

DIFFERENCES BETWEEN TWO JAPANESE HEALTH PROMOTION PROGRAMS ON MEASURES OF HEALTH AND WELLNESS.

Toshiaki Watanabe^{*1}, Koji Terasawa¹, Keisuke Nakade², Yuki Murata¹,

Saiki Terasawa³, Kenich Nemoto⁴, Toshie Kobayashi⁵, Koki Nakajima⁴, Yong Zhang⁶, Suchinda Jarupat Maruo⁷,

Fumihito Sasamori³, Naoko Hirota⁴, Masao Okuhara⁸



^{*1}Shinshu University, Faculty of Education, 6-Ro Nishinagano, Naganoshi, Nagano 380-8544,

²Minowa town Government Office, 10298 Nakaminowa, Minowamati, Kmiinagun, Nagano 399-4695, Japan

³Shinshu University Faculty of Electrical and Electronic Engineering, 4-17-1 Wakasato, Naganoshi, Nagano 380-0928, Japan

⁴Matsumoto University, 2095-1 Niimura, Matsumoto, 390-1241, Japan

⁵Department of Early Childhood Education, SeisenJogakuin College, 2-120-8 Ueno Nagano, 381-0085, Japan

⁶Nagano Prefecture College, 8-49-7, Miwa, Nagano, 380-0803, Japan

⁷School of Nursing, Ramathibodi Hospital, Faculty of Medicine, Mahidol University, Bangkok, Thailand

⁸Tokyo University of Science, Center of General Education and Humanities, 5000-1 Toyohira, Chino, Nagano 391-213, Japan

ARTICLE INFO

Corresponding Author:

Toshiaki Watanabe*

Shinshu University, Faculty of Education,
6-Ro Nishinagano, Naganoshi, Nagano
380-8544, Japan

toshiwa@shinshu-u.ac.jp

Key words: Anthropometry, Health
Education, Health Promotion, Physical
Fitness, Walking



DOI: <http://dx.doi.org/10.15520/ijmhs.2015.vol5.iss4.75.170-181>

ABSTRACT

We implemented and compared two 10-month health education programs in Minowa town and Matsumoto city, Nagano prefecture, Japan. The Matsumoto city cohort underwent a program of monthly classroom activities (CA group), whereas the Minowa town cohort were not only subjected to classroom activities but also performed 90-min strength and weight training once a week and were termed the classroom/training (CT) group. We measured anthropometric, blood pressure, physical fitness, blood chemistry, and brain function variables. All participants were provided pedometers and were encouraged to walk. Monthly seminars included education regarding yoga, exercise, blood pressure, nutrition, and other health-related topics. In total, 92 healthy participants were included in the CA group [age, 66.5 ± 5.4 years (mean ± standard error of mean); 30 males and 62 females] and 46 healthy participants were included in the CT group (mean age 62.7 ± 4.7 years; 22 males and 24 females). We observed significant differences between the average number of steps walked in the CA (7241.7 ± 113.6) and CT (8686.7 ± 167.2) groups. Both the groups both showed significant improvements in anthropometric, blood pressure, physical fitness, blood chemistry, and brain function tests; however, the CT group showed markedly greater improvement after the health education program than before participation. In conclusion, the CT program had added benefits over the CA program because of the higher average amount of walking (approximately 1,400 steps) and the inclusion of a weekly weight-training activity.

©2015, IJMHS, All Right Reserved

INTRODUCTION

Health promotion has received increased global attention since the World Health Organization (WHO) conference in Ottawa in 1986 [1]. Based on this, Japan founded the “Kenko Nippon 21” national health campaign in 2000, which aimed to reduce mortality rates among late-middle-aged individuals, prolong health, improve quality of life, and promote regional health. In 2002, the Japanese government required that each prefecture had their own health-promotion policy [2]. Subsequently, in 2013, the Japanese Ministry of Health, Labour and Welfare identified the need for a national policy to improve the prevention and treatment of metabolic syndrome, and for the performance of medical examinations. [3]. These health-promotion policies have led to a growth in the practice of health education at national, state, and city levels.

Globally, to fulfill the broad requirement to improve health, various health education programs have been devised focusing on the physical, mental, and social aspects of health. In addition, the WHO has published diagnostic criteria for the metabolic syndrome [4] and Mora et al. have reported on the benefits of physical activity in its management [5]. Moreover, scientific evidence confirms that physical activity, including simple walking exercises, can add years of active independent living, lower disability, and improve quality of life among the elderly [6]. Based on demonstrable health benefits, aerobics and strength training are also recommended for the elderly [5,7,8]. This international research effort has improved the quality of information provided through health education, with a clear message that physical activity is beneficial.

In the context of this revolution in health promotion, we introduced different health education programs in Matsumoto city and Minowa town (both in Nagano prefecture) in 1997 and 2004, respectively [9,10,11]. In 2005, Japan had the highest longevity in the world, and Nagano prefecture was among the areas with the greatest longevity. Our health education program comprises a series of monthly seminars and energy expenditure measurements using a pedometer, with health assessments performed before and after the program. The aim of this study was to demonstrate that differences existed between the programs offered in Minowa town and Matsumoto city.

METHOD

General method

We implemented 10-month health education programs from May 2011 to Feb 2012 in Minowa town and Matsumoto city, Nagano prefecture, Japan. The latest version, this program measuring energy expenditure using a pedometer and including anthropometric, blood pressure, physical fitness, blood chemistry, and brain function tests, was used. Participants were enrolled from the two health education programs. All participants were provided pedometers and encouraged to walk. They also participated in a series of monthly seminars regarding yoga, exercise, blood pressure, nutrition, and other health-related topics. However, the Matsumoto city cohort included only the monthly classroom activity, whereas the Minowa town cohort were subject to the classroom activity as well as a 90-min strength and weight training session once a week; these cohorts were termed the classroom activity (CA) group and classroom/training (CT) group, respectively. Table I summarizes the contents of the programs. The study was approved by the Institutional Ethics Committee of Shinshu University, and it was conducted according to the latest guidelines of the Declaration of Helsinki. Written informed consent was obtained from all participants before inclusion.

