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An Intervention Study of a Health Promotion Program on the Physical, Mental and Dietetic Health Status of Middle-Aged and Elderly Women

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Abstract

Purpose: To examine the effect of a walking exercise-centered health promotion program for middle-aged and elderly women who participated in the program between April 1999 and February 2002, the participants' pre- and after medical data were assessed and compared.

Method: One hundred and fifty-four women living in Tokyo who attended the health promotion programs and completed the health status assessment were recruited as subjects of this study. (Their (n=103) average age, height, body mass and BMI were 55.6±7.9 yrs (40-65 yrs), 153.1±5.6cm, 53.9±7.1kg, and 23.0±3.3kg/m^2 (mean±SD), respectively.) One program lasted 6 months; participants met once a week for a 2-hour session in the afternoons, resulting in 15 sessions in total. Each session included both aerobic and anaerobic exercises, lectures on preventing lifestyle-related diseases together with arranged meal trials. Before and after the program, health status assessments were measured. The assessment consisted of general medical records, medical history, questionnaire regarding exercise and relaxation activities, details of dietary intake based on food records, eating behavior, complaints (CMI) and physical activity levels.

Results: Upon completion of the program

1) Values of serum total cholesterol, systolic and diastolic blood pressure decreased. Body mass and BMI values also decreased.
2) Total daily energy expenditures increased.
3) Major nutrient intakes, density of nutrients and eating behavior were improved. The daily salt intakes decreased.
4) Stress scores decreased, the subjects with higher scores at the beginning of the program markedly improved. Regarding CMI, there were improvements in categories II～IV. Participants with neurotic personality traits were mitigated.

Conclusions: From the above results we concluded that the walking exercise-centered health promotion programs were effective in keeping desirable lifestyles in middle-aged and elderly women. These suggest that in order to maintain and/or improve the QOL of middle-aged and elderly women, good dietary habits and psychological support are essential. Further long-term investigations of a larger population (middle-aged to elderly) are necessary.

Key words: Middle-aged women, Elderly women, Health promotion, Health status assessments, Walking exercise

Background

The health status measurement and health promotion programs for residents were not so common when 'S Medical Center' started the health promotion projects twenty-five years ago. These health promotion projects of 'S Medical Center' were developed for the regional inhabitants. Nowadays more comprehensive educational programs are supplied to meet the demand.

1. Dietary education in health promotion

Two R.D.s are in charge of dietary education at 'S Medical Center'. The dietary education is composed of the nutritional assessment and the dietary counseling. They operate 'health status measurements' (approx. 2,500 people/year), 'healthy diet programs' (20 times/year), 'walking and health programs' (16 times/program, twice a year), and 'weight control programs' (16 times/program, twice a year).

2. Needs assessment for participants

In the early stage of the study, the nutritional assessment was done on each individual. However, people with no apparent health problems were not interested in diet and related matters even when their diet was not ideal. When their data was explained, more interest in diets and dietary practice was observed. But, generally speaking, participants were not so interested in dietary education.

3. An investigation into the effects of the dietary education

The dietary education analysis for conscientious participants showed that greater improvements were obtained by those who repeatedly had their medical check-ups and attended 'diet and exercise programs'.

4. Mental health and diet

It is known that there is a close relationship between the number of complaints, such as those concerning subjective fatigue, and diet. Therefore from 1985 a mental health program was included in the education.[1)2)]

The Intervention Study

The 'walking and health program' is one of the promotion programs with walking exercise shown in **Fig. 1**.

Introduction

In 1972, the health program for developing good habitual exercise started. An example and educational aims of the program are shown in **Table 1**. The participants met once a week for a two-hour session in the afternoons for fifteen weeks. In the first two weeks participants made friends in a walk-rally and were given the results of their medical examination. Lecture programs in the following weeks included basic knowledge of diet, exercise and relaxation, prevention of lifestyle-related diseases and instructions for walking exercises, dancing, and dumbbell exercises. Sample foods for a healthy diet were supplied. Later in the program participants took part in long walks, stretching, and autogenic training for relaxation. On the 14th session of the program, participants enjoyed walking for 7-8km and on the 15th session attended the graduation ceremony.

