CHAPTER 4

RESULTS AND DISCUSSION

This chapter consists of two parts. The first part reveals the study results and the second part describes the discussions.

Results

The study results are presented in two parts. The first part is a description of the demographic characteristics of the sample, and the second part reports the findings of the healthy eating behaviors of the sample.

Part 1: Demographic Characteristics of the Sample

Ninety participants including the elderly and family members who met the inclusive criteria and agreed to participate in the study were randomly assigned into the experimental and the control groups. Two participants in the experimental group and five participants in the control group were dropped-out, due to the inability to attend all intervention sessions because of sickness (one person in experimental group and two persons in control group), and traveling to other villages (one person in experimental group and three persons in control group). Therefore, 83 participants remained in the study, 43 in the experimental group and 40 in the control group.

In this study, the majority of the participants in the experimental group and the control group were female (65.1% vs 60.0%), farmers (93.0% vs 93.0%), and

married persons (65.1% vs 67.5%). All of them were Buddhists. All participants in the experimental group and 37 (92.5%) of the control group finished primary school. The age of the participants in the experimental group ranged from 60 to 85 years with a mean age of 67.42 years (SD = 6.62), while that in the control group ranged from 60 to 82 years with a mean age of 66.6 years (SD = 5.5). The majority of them lived with their spouse and with child/grandchild (53.49% vs 57.5%), and had three to four family members (62.8% vs 60.0 %) (Table 4-1).

Table 4-1

Demographic Variables of the Elderly in the Experimental and the Control Groups

Demographic characteristics	Experiment (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Age (years)					.610[t]
M ± SD	67.42 ± 6.62		66.6 ± 5.51		
(Range)	(60-85)		(60-82)		
Gender					.630[a]
Female	28	65.1	24	60.0	
Male	15	34.9	16	40.0	
Marital status					.818[a]
Married	28	65.1	27	67.5	
Widowed	15	34.9	13	32.5	
Religion					-
Buddhist	43	100.0	40	100.0	

Table 4-1 (continued)

Demographic characteristics	Experiment (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Education level					.108[b]
Primary school	43	100	37	92.5	
Secondary school	0	0	2	5.0	
High school	0	0	1	2.5	
Occupation					.495[b]
Farmer	40	93.0	39	97.5	
Merchant	2	4.7	0	0	
Unemployed	1	2.3	0	0	
Retired officer (Retirement)	0	0	1	2.5	
Persons who are living with					.930[a]
Spouse and children/grandchildren	23	53.49	23	57.5	
Children/grandchildren	15	34.88	13	32.5	
Spouse	5	11.63	4	10.0	
Numbers of family members					.549[a]
2	9	20.9	6	15.0	
3-4	27	62.8	24	60.0	
5-6	7	16.3	10	25.0	

Note. [t] = t-test. [a] = Chi-square test. [b] = Fisher's Exact test.

- = No statistics are computed because of a constant number in both groups.

Regarding family members, the majority in experimental and the control groups were also female (76.7% vs 80.0%), farmers (95.3% vs 97.5%), and married persons (90.7% vs 97.5%). All of them were Buddhists. Most of them finished primary school (53.5% in the experimental group and 40.0% in the control group). The age of family members in the experimental group ranged from 24 to 71 years with a mean age of 49.02 years (SD = 13.55), while that in the control group ranged from 23 to 67 years with a mean age of 43.93 years (SD = 13.12). The majority of family members were children/ grandchildren (58.1% in the experimental group and 70.0% in the control group) (Table 4-2).

Table 4-2

Demographic Variables of Family Members in the Experimental and the Control Groups

Demographic characteristics	Experimental (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Age (years)					.086[t]
M ± SD	49.02 ± 13.55		43.92 ± 13.12		
(Range)	(24-71)		(23-67)		
Gender					.794[a]
Male	10	23.3	8	20.0	
Female	33	76.7	32	80.0	
Marital status					.361[b]
Single	4	9.3	1	2.5	
Married	39	90.7	39	97.5	

Table 4-2 (continued)

Demographic characteristics	Experimental (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Religion					-
Buddhist	43	100.0	40	100.0	
Education level					.667[b]
Primary school	23	53.5	16	40.0	
Secondary school	8	18.6	10	25.0	
High school	10	23.3	10	25.0	
Certificated diploma	1	2.3	3	7.5	
Bachelor degree	1	2.3	1	2.5	
Occupation					1.000[b]
Farmer	41	95.3	39	97.5	
Merchant	2	4.7	1	2.5	
Relating status					.249[a]
Spouse	18	41.9	12	30.0	
Children/grandchildren	25	58.1	28	70.0	

Note. [t] = t-test. a = Chi-square test. b = Fisher's Exact test.