Table I: Program contents of the 1-year health education in the CA and CT groups

Month	CA program	CT Program
April	Opening ceremony	Opening ceremony
May	Measurement before the health education and distribution of the pedometers	Measurement before the health education, distribution of the pedometers, and training once a week
June	Practical stretch and recreation	Lecture on the importance of health and training once a week
July	Camp	Practical recreation and training once a week
August	Exercise dance and PC Classroom	Hiking and training once a week
September	Nature observation	Lecture of nutrition and training once a week
October	Practical tennis and golf	Practical walking and training once a week

November	Craft making	Lecture on blood pressure and training once a week
December	Tai Chi Chuan	Lecture on dental health and training once a week
January	Aerobic exercises	Tai Chi Chuan and training once a week
February	Measurement after completion of the program and collection of the pedometers	Measurement after completion of the program and collection of the pedometers
March	Closing ceremony	Closing ceremony

CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Pedometers

The number of steps walked and energy expenditure were measured in both the CA and CT groups. Exercise steps were defined as those taken during expenditure greater than 4 metabolic equivalents. The weight-bearing index (WBI) provided an easy assessment of the muscular strength of the lower limbs by evaluating the ability to stand up and by providing an approximate goal for the number of walking and exercise steps that were appropriate [13]. A pedometer model (Acos Inc., FS50) enabled data to be transferred and saved to a personal computer. Participants reported their results to a group leader at the monthly meetings.

Anthropometry and blood pressure

Anthropometric measures included weight, height, body mass index (BMI), and waist circumference. Systolic and diastolic blood pressures were measured at rest, 15 min after arrival at a designated measurement location.

Physical fitness test

We used the physical fitness test approved by the Japan Ministry of Education, Culture, Sports, Science and Technology [14]. It comprised six physical assessments, including grip strength, sit-ups, sit-and-reach flexibility, eyes-open single-leg stance, 10-meter obstacle walk, and 6-min walk. Each participant's physical ability was assessed before and after the health education programs.

Blood chemistry

We assessed blood chemistry for the metabolic syndrome based on the recommendations of the Japanese Ministry of Health, Labour and Welfare [15]. Four components were measured as follows: high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglyceride, and fasting glucose levels. Participants underwent blood chemistry testing before and after the health education programs.

Go/no-go tasks for the assessment of brain function

We adopted go/no-go tasks to assess brain function [16]. The go/no-go tasks comprised three experimental stages: formation, differentiation, and reverse differentiation. In the formation stage, participants were instructed to squeeze a rubber ball in response to a red light. During the differentiation stage, they squeezed the rubber ball in response to the red light but not a yellow light when red or yellow lights were displayed randomly. During the reverse differentiation stage, participants squeezed the rubber ball in response to the yellow light but not the red light. Participants completed 20 trials in each of the differentiation and reverse differentiation stages, with red and yellow lights displayed 10 times each. In this study, incorrect responses were labeled as follows: we used the term "forget" to indicate that participants did not squeeze the ball when it was supposed to be squeezed and "mistake" to indicate that participants squeezed the ball when it was not supposed to be squeezed.

Statistical analysis

Paired t-test was used to compare the results before and after participation in the health education programs. Factor analyses of the CA group versus the CT group were performed using a two-way repeated measure analysis of variance (ANOVA). Statistical Analyses were performed using SPSS for Windows, Version 11.0.1 (SPSS Inc., Chicago, USA). The significance level was set at 0.05. Data are presented as mean \pm standard error of mean (SE).

RESULTS

Sample

The CA group included 92 healthy participants aging 66.5 ± 5.4 (mean \pm SE) years, of which 30 were males (67.5 ± 5.0 years) and 62 were females (66.1 ± 5.5 years). The CT group included 46 healthy participants aging 62.7 ± 4.7 years, of which 22 were males (64.9 ± 4.7 years) and 24 were females (60.8 ± 3.9 years).

Steps and exercise steps

Significant differences were present in the average number of walking and exercise steps between the CA and CT groups. The CT group had a significantly higher averages compared with the CA group ($p < 0.001$; Table II).

Table II: Walking steps before and after the CT and CA health education programs

Walking	Sex	CA	CT	p-value
Walking/day (steps)	male and female	7241.7 ± 113.6	8686.7 ± 167.2	<0.001
	male	8631.8 ± 206.2	10308.7 ± 257.6	<0.001
	female	6500.6 ± 114.1	7323.8 ± 175.7	<0.001
Exercise Walking/day (steps)	male and female	4638 ± 98.0	5523.2 ± 149.4	<0.001
	male	6061.0 ± 199.4	6948.8 ± 240.5	<0.01
	female	3935.6 ± 95.4	4330.3 ± 147.8	<0.01

Data are presented as mean \pm SE. CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

The average number of walking and exercise steps increased from May to September among the males and females in the CA group. In May, walking and exercise steps accounted for 7597.0 ± 331.0 and 4604.9 ± 299.5 steps, respectively (males: 9128.3 ± 550.2 and 6179.8 ± 562.6 , females: 6784.5 ± 367.7 and 3769.3 ± 286.7). In September, walking and exercise steps accounted for 8204.1 ± 394.4 and 5321.6 ± 354.9 steps, respectively (males: 10064.3 ± 697.0 and 6992.0 ± 675.7 , females: 7217.1 ± 417.5 and 4435.3 ± 351.8). However, both walking and exercise steps decreased to 6760.3 ± 379.2 and 4986.4 ± 409.1 , respectively, by February (males: 8715.7 ± 715.2 and 6666.5 ± 787.3 , females: 5722.7 ± 365.0 and 3971.2 ± 373.0 ; Figure 1).

