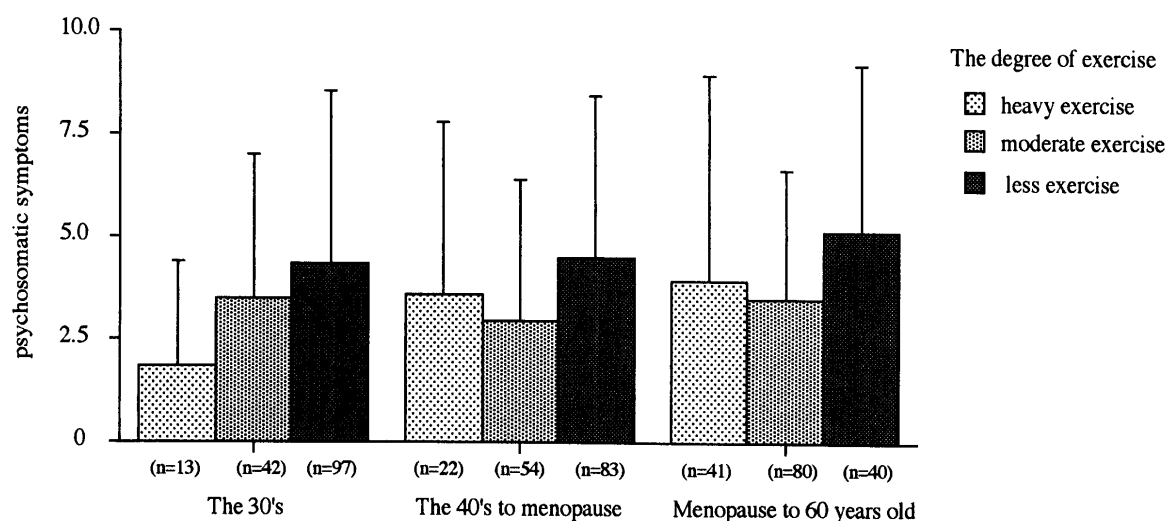
was also noted with the degree of exercise in and after the 30's, with a low score for those who reported having exercised "moderately". Thus, the exercise that showed a significant relationship with climacteric symptoms was that experienced in and after the 30's. Generally, climacteric symptoms occur roughly during the decade around menopause, most likely at 42 to 55 years of age (Mori, 1984). This indicated the possibility that exercise experience from younger than such an age could also be related to the alleviation of climacteric symptoms.

Shindo et al. (1976) and Kawakubo and Motoki (1995) reported their programs in which middle-aged women who had climacteric symptoms did low-intensity exercise about three times per week for 10 to 12 weeks. In both reports, Kupperman's index declined and improved the vasomotor symptoms. It is known that hot flushes, the typical menopausal vasomotor symptom, are affected by changes in activation of the neurotransmitter substance (β -endorphin) of the hypothalamus (Schurz et al., 1988; Tepper et al., 1987) and that continual exercise influences such activation (Cumming and Wheeler, 1987). Continual exercise has the possibility of improving vasomotor symptoms (Hammer et al., 1990). For psychosomatic symptoms, our study indicated that those who did not

Table 6 Relationship between exercise experience in the life stages and the three symptom categories in Kupperman's index