Methods

1. Subjects

One hundred and fifty-four middle-aged and elderly women living in Tokyo who attended health promotion programs and completed the health status assessments between April 1999 and February 2002 were recruited as the subjects of this study. Of the one hundred and fifty-four, one hundred and three completed the program.

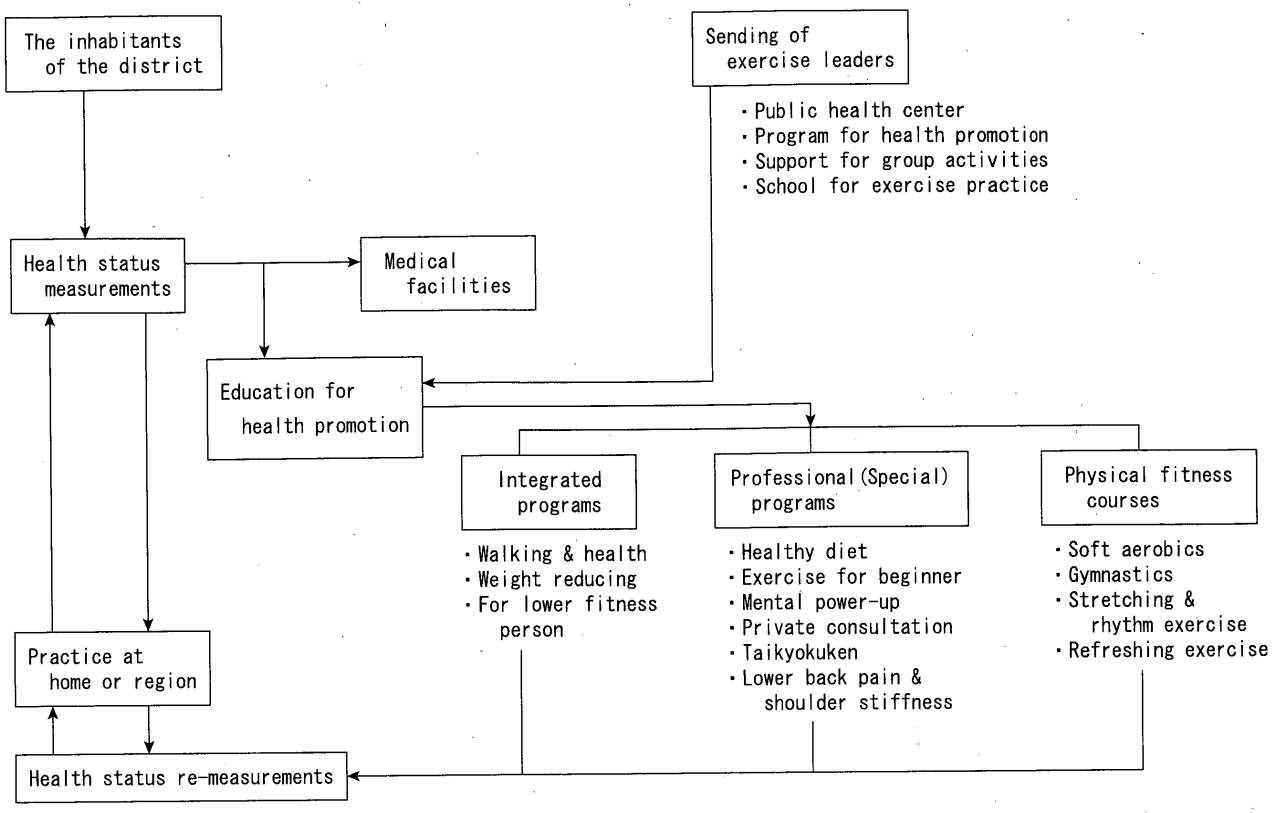

Fig. 1 The complete system of the 'S Medical Center' for health promotion program