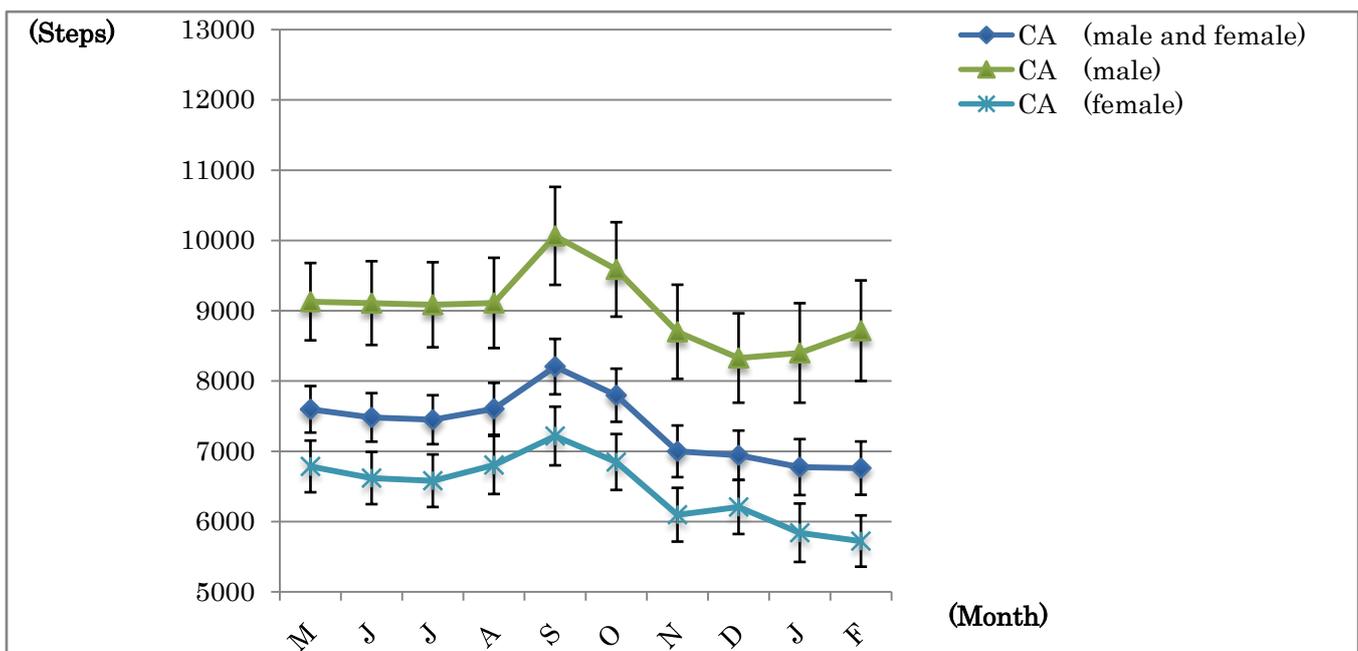


Figure 1: The number walking steps every month in the CA group.

CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

The average number of walking and exercise steps increased from May to October among the males and females in the CT group. In May, walking and exercise steps accounted for 7457.6 ± 495.8 and 4222.8 ± 409.2 , respectively (males: 8614.3 ± 786.3 and 5200.7 ± 627.6 , females: 6451.8 ± 560.3 and 3372.4 ± 480.7). In October, walking and exercise steps accounted for 9382.6 ± 512.6 and 6235.2 ± 468.0 , respectively (males: 11307.5 ± 799.3 and 7736.5 ± 768.4 , females: 7957.5 ± 496.6 and 4984.0 ± 441.2). However, both walking and exercise steps decreased to 7991.4 ± 517.1 and 5515.7 ± 489.4 , respectively, in February (males: 9532.2 ± 838.0 and 7102.8 ± 808.9 , females: 6707.4 ± 524.7 and 4193.0 ± 450.7 ; Figure 2).