- = No statistics are computed because of a constant number in both groups.

The majority of both experimental and control groups had family income of 1,000 to 5,000 Baht per month (83.72% vs 95.0%). Most of them got income from older person monthly allowance (500 Bahts/ month)(88.4% vs 97.5%), and perceived their income as inadequate (48.8% vs 50.0 %) (Table 4-3).

Table 4-3

Income of the Experimental and the Control Groups

Demographic characteristics	Experimental (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Family income (baht per month)					.229[a]
< 1,000	2	4.7	1	2.5	
1,000-5,000	36	83.72	38	95.0	
5,001-10,000	5	11.6	1	2.5	
> 10,000	0	0	0	0	
Adequacy of income					.854[a]
Inadequate	21	48.8	20	50.0	
Adequate	16	37.2	16	40.0	
Adequate and have savings	6	14.0	4	10.0	
Source of income (more than one answer)					
Older person monthly allowance	38	88.4	39	97.5	.203[b]
Themselves	37	86.0	34	85.0	.892[a]
Children	33	76.7	38	95.0	.435[b]

Note. [a] = Chi-square test. b = Fisher's Exact test.

Regarding health status of the experimental and the control groups, although the majority of the participants reported having some diseases such as diabetes, hypertension and heart disease (69.8% vs 70.0%), they did not have symptoms of illness during the past six months (58.1% vs 52.5%) and had not taken any medication (51.2 % vs 52.5%). Most of the participants in both groups chose provincial public hospitals when they had illness (79.1% vs 85.0%) (Table 4-4).

Table 4-4

Health Status and Use of Health Care Services of the Elderly in the Experimental and the Control Groups

Demographic characteristics	Experimental (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Having disease					.982[a]
No	13	30.2	12	30.0	
Yes	30	69.8	28	70.0	
Having serious symptoms of disease					.606[a]
No	25	58.1	21	52.5	
Yes	18	41.9	19	47.5	
Taking medication for disease					.903[a]
No	22	51.2	21	52.5	
Yes	21	48.8	19	47.5	
Health care services (more than one answer)					
Provincial public hospitals	34	79.1	34	85.0	.483[a]
Primary health care units	10	23.3	5	2.5	.203[a]
Private clinics	15	34.9	11	27.5	.469[a]
Alternative medicine	1	2.3	0	0	1.00[b]
Private hospitals	1	2.3	0	0	1.00[b]
Drug stores	1	2.3	2	5.0	.607[b]

Note. [a] = Chi-square test. [b] = Fisher's Exact test.

The body mass index (BMI) of the participants in the experimental group ranged from 15.23 to 31.11 kgs/m2 with a mean of 23.01 kgs/m2 (SD = 3.60), while that in the control group ranged from 14.98 to 31.22 kgs/m2 with a mean of 21.63 kgs/m2 (SD = 3.20). The majority of the participants in the experimental group were overweight (53.5%), while the majority of the control group had normal weight (55.0%). Most participants in both experimental and control groups did not have any eating problem at present. Most participants in the experimental and the control groups had their children, grandchildren and relatives as the responsible persons for food selection (44.2% vs 45.0%) and food preparation (34.9% vs 45.0%) (Table 4-5).