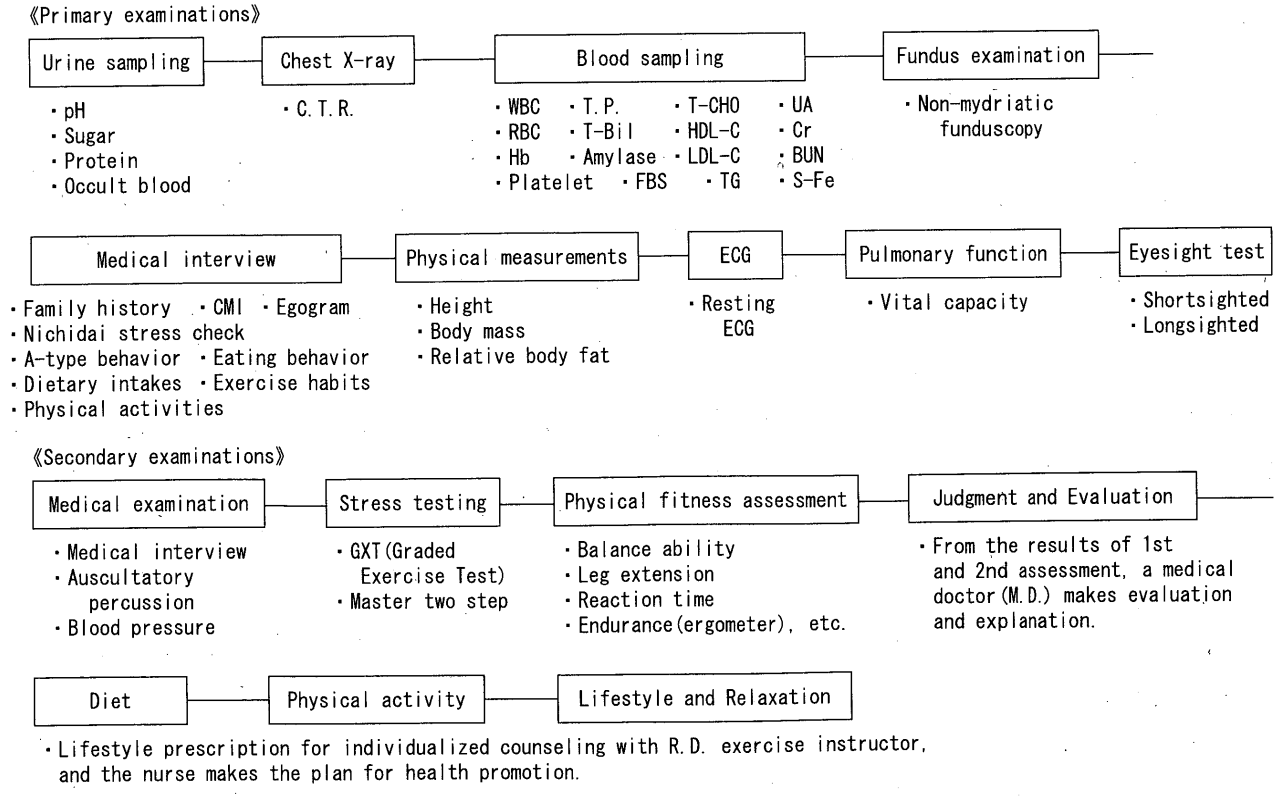

Fig. 2 The flow chart of health status measurements

Table 1. Example of walking and health program

Exercise	Lecture, etc.
	Orientation
Medical and physical fitness assessment (first) three weeks before the start of the program	
1 Walk-rally (outdoor)	
2 Gymnastics	Reports of health assessment. Water supply
3 Gymnastics and how to use one's body	How to choose one's shoes
4 25min walking (outdoor)	Posture and how to walk
5 Stretching and soft aerobic exercise	Diet (what, how much)
6 Long distance walk with fun (4km, outdoor)	
7 Heart rate during exercise (find one's optimal intensity)	Stress control
8 Warming up and cooling down	Diet to improve hyperlipidemia
9 Exercise to prevent osteoporosis	Diet to prevent osteoporosis
10 Exercise to prevent lower back pain	Diet to reduce obesity and hypertension
11 Timed 2km walk (at K-park, outdoor)	
12 Exercise to improve flexibility, 25min walking (outdoor)	Relaxation by autogenic training (I)
13 Exercise to improve strength, 25min walking (outdoor)	Relaxation by autogenic training (II)
Medical and physical fitness re-assessment (second)	
14 Walking (7km, outdoor)	
15 Walking (25min, outdoor)	Graduation and summary

Participants should be under 65 years old. The number is limited to 40.

Educational aims of the 'walking and health program'

Diet	Optimal nutritional density of three daily meals and salt intake Good eating behavior and tasting sensitivity
Physical activity	Practice of walking and perseverance Exercise intensity and frequency
Stress control and relaxation	Recognition of stress and behavior patterns Relaxation by abdominal respiration and autogenic training

Their average age, height, body mass and BMI were 55.6±7.9 yrs (40-65 yrs), 153.1±5.6cm, 53.9±7.1kg, and 23.0±3.3kg/m^2 (mean±SD), respectively.) **Table 2.**

2. Measurements