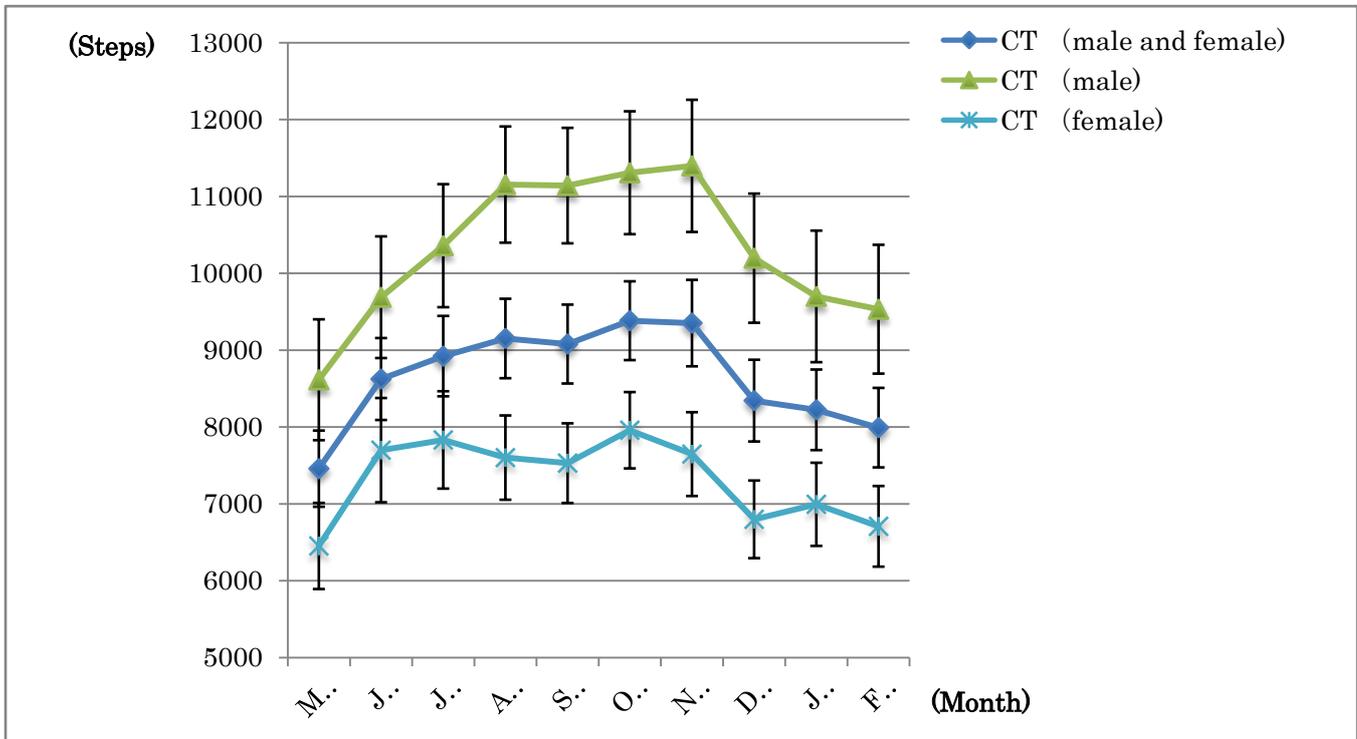


Figure 2: The number of walking steps by month in the CT group

CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Anthropometry and blood pressure

Table III summarizes the results of the anthropometric and blood pressure measurements. Before and after the health education programs, male and female in the CT group showed significant decreases in weight(overall $t = 4.0$, male $t = 3.0$, female $t = 2.8$) and waist circumference (overall $t = 8.7$, male $t = 2.7$, female $t = 9.6$).The CT group also showed significant decreases in weight (overall $t = 2.9$, female $t = 4.5$), BMI (overall $t = 3.0$, female $t = 4.3$), waist circumference (overall $t = 4.5$, male $t = 2.2$, female $t = 4.3$), systolic blood pressure (overall $t = 4.5$, male $t = 3.4$, female $t = 3.0$), and diastolic blood pressure (overall $t = 4.3$, male $t = 4.0$, female $t = 2.1$) from before to after the health education program.

Table III: Anthropometry before and after the CT and CA health education programs

Anthropometry	Sex	CA			CT		
		Before	After	p-value	Before	After	p-value
Weight (kg)	male and female	58.1±1.3	57.2±1.3	<0.001	59.5±1.6	58.5±1.6	<0.01
	male	65.9±1.8	64.7±1.8	<0.01	65.8±1.9	65.1±1.7	NS
	female	54.3±1.4	53.6±1.4	<0.01	54.5±2.0	53.3±2.0	<0.001
BMI (body mass index)	male and female	22.8±0.4	22.8±0.4	NS	23.0±0.5	22.7±0.5	<0.01
	male	24.2±0.6	24.1±0.6	NS	23.7±0.6	23.5±0.5	NS
	female	22.2±0.4	22.2±0.4	NS	22.5±0.8	22.0±0.9	<0.001
Waist circumference (cm)	male and female	88.5±0.9	83.9±1.0	<0.001	84.4±1.6	82.2±1.5	<0.001

	male	86.8±1.5	85.1±1.7	<0.05	87.3±1.9	85.5±1.4	<0.05
	female	89.3±1.1	83.3±1.3	<0.001	81.7±2.4	79.3±2.3	<0.001
Systolic blood pressure (mmHg)	male and female	132.2±1.8	133.0±1.7	NS	133.0±1.9	125.5±2.0	<0.001
	male	141.7±3.0	139.2±3.1	NS	141.2±2.3	131.9±2.7	<0.01
	female	128.0±2.0	130.1±2.0	NS	126.5±2.1	120.5±2.6	<0.01
Diastolic blood pressure (mmHg)	male and female	78.9±1.2	81.1±1.2	NS	80.4±1.2	76.1±1.1	<0.001
	male	84.5±2.4	86.5±2.2	NS	84.4±1.4	77.9±1.9	<0.001
	female	76.4±1.3	78.8±1.4	NS	77.2±1.5	74.7±1.3	<0.05

Data are presented as mean ± SE. NS: not significant; BMI: body mass index; CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Physical Fitness test

Table IV summarizes the results for the physical fitness tests. The CA group showed significant improvement in sit-ups (overall t = -2.2, male t = -2.8), sit-and-reach flexibility (overall t = -3.6, female t = -3.4), eyes-open single-leg stance (overall t = -2.2), the 10-m obstacle walk (overall t = 9.9, male t = 5.7, female t = 8.0), and the 6-min walk (overall t = -7.6, male t = -7.3, female t = -5.0) from before to after the health education program. The CT group showed significant improvement in handgrip strength (overall t = -7.6, male t = -4.9, female t = -5.7), sit-ups (overall t = -6.7, male t = -4.32, female t = -5.1), sit-and-reach flexibility (overall t = -8.8, male t = -6.4, female t = -6.0), 10-m obstacle walk (overall t = 17.3, male t = 12.4, female t = 11.9), and 6-min walk (overall t = -14.3, male t = -14.1, female t = -7.8) from before to after the health education program.