Table 4-5

Nutritional Status, Eating Problems, Resources of Food Selection and Food Preparation of the Experimental and the Control Groups

Demographic characteristics	Experiment (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Body mass index (BMI) (kgs/m^2)					1.848[t]
$\bar{X} \pm SD$	23.01 ± 3.60		21.63 ± 3.20		
(Range)	(15.23 – 31.11)		(14.98 – 31.22)		
BMI level (kgs/m^2)					.092[a]
< 18.5 (underweight)	5	11.6	6	15.0	
< 18.5 – 22.9 (normal weight)	15	34.9	22	55.0	
≧ 23 (overweight)	23	53.5	12	30.0	
Present eating problems					
Difficulty chewing					.991[a]
No	28	65.1	26	65.0	
Yes	15	34.9	14	35.0	
Difficulty swallowing					.242[b]
No	40	93.0	40	100.0	
Yes	3	7.0	0	0	

Table 4-5 (continued)

Demographic characteristics	Experiment (n = 43)		Control (n = 40)		p-value
	n	%	n	%	
Loss appetite					.351a
No	30	69.8	24	60.0	
Yes	13	30.2	16	40.0	
Food allergy					-
No	43	100.0	40	100.0	
Yes	0	0	0	0	
Food selector					.565[a]
Children, grandchildren and relatives	19	44.2	18	45.0	
Themselves, children, grandchildren and relatives	11	25.5	5	12.5	
Themselves and spouse	6	14.0	8	20.0	
Children, grandchildren , relatives and spouse	4	9.3	4	10.0	
Spouse	3	7.0	5	12.5	
People preparing food					.773[a]
Children, grandchildren and relatives	15	34.9	18	45.0	
Themselves, children, grandchildren and relatives	9	20.9	5	12.5	
Themselves and spouse	8	18.6	7	17.5	
Children, grandchildren, relatives and spouse	6	14.0	4	10	
Spouse	3	7.0	5	12.5	
Themselves	1	2.3	1	2.5	
Themselves, children, grandchildren, relatives and spouse	1	2.3	0	0	

Note. [t] = t-test. [a] = Chi-square test. [b] = Fisher's Exact test.

- = No statistics are computed because of a constant number in both groups.

Part 2: Healthy Eating Behaviors of the Sample

Healthy eating of the elderly in northeastern Thailand was measured by "The Elderly Healthy Eating Scale" that was composed of three sub-dimensions; food selection, food preparation and food consumption behaviors. This study aimed to compare healthy eating of the elderly in northeastern Thailand between the experimental and control groups, and to compare healthy eating of the elderly in northeastern Thailand before and after receiving the nutritional education program among the participants in the experimental group.

Comparing Healthy Eating of the Participants between the Experimental and the Control Groups

The scores of overall healthy eating and healthy eating sub-dimensions at each point of measurement of the experimental and the control groups are shown in Table 9. At baseline, the score of overall healthy eating of both experimental and control groups was at low level with means of 325.51 vs 330.30, respectively. At baseline, food selection and food consumption were also at low level, while food preparation in both groups was similarly at moderate level. Overall healthy eating score changed dramatically from low level at baseline to high level at 3 months and 6 months in the experimental group, but in the control group it changed from low level at baseline to moderate level at both 3 and 6 months (Table 4-6 and Figure 4-1). Food selection, food preparation and food consumption behaviors also changed to high level at 3 months and 6 months in the experimental group (Table 4-6 and Figure 4-2,

4-3, 4-4), whereas for those participants' behaviors in the control group were still in the same level at 3 months and 6 months (Table 4-6 and Figure 4-2, 4-3, 4-4).

Table 4-6

Mean, standard deviation, and range of overall healthy eating scores at baseline, 3 months and 6 months of the experimental and the control groups

Variables	Possible scores	Experimental group (n = 43)		Control group (n = 40)	
		M ± SD	Level	M ± SD	Level
Overall healthy eating					
Baseline	114-570	325.51 ± 17.51	low	330.30 ± 18.95	low
3 months	114-570	490.26 ± 23.45	high	347.28 ± 16.20	moderate
6 months	114-570	517.51 ± 20.67	high	349.90 ± 16.60	moderate
Food selection behavior					
Baseline	36-180	100.84 ± 5.41	low	99.98 ± 6.42	low
3 months	36-180	148.77 ± 9.49	High	103.43 ± 5.50	low
6 months	36-180	159.91 ± 8.41	High	104.58 ± 5.14	low
Food preparation behavior					
Baseline	26-130	87.06 ± 9.07	moderate	87.78 ± 9.31	moderate
3 months	26-130	124.23 ± 5.42	high	98.50 ± 9.58	moderate
6 months	26-130	128.19 ± 3.03	high	99.53 ± 10.11	moderate
Food consumption behavior					
Baseline	52-260	137.07 ± 9.50	low	142.55 ± 10.66	low
3 months	52-260	217.26 ± 14.25	high	145.35 ± 11.04	low
6 months	52-260	229.42 ± 11.72	high	145.80 ± 10.42	low