Before and after the program, health status assessments were measured as shown in **Fig. 2.** The health status assessments consisted of general medical records, medical history, questionnaire regarding diet, exercise and relaxation activities (activity levels, intensity and frequency), details of dietary intake based on quantitative food frequency questionnaire, eating behavior scale, complaints (CMI) and A-type behavior patterns. Bone mineral density (stiffness) was measured only once using Achilles ultrasound bone densitometer.

3. Statistical analysis

All data measured were expressed as mean ±SD. Analysis of T-test was performed by SAS

Table 2. Body composition of the subjects

(n=103)

Variable	Base-line	At the end of the program
height *(cm)*	153.1±5.6	153.3±3.8
weight *(kg)*	53.9±7.1	52.9±5.5 a)
BMI	23.0±3.3	22.6±3.3
% fat *(%)*	24.1±3.0	22.6±2.5 a)
FW *(kg)*	13.4±3.2	11.9±2.3 a)
LBM *(kg)*	42.2±3.1	42.9±2.8

Values are mean±SD.

BMI; body mass index, FW; fat weight, LBM; lean body mass.

a): $p<0.05$ different from base-line

Table 3. Serum lipid profiles and bone stiffness of subjects with risk factors

Variable	Base-line	At the end of the program
TC *(mg/dl)*	232±37	223±28 a)
TG *(mg/dl)*	127±54	78±30 a)
HDL-C *(mg/dl)*	58±13	68±16
LDL-C *(mg/dl)*	134±31	118±29 a)
S.B.P. *(mm Hg)*	144±14	138±16 a)
D.B.P. *(mm Hg)*	90±12	86±15 a)
Bone stiffness *(%)*	70±7	75±6 a)

Values are mean±SD.

TC; total cholesterol, TG; triglycerides, HDL-C; HDL-cholesterol, LDL-C; LDL-cholesterol, S.B.P.; systolic blood pressure, D.B.P.; diastolic blood pressure.

a): $p<0.05$ different from base-line

with p values <0.05 as significant.

Results

Primary results of the subjects were as follows:

1. Attendance rate

Sixty seven percent of the participants completed the health promotion program.

2. Changes in medical records. **Table 3.**

After a six month program, total cholesterol (232±37→223±28mg/dl), LDL cholesterol and triglyceride levels were significantly decreased, and HDL-cholesterol levels tended to be increased. Both systolic and diastolic blood pressure were decreased (S: 144±14→138±16, D: 90±12→86±15mmHg). From the viewpoint of body composition, body mass and BMI tended to be decreased (23.0±3.3→22.6±3.3kg/m^2). Bone stiffness index increased significantly (70.1 %→74.6%, $p<0.05$).