Table IV: Physical fitness before and after the CT and CA health education programs

Physical Fitness	Sex	CA			CT		
		Before	After	p-value	Before	After	p-value
Handgrip strength (kg)	male and female	28.3±1.0	28.1±0.9	NS	33.6±1.5	37.3±1.5	<0.001
	male	37.6±0.9	37.1±0.8	NS	41.6±1.4	45.3±1.4	<0.001
	female	24.1±0.6	24.0±0.7	NS	26.0±0.9	29.8±1.0	<0.001
Sit-up (reps)	male and female	13.0±0.6	14.4±0.8	<0.05	11.9±0.9	15.3±0.9	<0.001
	male	14.7±1.2	17.5±1.3	<0.05	13.6±1.0	16.5±1.1	<0.001
	female	12.2±0.7	12.9±1.0	NS	10.3±1.3	14.1±1.4	<0.001
Sit-and-reach flexibility (cm)	male and female	39.3±1.1	42.5±1.2	<0.001	42.6±1.3	47.4±1.1	<0.001
	male	34.5±2.0	37.2±2.3	NS	39.6±2.3	44.9±2.0	<0.001
	female	41.5±1.2	44.9±1.3	<0.01	45.4±1.1	49.7±1.1	<0.001
Eyes-open single-leg stance (s)	male and female	97.5±4.5	105.1±3.7	<0.05	106.0±4.5	105.7±4.5	NS
	male	94.8±8.3	98.5±7.1	NS	98.4±8.5	97.0±8.4	NS
	female	98.8±5.4	108.3±4.3	NS	112.3±3.7	112.9±4.0	NS
10-m obstacle walk (s)	male and female	5.3±0.1	4.5±0.1	<0.001	6.8±0.1	5.1±0.1	<0.001
	male	4.8±0.2	3.9±0.1	<0.001	6.6±0.2	5.0±0.2	<0.001
	female	5.5±0.2	4.7±0.2	<0.001	7.0±0.1	5.2±0.2	<0.001
6-min walk (m)	male and female	638.9±8.8	685.1±9.6	<0.001	622.2±7.3	719.9±9.2	<0.001
	male	652.2±17.0	716.7±18.9	<0.001	633.3±11.0	737.8±11.9	<0.001

female	632.9±10.2	670.9±10.5	<0.001	610.5±9.0	701.1±13.0	<0.001
--------	------------	------------	--------	-----------	------------	--------

Data are presented as mean ± SE. NS: not significant; CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Blood chemistry

Table V summarizes the results for the blood chemistry tests. The CA group showed no significant improvement in HDL, LDL, or triglyceride levels from before to after the health education program. However, fasting glucose (overall t = -3.6, male t = -2.6, female t = -2.6) and glycosylated hemoglobin (HbA1c; overall t = -7.9, male t = -2.9, female t = -8.7) levels were significantly increased after the health education program. The CT group also showed no significant improvement in HDL, LDL, or triglyceride levels from before to after the health education program. However, fasting glucose levels (overall t = 2.5, p < 0.05, female t = 2.5) and HbA1c levels (overall t = 4.6, male t = 2.8, female t = 3.8) were significantly increased after the health education program.

Table V: Blood chemistry before and after the CT and CA health education programs

Blood chemistry	Sex	CA			CT		
		Before	After	p-value	Before	After	p-value
HDL (mg/dl)	male and female	74.0±2.1	74.8±2.3	NS	61.0±2.2	61.1±2.0	NS
	male	66.8±3.1	67.3±3.4	NS	54.2±2.7	55.1±3.0	NS
	female	77.8±2.7	78.6±2.9	NS	66.4±3.0	65.9±2.4	NS
LDL (mg/dl)	male and female	130.8±3.6	129.7±2.8	NS	127.2±4.1	127.6±4.2	NS
	male	119.5±5.0	125.3±4.8	NS	132.0±5.8	131.5±6.3	NS
	female	136.6±4.6	132.0±3.5	NS	123.5±5.7	124.5±5.7	NS
Triglyceride (mg/dl)	male and female	100.9±4.6	102.9±5.4	NS	118.2±9.1	114.9±9.4	NS
	male	103.8±7.5	112.8±10.7	NS	139.2±14.6	138.3±17.0	NS
	female	99.4±5.8	97.7±6.0	NS	101.6±10.6	96.4±8.9	NS
Fasting glucose (mg/dl)	male and female	102.0±1.7	105.3±2.0	<0.001	103.1±2.7	100.0±2.2	<0.05
	male	107.6±3.7	111.8±4.9	<0.05	107.3±4.7	104.3±3.5	NS
	female	99.1±1.6	101.8±1.6	<0.05	99.8±3.1	96.7±2.8	<0.05
HbA1c (mg/dl)	male and female	5.3±0.1	5.5±0.1	<0.001	5.5±0.1	5.3±0.1	<0.001
	male	5.5±0.2	5.6±0.2	<0.01	5.5±0.1	5.3±0.1	<0.05
	female	5.3±0.0	5.4±0.1	<0.001	5.5±0.1	5.3±0.1	<0.001

Data are presented as mean ± SE. NS: not significant; HbA1C: glycosylated hemoglobin; LDL: low-density lipoprotein cholesterol; HDL: high-density lipoprotein cholesterol; CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Go/no-go tasks of the brain function test

Table VI summarizes the response times (in ms) for the go/no-go task, whereas Table VII summarizes the number of errors (forget or mistake). The males and females of the CA group showed no significant differences in response times for the differentiation task, the reverse differentiation task, total response times, number of forgets for the differentiation task, number of mistakes for the differentiation task, number of forgets for the reverse differentiation task, number of mistakes for the reverse differentiation task, or total number of forgets and mistakes before and after the health education program. However, they showed significant differences in response times for the formation task (overall t = -2.5, female t = -2.3) from before to after the health education program. In contrast, the CT group showed no significant differences in response times for the formation task, response times for the reverse differentiation task, number of forgets for the differentiation task, number of forgets for the reverse differentiation task, number of mistakes for the

reverse differentiation task, or total number of forgets and mistakes from before to after the health education program. However, they showed significant differences in response times for the differentiation task (overall $t = 2.1$, male $t = 2.8$), total response times (overall $t = 2.4$, male $t = 3.2$), and number of mistakes for the differentiation task (overall $t = 4.2$, male $t = 3.8$, female $t = 2.2$) from before to after the health education program.