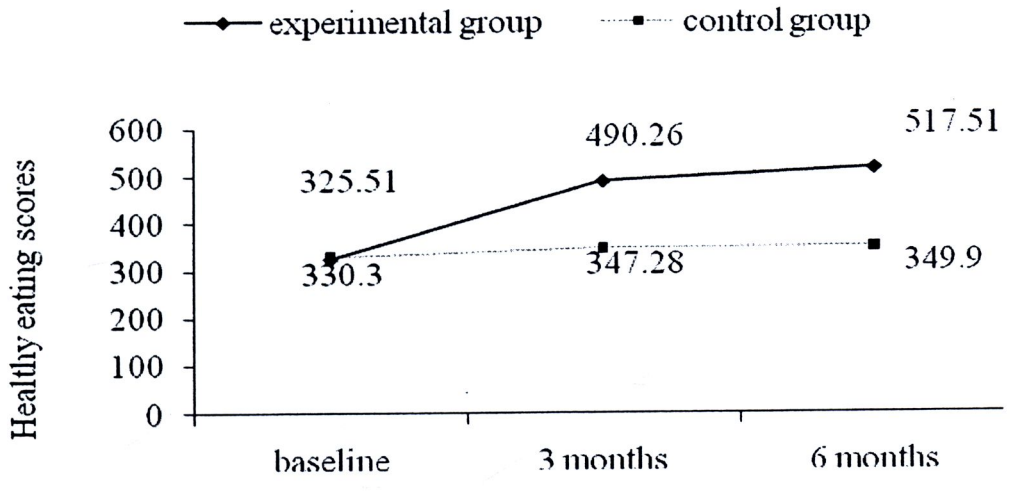

Figure 4-1. Changes over time in overall healthy eating scores of the experimental and the control groups

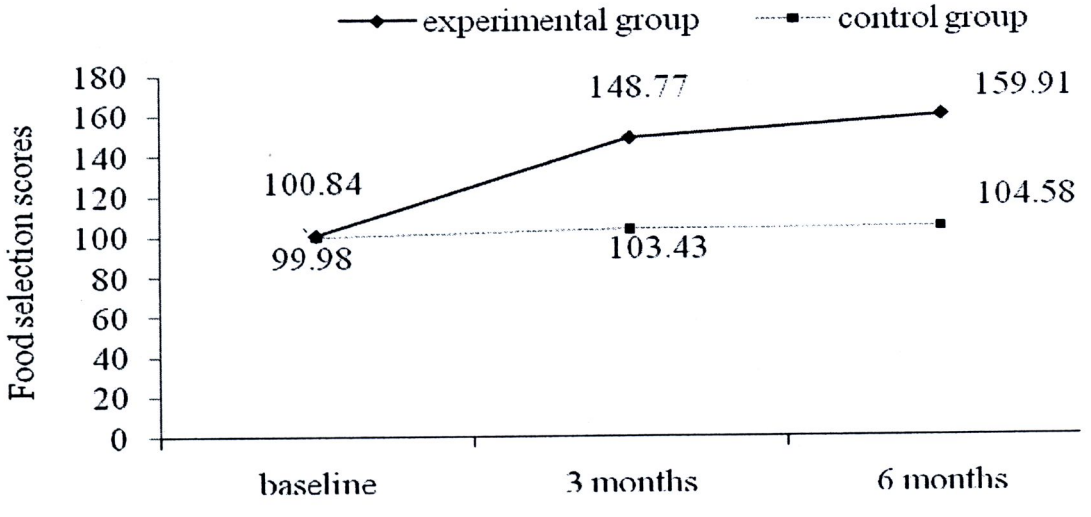

Figure 4-2. Changes over time in food selection behavior scores of the experimental and the control groups