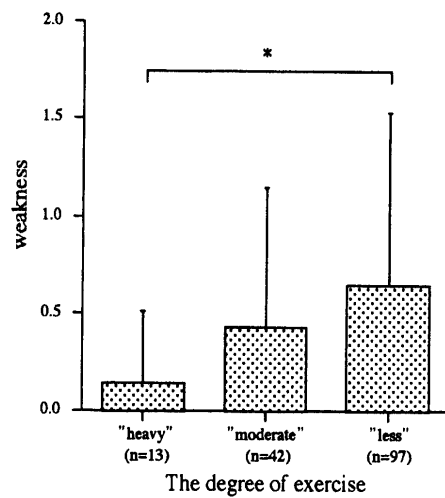
Category	Life stage	n	Degree of exercise	Volume	Intensity	Duration	Frequency
Vasomotor	The teens (10-19)	179					
	The 20's	170	†				
	The 30's	152			†		†
	The 40's to menopause	159					
	Menopause to 60 years old	161	†				
Motorial	The teens (10-19)	179					
	The 20's	170					
	The 30's	152					
	The 40's to menopause	159					
	Menopause to 60 years old	161					
Psychosomatic	The teens (10-19)	179					
	The 20's	170					
	The 30's	152	†				
	The 40's to menopause	159	†			*	
	Menopause to 60 years old	161	†			*	

†p<.10, *p<.05.

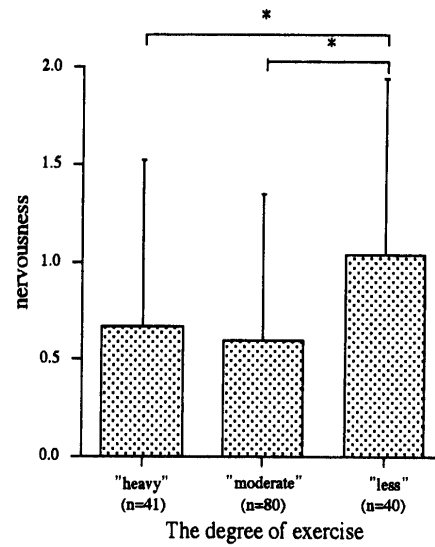
**Fig. 3** Details of the relationship between the degree of exercise in and after the 30's and the psychosomatic symptoms.**Table 7** Relationship between the degree of exercise in the life stages and the 11 symptoms in Kupperman's index

Symptom	Category	The teens (10-19) (n=179)	The 20's (n=170)	The 30's (n=152)	The 40's to menopause (n=159)	Menopause to 60 years old (n=161)
(1) Vasomotor	Vasomotor					
(2) Paresthesia	Psychosomatic	†				
(3) Insomnia	Psychosomatic			†		
(4) Nervousness	Psychosomatic				*	*
(5) Melancholia	Psychosomatic				*	*
(6) Vertigo	Psychosomatic					
(7) Weakness (Fatigue)	Psychosomatic			*		
(8) Arthralgia and Myalgia	Motorial					
(9) Headaches	Psychosomatic					
(10) Palpitation	Vasomotor					†
(11) Formication	Psychosomatic					

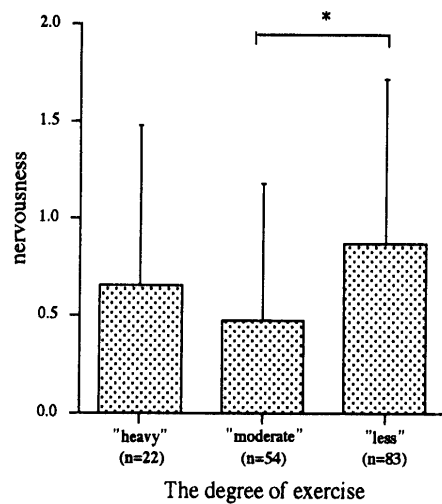
†p<.10, *p<.05.



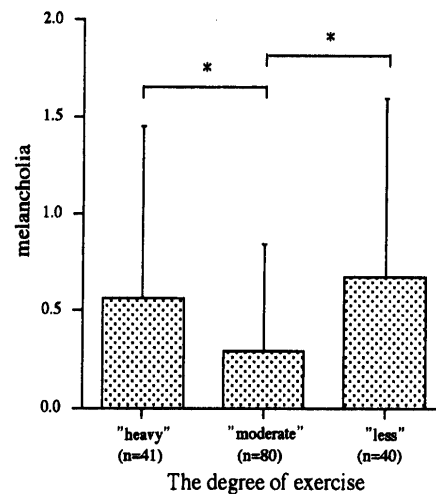
a) Exercise in "the 30's" and "weakness"