Table VI: Response time for the go/no-go task before and after the CT and CA health education programs

Response time of go/no-go task(ms)	Sex	CA			CT		
		Before	After	p-value	Before	After	p-value
Response time of formation	male and female	242.0±5.8	257.3±5.7	<0.05	258.0±8.2	243.1±5.5	NS
	male	233.9±10.1	245.7±9.7	NS	246.3±8.3	226.5±6.9	NS
	female	245.8±7.0	262.8±7.0	<0.05	269.7±14.0	259.8±6.9	NS
Response time of differentiation	male and female	367.6±8.0	373.0±7.4	NS	403.0±8.5	381.0±9.3	<0.05
	male	354.8±13.4	363.5±10.9	NS	398.8±11.8	362.5±12.5	<0.05
	female	373.7±9.9	377.6±9.6	NS	407.2±12.5	399.6±12.7	NS
Response time of reverse differentiation	male and female	387.3±7.1	393.4±7.7	NS	428.8±10.3	412.8±10.9	NS
	male	369.0±13.5	372.8±11.7	NS	417.7±12.5	392.1±15.1	NS
	female	396.0±8.1	403.1±9.6	NS	439.9±16.2	433.4±14.7	NS
Response time of total	male and female	352.7±6.3	359.8±6.3	NS	386.9±7.5	367.6±8.2	<0.05
	male	338.1±11.0	345.4±9.5	NS	378.5±9.7	347.4±10.6	<0.01
	female	59.6±7.5	366.6±7.9	NS	395.2±11.3	387.7±11.0	NS

Data are presented as mean ± SE. NS: not significant; CA group: monthly classroom activity only, the Matsumoto city cohort; CT group: the classroom/training (CT) group, monthly classroom activity plus weekly 90-min strength and weight training, the Minowa town cohort

Table VII: The number of error of go/no-go task before and after health education in CTG and CG

Number of errors (times)	Sex	CA			CT		
		Before	After	p-value	Before	After	p-value
Forget of the differentiation	male and female	0.1 ± 0.0	0.0 ± 0.0	NS	0.0 ± 0.0	0.1 ± 0.1	NS
	male	0.1 ± 0.1	0.0 ± 0.0	NS	0.0 ± 0.0	0.1 ± 0.1	NS
	female	0.0 ± 0.0	0.0 ± 0.0	NS	0.1 ± 0.1	0.0 ± 0.0	NS
Mistake of differentiation	male and female	2.9 ± 0.3	2.8 ± 0.3	NS	2.1 ± 0.3	1.3 ± 0.2	<0.001
	male	2.9 ± 0.4	2.3 ± 0.4	NS	2.5 ± 0.4	1.5 ± 0.3	<0.01
	female	2.9 ± 0.3	3.1 ± 0.4	NS	1.8 ± 0.4	1.1 ± 0.3	<0.05
Forget of reverse differentiation	male and female	0.1 ± 0.1	0.1 ± 0.0	NS	0.1 ± 0.0	0.2 ± 0.2	NS
	male	0.2 ± 0.2	0.1 ± 0.1	NS	0.1 ± 0.1	0.4 ± 0.4	NS
	female	0.1 ± 0.0	0.1 ± 0.0	NS	0.1 ± 0.1	0.0 ± 0.0	NS
Mistake of reverse differentiation	male and female	2.9 ± 0.3	2.8 ± 0.3	NS	0.9 ± 0.2	0.6 ± 0.1	NS
	male	2.9 ± 0.4	2.3 ± 0.4	NS	1.0 ± 0.2	0.9 ± 0.3	NS
	female	2.9 ± 0.3	3.1 ± 0.4	NS	0.7 ± 0.2	0.3 ± 0.1	NS
Total of forget	male and female	0.2 ± 0.1	0.1 ± 0.0	NS	0.1 ± 0.0	0.2 ± 0.2	NS
	male	0.3 ± 0.2	0.1 ± 0.1	NS	0.1 ± 0.1	0.5 ± 0.5	NS

	female	0.1 ± 0.0	0.1 ± 0.0	NS	0.1 ± 0.1	0.0 ± 0.0	NS
Total of mistake	male and female	4.7 ± 0.5	4.4 ± 0.5	NS	3.0 ± 0.4	1.9 ± 0.3	<0.001
	male	4.7 ± 0.7	3.9 ± 0.8	NS	3.5 ± 0.5	2.4 ± 0.5	<0.01
	female	4.7 ± 0.6	4.7 ± 0.6	NS	2.5 ± 0.6	1.4 ± 0.4	<0.05
Total of forget and mistake	male and female	4.8 ± 0.5	4.5 ± 0.5	NS	3.1 ± 0.4	2.1 ± 0.4	<0.05
	male	5.1 ± 0.7	4.0 ± 0.7	NS	3.5 ± 0.6	2.8 ± 0.7	NS
	female	4.8 ± 0.6	4.7 ± 0.6	NS	2.6 ± 0.6	1.4 ± 0.4	<0.05

Data are presented as mean ± SE. NS: not significant.

The repeated two-way ANOVA results of the health education program for the CA and CT groups' before and after items showed no significant differences.

DISCUSSION

Walking steps of the pedometer

The daily average walking steps in the CT group was 8687 compared with 7242 in the CA group, i.e., approximately 1,400 steps more. In the CA group, although the average amount of walking and exercise steps gradually increased from May to September, the number of walking steps decreased from September to February. A similar pattern was seen in the average amount of walking and exercise steps from May to October in the CT group, but both walking and exercise steps decreased from October to February. Minowatown (CT group) is approximately 50 km from the city of Matsumoto (CA group), and both areas have the same climate, with the temperature falling from October to an average winter temperature of approximately -6.6°C. The numbers of walking steps began to decrease from October in the CA group and from December in the CT group under comparable climates, suggesting that the CT group may have more health awareness. In addition, males in both groups may have stronger health awareness than females in both groups because males performed more daily steps compared with females.