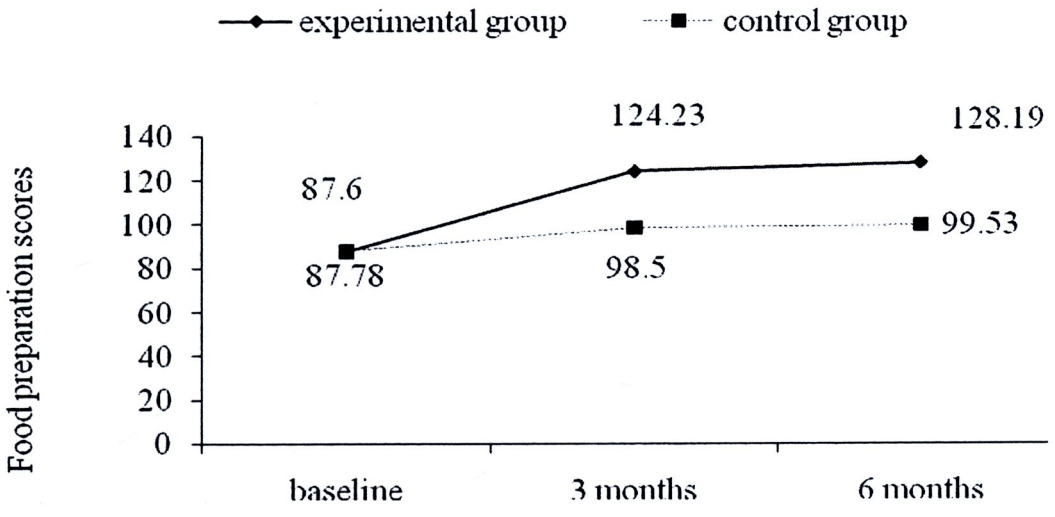

Figure 4-3. Changes over time in food preparation behavior scores of the experimental and the control groups

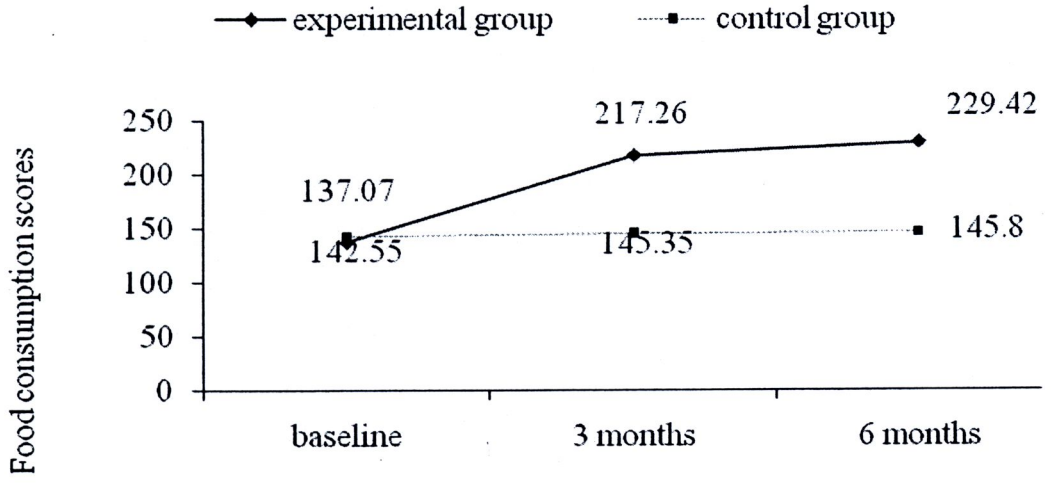

Figure 4-4. Changes over time in food consumption behavior scores of the experimental and the control groups

1. *Comparing overall healthy eating scores of the participants between the experimental and the control groups, and between each point of measurement in the experimental and the control groups.*

The comparisons of overall healthy eating scores between the experimental and the control groups were done. As the scores of overall healthy eating of both groups were normally distributed, homogeneity of variances and compound symmetry were found (see Appendix B), two- way repeated measures ANOVA was used to test the differences between groups of overall healthy eating scores and change over time in each group. The results presented that there was a significant difference between the experimental and the control groups ($F = 867.092$, $p < .001$) (Table 4-7). Regarding change of scores over time in each group, the scores showed an interaction between group and time ($F = 1021.895$, $p < .001$) (Table 4-7). Therefore, it is needed to confirm by other statistical tests.