3. Changes in dietary intake. **Table 4.**

Daily calcium intakes significantly increased (599.4mg→706.5mg, $p<0.05$). Major nutrient intakes and eating habits were improved. Daily salt intakes were decreased from 13.0g to 12.3g. Their energy expenditure for physical activity

Table 4. Daily energy and major nutrient intakes of subjects

(n=103)

Variable	Base-line	At the end of the program
energy *(kcal)*	1985±301	1868±296
protein *(g)*	70±14	81±16
fat *(g)*	67±15	58±15
CHO *(g)*	265±40	254±44
calcium *(mg)*	599±156	707±136 a)
iron *(mg)*	10.9±1.0	11.1±0.7
salt *(g)*	13.0±1.5	12.3±1.2
Meals (1 unit = 80kcal)	24.8±3.7	23.35±3.7
breakfast	7.1±1.8	7.1±1.9
lunch	8.4±1.8	8.2±1.6
supper	9.4±1.7	8.2±1.6 a)
Eating behavior score*(%)*	67.0	72.3 a)

Values are mean±SD, CHO: carbohydrate. a): $p<0.05$ different from base-line

Table 5. Psychological behavior traits of subjects

Variable	Base-line	At the end of the program
Type A Behavior Pattern*(%)*		
No score	6	23
Lower score	56	26
Middle score	29	37
Higher score	9	14
Nichidaistresss(score)	4.2±8.2	3.5±8.1 a)
Lower score*(%)*	86	92
Higher score*(%)*	14	.5
Cornel Medical Index (n)		a)
Cornel Medical Index I	79	84
Cornel Medical Index II	19	17
Cornel Medical Index III	3	0
Cornel Medical Index IV	2	2

Values are mean±SD. a): $p<0.05$ different from base-line

increased.

4. Changes of psychological traits. **Table 5.**

Type A behavior pattern tended to decrease. Stress scores by Nichidai stress check tended to decrease most, and the persons with higher stress scores decreased remarkably. In CMI there were improvements in categories II~IV. Neurotic tendency was decreased.

Discussion

In order to prevent lifestyle-related diseases, it is essential to control blood pressure and improve cholesterol levels. Paffenbargar, et al.[3] and Pate, et al.[4] suggested that regularly performed exercise and high physical fitness are effective for decreasing mortality. We have

reported that the supervised walking exercise program with education about diet, exercise and relaxation decreased blood pressure from hypertension to within normal range.[5] In this study, the health measurement was carried out before and after the health promotion program. Results show that there was a reduction of body fat, serum cholesterol level and blood pressure values, which are the main risk factors of coronary heart disease (CHD).

Study design

In this program, an experimental control group could not be set since it was an event for regional inhabitants. According to Okayama, et al.,[6] the health education carried out in the municipality is generally called 'intervention study, which does not adopt the control group'. However, this evaluation system of study has been established convinced that the effects can be measured from the data of the three procedures; pre-assessment, practical countermeasures and after-assessment.

There are few studies of epidemiological evaluation research of health education based on randomized control trials.[7] Also, the researchers' constant referring to the average data or accustomation of measurement may lead to an over estimate of the results. In the future, the evaluation based on epidemiological techniques such as the randomized control trial must be the aim of scientific research in this field.

Three elements for the health promotion

This education program consisted of diet, exercise and relaxation, and it is not possible to know which part is most effective. However, it is difficult to practice health promotion without the involvement of all three elements. Especially for the middle-aged and elderly women, the prevention of lifestyle-related diseases brought about by arteriosclerosis, obesity and so on are important. To promote wellness, one must adopt a good biorhythmic periodicity fitted with one's own lifestyle. The acquisition of a suitable quantity of food intakes, moderate exercise and relaxation and stress management seem to be most effective. Therefore, self-monitoring of the life practice was also carried out during the program.