Paffenbarger et al. reported that expending more than 2000 kcal/week reduced the risk of heart attacks [17]. In addition, walking 10,000 steps/day improves glucose tolerance and reduces blood pressure, both of which are risk factors for type 2 diabetes [18,19]. However, participants of previous health education programs complained of knee and low back pain because of excessive walking [13]; hence, we measured the WBI and set individualized walking targets.

Anthropometry and blood pressure

The CA group showed significant decreases in weight and waist circumference from before to after the health education program. Although males lost more weight than females did, males had smaller decreases in waist circumference. In the CA group, there were also no significant differences in either BMI or blood pressure from before to after the health education program. In contrast, the CT group showed significant decreases in weight, BMI, waist circumference, systolic blood pressure, and diastolic blood pressure from before to after the health education program. However, males showed no significant difference in weight or BMI from before to after the CT health education program. When comparing the CT and CA groups, the former showed the most significant improvement from before to after the program. Aerobic exercise and health education to walk more can help decrease weight, BMI, and blood pressure [20,21]. In our study, the CT group showed a significant improvement in the BMI and blood pressure compared with the CA group. This may have been because the CT group walked an average of 1,400 steps more than the CA group and performed 90-min weight training once a week.

Physical fitness test

From before to after the health education programs, the CA group showed significant improvements in sit-ups, sit-and-reach flexibility, eyes-open single-leg stance, 10-m obstacle walk, and 6-min walk, whereas the CT group showed significant improvements in handgrip strength, sit-ups, sit-and-reach flexibility, 10-m obstacle walk, and 6-min walk. Although the CA group showed significant overall improvements in sit-ups and sit-and-reach flexibility after the health education program, females showed no significant improvement in the sit-up domain (muscular endurance) and males showed no significant improvement in the sit-and-reach flexibility domain. This result may suggest that it is easier to improve muscular endurance in males, while

flexibility is easier to improve in female.

The CT and CA groups showed no significant improvements in eyes-open single-leg stance and handgrip strength, respectively. However, the eyes-open single-leg stance in the CT group was almost 120 s of the maximum and was higher than in the CA group. Muscular strength is not known to improve when exercising by only walking [22]. Therefore, handgrip strength may have decreased in the CA group after receiving health education only. The CT group showed a more significant improvement from before to after the health education program.

Blood chemistry

From before to after the health education program, the CA group showed significant increases in fasting glucose and HbA1c levels, whereas the CT group showed significant decreases in fasting glucose and HbA1c levels. This is consistent with evidence that HbA1c and fasting glucose significantly decreased in patients with diabetes who participated in aerobic and resistance exercise programs [23, 24]. The aforementioned differences in HbA1c and fasting glucose levels may have been due to the greater amount of walking and the weekly 90-min weight training in the CT group.

Go/no-go tasks of the brain function test

Although the go/no-go task was initially developed to investigate brain function in children [25], it has been reported to be suitable for brain function screening in dementia [26]. A previous go/no-go task study suggested that a health program could improve brain function, including working memory [27]. In that study, participants performed an average of 6,500 steps/day in the first year of continuous exercise, at the end of which their go/no-go task reaction times increased significantly and the number of error responses decreased significantly. In the second year, the walking exercise was continued at an average of 7,000 steps/day and a 2-h weight-training session was introduced. This led to further reductions in the reaction times and the number of error responses. In our study, the males and females in the CA group showed significant delays in response times for the formation task. In contrast, the CT group showed significantly faster response times for the differentiation task and the total response time. Furthermore, the CT group showed significant decreases in the number of mistakes during the differentiation and reverse differentiation tasks.

CONCLUSION

We implemented two 10-month health education programs that compared classroom activity alone (i.e., the CA program) with classroom activity plus weekly 90-min strength and weight training (i.e., the CT program). Overall, the CT program appeared to be more effective than the CA program on the measures tested. The CT group: walked more (energy expenditure); had greater improvements in BMI and blood pressure (anthropometric measures); showed significant improvements in handgrip strength, sit-ups, sit-and-reach flexibility, 10-m obstacle walk, and 6-min walk (physical fitness); showed decreased HbA1c and fasting glucose (blood measures); and, in the go/no-go tasks, faster overall and differentiation response times, and significantly fewer mistakes in the differentiation and reverse differentiation elements (brain function). However, the CA group did show significant improvement in sit-ups, sit-and-reach flexibility, eyes-open single-leg stance, 10-m obstacle walk, and 6-min walk (physical fitness). Notably, the CA group also showed significant increases in both HbA1c and fasting glucose, as well as significant delays in the response times for the formation task (go/no-go task). Thus, the CT program was superior to the CA program on the measures used. In conclusion, the CT program had added benefits over the CA program because of the higher average amount of walking (approximately 1,400 steps) and the inclusion of a weekly weight-training activity.

ACKNOWLEDGMENTS

This study was supported by a grant of the Preventive Medical Center of Shinshu University Hospital from Ministry of Education, Culture, Science and Technology. In addition, Koji Terasawa was supported by a Grant-in-Aid for the Scientist (Houga: 23650426, KibanA: 25257101) provided by the Ministry of Education, Culture, Sports, Science and Technology of Japan.

REFERENCES

- [1] Kickbush D. (1986) Health promotion, a global perspective. *Can. J. Public Health* 77: 321-7.
- [2] Japan Health Promotion & Foundation. (2000) <http://www.kenkouippon21.gr.jp/>.
- [3] Ministry of Health, Labour and Welfare. <http://www.mhlw.go.jp/bunya/kenkou/seikatsu/>.