Table 4-7

The Difference in Overall Healthy Eating Scores between both Groups and Points of Measurement

Variables	SS	df	MS	F^r	*p-value*
Overall healthy eating					
- Between subject					
Group	645974.868	1	645974.868	867.092	.000***
Error	60344.209	81	744.990		
- Within subject					
Time	543556.511	2	271778.256	1541.522	.000***
Time x group	360330.808	2	180165.404	1021.895	.000***
Error	28561.441	162	176.305		

Note. ^{r} = 2 – way repeated measures ANOVA. *** $p < .001$.

Testing of the changes over time of overall healthy eating scores in each group was done using one - way repeated measures ANOVA. The results showed that overall healthy eating scores of both experimental and control groups significantly increased over time ($p < .001$) (Table 4-8).

Table 4-8

Comparisons of Overall Healthy Eating Scores between Each Point of Measurement in the Experimental and Control Groups

Group	Mean of overall healthy eating scores			Statistics value	*p-value*
	baseline	3 months	6 months		
Experimental group	325.51	490.26	517.51	1604.509[r]	.000***
Control group	330.30	347.28	349.90	82.739[r]	.000***

Note. [r] = One-way repeated measures ANOVA. *** $p < .001$.

Multiple pairwise comparisons between each point of measurement were done using Bonferroni test. The results showed that overall healthy eating scores significantly increased from baseline to 3 months, from baseline to 6 months, as well as increased from 3 months to 6 months ($p < .001$) (Table 4-9).

Table 4-9

Multiple Pairwise Comparisons of Overall Healthy Eating Scores in the Experimental and the Control Groups

Group	Mean of overall healthy eating scores			*p-value*		
	Baseline(1)	3 months(2)	6 months (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Experimental group	325.51	490.25	517.51	.000***[b]	.000***[b]	.000***[b]
Control group	330.30	347.28	349.90	.000***[b]	.000***[b]	.029***[b]

Note. [b] = Bonferroni test. *** = $p < .001$.

2. *Comparing healthy eating sub-dimensions scores of the participants between the experimental and the control groups, and between each point of measurement in the experimental and the control groups.*

2.1 *Food selection behavior.* The scores of food selection behavior at all times of measurement in both groups were normally distributed, and homogeneity of variances and compound symmetry were found, therefore two- way repeated measures ANOVA was used to test the differences between groups and change over time in each group of food selection behavior scores. Similar to overall healthy eating scores, the results presented that food selection behavior scores of the experimental group were significantly higher than that of the control group ($F = 916.029$, $p < .001$) (Table 4-10). There was also a significant interaction between group and time ($F = 512.840$, $p < .001$) (Table 4-10), therefore one- way repeated measures ANOVA was used to test the changes over time of food selection behavior scores in each group. The results showed that food selection behavior scores of the experimental and the control groups significantly increased over time ($p < .001$) (Table 4-11).

Multiple pairwise comparisons between each point of measurement were done using Bonferroni test. The results indicated that food selection behavior scores significantly increased from baseline to 3 months, from baseline to 6 months, as well as increased from 3 months to 6 months ($p < .001$) (Table 4-12).

Table 4-10

The Difference in Food Selection Behavior Scores between Both Groups and Points of Measurement

variables	SS	df	MS	F^r	*p-value*
- Between subjects					
Group	71215.507	1	71215.507	916.029	.000***
Error	6297.240	81	77.744		
- Within subjects					
Time	47281.351	1.863[a]	25376.553	695.763	.000***
Time x group	34850.636	1.863[a]	18704.817	512.840	.000***
Error	5504.448	150.448[a]	36.473		

Note. [r] = 2 – way repeated measures ANOVA

[a] = Greenhouse - Geisser was used to adjust the degree of freedom

*** $p < .001$

Table 4-11

Comparisons of Food Selection Behavior Scores between Each Point of Measurement in the Experimental and Control Groups

Group	Mean of food selection behavior scores			Statistics value	*p-value*
	baseline	3 months	6 months		
Experimental group	100.84	148.77	159.91	712,555 [r]	.000***
Control group	99.98	103.43	104.58	35.000 [r]	.000***

Note. [r] = One-way repeated measures ANOVA. *** $p < .001$.