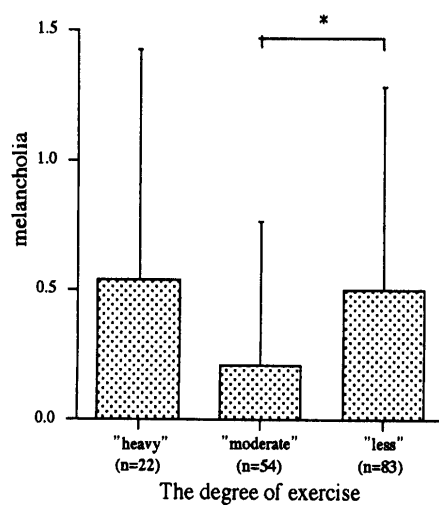
d) Exercise in "menopause to 60 years old" and "nervousness"



b) Exercise in "the 40's to menopause" and "nervousness"



e) Exercise in "menopause to 60 years old" and "melancholia"



c) Exercise in "the 40's to menopause" and "melancholia"

Fig. 4 Details of the relationship between the degree of exercise in life stages and 11 symptoms (*: $p < 0.05$).

exercise in and after their 30's had a tendency toward a higher degree than those who had exercised during those periods. The degrees of the symptoms of "weakness", "nervousness" and "melancholia", in particular, were higher with the former, and the lowest scores for these symptoms were marked by those having exercised moderately. The psychological and social/cultural factors are considered to greatly influence the crisis of psychosomatic symptoms (Ushiroyama, 1997). That is, the climacteric period would often be a major turning point in life for women.

This generation also sustains severe mental stress from such circumstances as changes in family life, including the husband's living away from home due to work and the children's independence, the shock of the loss of the reproductive function and the anxiety about aging. In addition, the social stress exerted on women is increasing as they assume more active roles in society (Ushiroyama, 1997).

It is known that exercise promotes resistance to stress, depression and anxiety (Blumenthal et al., 1982; Harris, 1987). Tokunaga et al. (1995) reported that continual exercise improves the psychological ability to cope with daily life. Supposedly, these benefits occur because exercise triggers the secretion of hormones (such as monoamine and endorphin) through the function of the autonomic nervous system, and because exercise for recreation may promote a sense of value and meaning as the individual grows toward self-efficacy (Sugihara, 1990). However, these have not been clarified yet. Indeed, it is thought that psychological and physiological climacteric symptoms are caused by changes in hormone secretion due to menopause; and changes in the endocrine environment (the lack of androgen, in particular) bring about psychosomatic symptoms such as feelings of misgiving, nervousness and sleeplessness (Morioka and Sagara, 1997). However, although all women in the climacteric period undergo the endocrine circumstantial change, not all of them develop climacteric symptoms. Actually, some have a sense of fulfillment at having finished their duties and child rearing, and enjoy life without feeling symptoms. Therefore, there is a possibility that environmental and personality factors might have stronger influences than the hormonal changes (Greene and Cooke, 1980). Consequently, it is thought that the influences of exercise on climacteric symptoms appeared conspicuously in the psychosomatic symptoms. On the other hand, as to the reason for low climacteric symptom with subjects who exercised moderately, it was thought that the moderate exercise might be easy to practice and effective in preventing lifestyle-related diseases. Most of the subjects in this study were exercising at a health or sports club. It was thought that exercising and belonging to a club might increase confidence in one's own physical fitness and help establish human relationships. Consequently, these women would achieve psychological fulfillment, which might

reduce their climacteric symptoms.

Thus, our study has elucidated that exercise in the climacteric period influences psychosomatic symptoms in addition to vasomotor symptoms. Moreover, its effect on diseases, which is already known, exercise of medium intensity according to a subjective perspective lowered the degree of climacteric symptoms.

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