Exercise

For health promotion, aerobic exercises such as walking and jogging have been widely adopted. The Ministry of Health, Labor and Welfare in Japan has recommended guidelines for the exercise intensity and duration and frequency for efficiently carrying out the aerobic exercises.

The aerobic exercise may have a preventive or recovering role for hypertension, diabetes mellitus, obesity and hyperlipidemia, and it improves aerobic capacity, which depends on the cardio respiratory system. Diminished lipid metabolism function[8] and decreased basal metabolism with ageing by the lowering of muscle mass have been observed (Yanagibori, et al.[9]), and it is also indicated that ageing raises crisis and morbidity level of diabetes mellitus and arteriosclerosis. (Stout[10])

It is suggested that Resistance Exercise with low-intensity and high-repetition using dumbbells is effective for increasing muscle and bone mass. This type of exercise using a dumbbell of light weight has low accident risk. It has been shown that Resistance Exercise decreases body fat mass and increases lean body mass for middle-aged and elderly persons (Frontera, et al.[11] and Menkes, et al.[12]). Then, it follows that basal metabolism may be raised (Pratley, et al.[13] and

Ryan, et al.[14]).

In the health promotion program of this study, the walking exercise, which is one of the aerobic exercises, was carried out. In addition to the walking exercise Resistance Exercise was applied more and more to prevent a lowering of muscle-force. This resulted in the participants being more active in their daily life including an increase in the number of their outings per week. It was also apparent that they were accustomed to the exercise.

It is known that the LBM decreases when body weight reduction is carried out without exercise. This point being considered, we surmise that the decrease of body weight and body fat mass in this study is due to the aerobic walking-centered exercise. It is also known that Resistance Exercise with high-intensity and low-repetition is effective for muscle growth but it has been indicated that lipid on serum such as the cholesterol is not affected in this type of exercise (Manning, et al.[15]).

In this program the dumbbell exercise was low-intensity/high-repetition and the ST fiber also strengthened and because the element of aerobics was added it seems that the lipid profiles improved.

The dumbbell exercise, in comparison with the walking exercise, can be carried out in a short time without the influence of weather because it can be done indoors in about 15 minutes. Therefore a new lifestyle habit is easily made. Seeing these merits, we suggest the adoption of safely programmed Resistance Exercise such as dumbbell exercises together with aerobic exercises for this highly aged-society.

Diet

After menopause the body's stockpile of nutrients such as vitamins decreases. Therefore, malnutrition is a risk. In addition, certain habits such as taking medicines become another risk factor (Riemersma, et al.[16]). It can be expected that as the nutritional requirements around the time of menopause increase due to exercise that it be accompanied by an increase in food intake. As a result, the risk of malnutrition lessens. (Sugiyama[17]).

Also, by exercising with a fellow companion, the psychological communication effect occurs and a long-lasting improvement in eating habits can be expected. It seems that the health promotion program fulfils the important role of improving eating habits and appropriate nutrient intake.

From the epidemiological study it is known that serum total cholesterol is increased by 15-30mg/dl after menopause (Tanaka, et al.[18]). In addition, the intervention study indicates that the suppression of any rise in the serum total cholesterol value is not only due to dietary counseling but is the result of the exercise programs of 30-60min/day including fast walking 3-4 times/week.

Yanagibori, et al.[19] also reported that an exercise program, which included walking 45 min/session, 3-4 times/week, for 12 weeks, for women after menopause, decreased serum total cholesterol, LDL-cholesterol, apo-protein B, and triglyceride levels.

In the health program for the regional inhabitant, Iso, et al.[20] supervised a program that reduced salt, increased dairy products and processed soy products and instigated a 30min and more walk per day. As a result, it is reported that hypertension and hyperlipidemia

were improved. The result of this study supports the result of the previous study, which practiced both nutrition and exercise.