Table 4-12

Multiple Pairwise Comparisons of Food Selection Behavior Scores in the Experimental and the Control Groups

Group	Mean of food selection behavior scores			*p-value*		
	Baseline (1)	3 months (2)	6 months (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Experimental group	100.84	148.77	159.91	.000***[b].	.000***[b]	.000***[b]
Control group	99.98	103.43	104.58	.000***[b]	.000***[b]	.083[b]

Note. [b] = Bonferroni test. *** = $p < .001$.

2.2 *Food preparation behavior.* Two-way repeated measures ANOVA was used to test the difference between groups and change over time in each group of food preparation behavior scores that the assumption was assumed (see Appendix B). Similar to overall healthy eating, the results presented that food preparation behavior scores of the experimental group were significantly higher than that of the control group ($F = 159.194$, $p < .001$) (Table 4-13). There was a significant interaction between group and time ($F = 148.623$, $p < .001$) (Table 4-13), therefore testing the changes over time of food preparation scores in each group, the Friedman test and one - way repeated measures ANOVA was used (Appendix B). The result showed that food preparation behavior scores of both experimental and control groups significantly increased over time ($p < .001$) (Table 4-14).

Multiple pairwise comparisons between each point of measurement were done using the Friedman test in the experimental group, and Bonferroni test was used in the control group. The results presented that the scores of food preparation behavior significantly increased from baseline to 3 months, baseline to 6 months, and 3 months to 6 months ($p < .001$) (Table 4-15).

Table 4-13

The Difference in Food Preparation Behavior Scores between Both Groups and Points of Measurement

variables	SS	df	MS	F^r	*p-value*
Food preparation behavior					
- Between subject					
Group	20309.549	1	20309.549	159.194	.000***
Error	10333.792	81	127.578		
- Within subject					
Time	34577.237	1.391[a]	24859.712	492.430	.000***
Time x group	10435.951	1.391[a]	7503.050	148.623	.000***
Error	5687.623	112.662[a]	50.484		

Note. [r] = 2 – way repeated measures ANOVA
[a] = Greenhouse - Geisser was used to adjust the degree of freedom
*** $p < .001$

Table 4-14

Comparisons of Food Preparation Behavior Scores between Each Point of Measurement in the Experimental and the Control Groups

Group	Mean of food preparation behavior scores			Statistics value	*p-value*
	baseline	3 months	6 months		
Experimental group	87.60	124.23	128.19	75.268[f]	.000***
Control group	87.78	98.50	99.53	48.535[r]	.000***

Note. [r] = One-way repeated measures ANOVA. [f] =Freidman test. *** $p < .001$.

Table 4-15

Multiple Pairwise Comparisons of Food Preparation Behavior Scores in the Experimental and the Control Groups

Group	Mean of food preparation behavior scores			*p-value*		
	Baseline (1)	3 months (2)	6 months (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Experimental group	87.60	124.23	128.19	.000***[w]	.000***[f]	.000***[f]
Control group	87.78	98.50	99.53	.000***[b]	.000***[b]	.469[b]

Note. [f] =Freidman test. [b] = Bonferroni test. *** = $p < .001$.

2.3 *Food consumption behavior*. Two-way repeated measures ANOVA was also used to test the difference between groups and change over time in each group of food consumption behavior scores that the assumption was assumed. Similar to overall healthy eating, the results presented that food consumption behavior scores of the experimental group were significantly higher than that of the control group ($F = 544.657$, $p < .001$) (Table 4-16). There was a significant interaction between group and time ($F = 938.684$, $p < .001$) (Table 4-16), therefore testing the changes over time of food consumption behavior scores in each group, one–way repeated measures ANOVA was also used. The result showed that food consumption behavior scores of both experimental and control groups significantly increased over time ($p < .001$) (Table 4-17).