- [4] Alberti KG, Zimmet PZ. (1998) Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus provisional report of a WHO consultation. *Diabetes Med.* 15:539-53.
- [5] Sabia S1, Elbaz A, Rouveau N, Brunner EJ, Kivimaki M, Singh-Manoux A. (2014) Cumulative associations between midlife health behaviors and physical functioning in early old age: a 17-year prospective cohort study. *J. Am.Geriatr. Soc.*62:1860-8.
- [6] Mora-Rodriguez R, Ortega JF, Hamouti N, Fernandez-Elias VE, Cañete Garcia-Prieto J, Guadalupe-Grau A, et al. (2014) Time-course effects of aerobic interval training and detraining in patients with metabolic syndrome. *Nutr.Metab.Cardiovasc. Dis.*24:792-8.
- [7] Abreu EL, Cheng AL, Kelly PJ, Chertoff K, Brotto L, Griffith E, et al.(2014) Skeletal muscle troponin as a novel biomarker to enhance assessment of the impact of strength training on fall prevention in the older adults. *Nurs. Res.*63:75-82.
- [8] Andersen TR, Schmidt JF, Nielsen JJ, Randers MB, Sundstrup E, Jakobsen MD, et al. (2014) Effect of football or strength training on functional ability and physical performance in untrained old men. *Scand. J. Med. Sci. Sports* 1:76-85.
- [9] Sakai A, Terasawa K, Inaki M, Yangidaira Y, Kobayashi I, Oana S, et al. (2000) Physical effects of "The Matsumoto physical training program for senior citizens." *ShinshuMed. J.*48: 89-96.
- [10] Terasawa K, Nakajima K, Zhang Y, Hirota N, Kobayashi T, Ishii M, et al. (2006) Nagano Wellness University Asia Pacific Project for Maintaining Health in Aging. 3 rd Active Aging in Asia Pacific.
- [11] Teraswa K, Nakade K, Okuhara M, Nakajima K, Fujimori S, Miura H, et al. (2008) A study of the relationship between muscle quantity and balance and brain function. *J. Aging Phys. Act.* 16: s176.
- [12] Kikawa A., Yamamoto T.(1991) The functional muscular strength measurement. Rating system of Weight Bearing Index. The Japanese Orthopaedic Society for Sports Medicine, 10:463-468.
- [13] Yamamoto T, Muranaga S. (2002) Easy law of the lower limbs muscular strength by the evaluation of the ability to stand up. *Sports Med.*41: 38-40.
- [14] Ministry of Education, Culture, Sports, Science and Technology. <http://www.mext.go.jp/>.
- [15] Ministry of Health, Labor and Welfare. <http://www.mhlw.go.jp/bunya/kenkou/seikatsu/>.
- [16] Masaki T, Moriyama G. (1971) Study on types of human higher nervous activity. Tokyo University of Science Press. 4: 69-81(in Japanese).
- [17] Paffenbarger RS, Jr, Wing AL, Hyde RT. (1978) Physical activity as an index of heart attack risk in college alumni. *Am. J.Epidemiol.* 108: 161-75.
- [18] Moreau KL, Degarmo R, Langley J, McMahon C, Howley ET, Bassett DR, Jr, et al. (2001) Increasing daily walking lowers blood pressure in postmenopausal women with borderline to stage I hypertension. *Med. Sci. Sports Exerc.*33: 1825-31.
- [19] Swartz AM, Strath SJ, Bassett DR, Moore JB, Redwine BA, Groër M, et al. (2003) Increasing daily walking improves glucose tolerance in overweight women. *Prev. Med.*37: 356-62.
- [20] Park JH, Miyashita M, Takahashi M, Kawanishi N, Hayashida H, Kim HS, et al. (2014) Low-volume walking program improves cardiovascular-related health in older adults. *J. Sports Sci. Med.*13:624-31.
- [21] Ryan AS, Katzell LI, Prior SJ, McLenithan JC, Goldberg AP, Ortmeyer HK. (2014) Aerobic exercise plus weight loss improves insulin sensitivity and increases skeletal muscle glycogen synthase activity in older men. *J.Gerontol. A. Biol. Sci. Med. Sci.*69:790-8.
- [22] Virág A, Karóczy CK, Jakab A, Vass Z, Kovács E, Gondos T. (2014) Short-term and long-term effects of Nordic Walking training on balance, functional mobility, muscle strength and aerobic endurance among Hungarian community-living older people: a feasibility study. *J. Sports Med. Phys. Fitness.*
- [23] Yardley JE, Hay J, Abou-Setta AM, Marks SD, McGavock J. (2014) A systematic review and meta-analysis of exercise interventions in adults with type 1 diabetes. *Diabetes Res ClinPract.*106:393-400.
- [24] Lynch EB, Liebman R, Ventrelle J, Keim K, Appelhans BM, Avery EF, et al. (2014) Design of the Lifestyle Improvement through Food and Exercise (LIFE) study: a randomized controlled trial of self-management of type 2 diabetes among African American patients from safety net health centers. *Contemp.Clin. Trials* 39:246-55.

- [25] Terasawa K, Tabuchi H, Yanagisawa H, Yanagisawa A, Shinohara K, Terasawa S, et al. (2014) Comparative survey of go/no-go results to identify the inhibitory control ability change of Japanese children. *BioPsychoSocialMed*.8: 1-7.
- [26] Terasawa K, Misaki S, Murata Y, Watanabe T, Terasawa S, Kobayashi T, et al. (2014) Relevance between Alzheimer's disease patients and normal subjects using go/no-go tasks and Alzheimer assessment scores. *J. Child Adolesc. Behav*.2: 162.
- [27] Murata Y, Nemoto K, Kobayashi I, Ippongi Y, Terasawa S, Osawa S, et al. (2013)The effect of two-year health program on the Go/No-Go, physical fitness, and blood test. 21st IUHPE World Conference on Health Promotion.

How to cite this article: Watanabe, Toshiaki. differences between two japanese health-promotion programs on measures of health and wellness. **Innovative Journal of Medical and Health Science**, [S.l.], v. 5, n. 4, p. 170-181, aug. 2015. ISSN 2277-4939. Available at: <<http://innovativejournal.in/ijmhs/index.php/ijmhs/article/view/75>>. Date accessed: 02 Sep. 2015. doi:10.15520/ijmhs.2015.vol5.iss4.75.170-181.