Concerning CHD and fat intake, it is generally being advised that saturated fatty acid should be reduced for the prevention of CHD. Hu, et al.[21] who examined the prevention of CHD in 80,082 women under 60 years old, reported that it was effective when monovalent unsaturated fatty acid contained in olive oil or polyunsaturated fatty acid contained in fish oil were included in the diet rather than when the total fat intake was decreased.

In this program an intake of seafood was the supply source of polyunsaturated fatty acid but it had not reached the optimal level(one point). Though after the nutrition guidance the intake increased to some extent, it was not a significant change. There also was some improvement in the serum lipid but it is felt that the guidance concerning seafood should be modified such as to show more seafood menus which will also be benefitial to make the improvement permanent.

Generally, when the serum cholesterol is 200 mg/dl it is thought to be normal but high and when it reaches 220 mg/dl some change in lifestyle is recommended. However, there are times when a level of 270 mg/dl can be found in elderly women and even so it is reported that their mortality is low.[22] Also, there are indications that too low a level is cause for concern.

Weverling-Rijinsburger, et al.[23] investigated the effect of serum total cholesterol on mortality. The subjects were 724 persons, aged 85-103 years old. If the cause of death was heart disease it made no difference whether the subject had high or low serum cholesterol. On the other hand if the subject had high serum total cholesterol then they were unlikely to die from cancer or infectious disease but to simply die from old age. These findings on serum lipids in aged women warrant a much closer examination when designing further longitudinal researches.

Psychological behavior traits

The skill training is said to be effective for stress management. In this program the training was given to teach relaxation by abdominal breathing and autogenic training method which can easily be repeated at home. It was thought to be quite effective. In addition, the enjoyment of communication and active participation with some companion was effective to reduce mental stress.

In this program the change of estrogens with menopause was not measured. For future programs to elucidate whether menopausal disorders can be mitigated only by improving the lifestyle, the input of such data might be a necessity.

Geene[24] commented on the deterioration of the subjective health status in the menopause saying that the lifestyle habits from before menopause are more important than the physical change brought about by menopause. Also, if psychological stress is added then there will be further complaints.

In this study there was no improvement of the menopause symptoms on the subjects with tendency towards neurotic disorder and this seems to be a drawback for the program. It is considered necessary to bolster the effectiveness of the intervention method with individual counseling and utilization of a good medical institution for those suffering from neurotic disorder tendency.

Generally, it was clear that participation in this health promotion program was effective for the middle-aged and elderly women. However,

there were indications of various problems concerning contents of the program, individual personalities, and lifestyle changes and continuity.

It is possible to reduce the problems associated with menopause such as unidentified complaints by improving one's eating habits, physical fitness, stress control and ability to relax in social surroundings without resorting to hormone replacement therapy. After all menopause is a natural physiological phenomenon which accompanies ageing.

Certainly one of the alternatives to overcome the problems of menopause is the application of health education coupled with medical treatment.

Graduation

The lecture in the closing ceremony encouraged participants to try self diagnosis of their condition and to have a check-up every six months while at the same time offered support for their continued practice of all that had been taught at other circles or programs.

It was stressed that walking was perhaps the best aerobic exercise especially for elderly women. It is recognised that one reason for the lack of participation in walks is the absence of a walking companion. It must be emphasized however that all other aspects of the program are hinged on this vital element of walking.

This study clearly confirmed that the combination of walking (aerobic exercise) and relaxation (autogenic training) decreased stress and improved medical parameters and eating behavior. Additionally it was apparent that the effects of group communication are very important.

Conclusion

From the results of this program we concluded that the walking exercise-centered health promotion programs were effective in keeping desirable lifestyles in middle-aged and elderly women. These suggest that in order to maintain and/or improve the QOL of middle-aged and elderly women, good dietary habits and psychological support is essential. Further long-term investigations of a larger population (middle-aged to elderly) are necessary.

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