Multiple pairwise comparisons between each point of measurement were done using Bonferroni test. The results showed that the scores of food consumption behavior significantly increased from baseline to 3 months, baseline to 6 months, and 3 months to 6 months ($p < .001$) (Table 4-18).

Table 4-16

The Difference in Food Consumption Behavior Scores between Both Groups and Points of Measurement

variables	SS	df	MS	F^r	*p-value*
Food consumption behavior					
- Between subject					
Group	155513.266	1	155513.266	544.657	.000***
Error	23127.529	81	285.525		
- Within subject					
Time	111799.337	1.751[a]	63832.198	1080.211	.000***
Time x group	97151.627	1.751[a]	55469.039	938.684	.000***
Error	8383.313	141.868[a]	59.092		

Note. [r] = 2 – way repeated measures ANOVA
[a] = Greenhouse - Geisser was used to adjust the degree of freedom
*** $p < .001$

Table 4-17

Comparisons of Food Consumption Behavior Scores between Each Point of Measurement in the Experimental and Control Groups

Group	Mean of food consumption behavior scores			Statistics value	*p-value*
	baseline	3 months	6 months		
Experimental group	137.07	217.26	229.42	1148.495[r]	.000***
Control group	142.55	145.35	145.80	20.794[r]	.000***

Note. [r] = One-way repeated measures ANOVA. *** $p < .001$.

Table 4-18

Multiple Pairwise Comparisons of Food Consumption Behavior Scores in the Experimental and the Control Groups

Group	Mean of food consumption behavior scores			*p-value*		
	Baseline (1)	3 months (2)	6 months (3)	(1) vs (2)	(1) vs (3)	(2) vs (3)
Experimental group	137.07	217.26	229.42	.000***[b]	.000***[b]	.000***[b]
Control group	142.55	145.35	145.80	.000***[b]	.000***[b]	1.000[b]

Note. [b] = Bonferroni test. *** = $p < .001$.

Discussion

The main objective of this study was to examine the effectiveness of a nutritional education program for promoting healthy eating among the elderly in northeastern Thailand. In this study, the hypotheses were that the elderly who received the program would have better healthy eating than those receiving usual education, and that after receiving the program, the elderly would have better healthy eating than before.

Results from this study revealed that the elderly receiving the program had significantly greater overall healthy eating ($p < .001$) and healthy eating sub-dimensions including food selection ($p < .001$), food preparation ($p < .001$), and food consumption behaviors ($p < .001$) than those receiving usual education. Furthermore, at 3 and 6 months after entering the program, their healthy eating behaviors increased significantly from baseline ($p < .001$) (Table 4-7, 4-8; Table 4-10, 4-11; Table 4-13, 4-14; and Table 4-16, 4-17). The findings confirmed the beneficial effects of the program designed using Pender's Health Promotion Model and health education strategies. Moreover, the positive effect of the program on healthy eating in this study is likely to be due to effective strategies, methods and activities of a nutritional education program. The findings were consistent with many evidences indicating that health education was an effective strategy for promoting healthy eating in the elderly (Boyle & Morris, 2000; Haber, 1996; Huang et al., 2004; McCamey et al., 2003; Mitchell et al., 2004; Sahyoun et al., 2004; Sharp et al., 1996).

Several studies recommended that multiple educational methods should be added in nutritional education program to promote healthy eating in the elderly

(Ammerman et al., 2002; Fletcher & Rake, 1998; Sahyoun et al., 2004). In addition, Mensing and Norris (2003) indicated that using a combination of variety of methods was well documented to enhance the amount of information the older people retain. Therefore, in the present study, multiple educational methods including nutritional education; nutritional counseling; motivating perceived self-efficacy for healthy eating, perceived benefits of healthy eating, perceived barriers to healthy eating, perceived social support from family for healthy eating; and maintaining and monitoring healthy eating were utilized to increase the elder's nutritional knowledge and cognition pertaining to healthy eating. Each method and strategies contributed to the success of the program.

According to WHO (2003), health education was an important strategy to promote healthy eating of the elderly, aiming to decrease their risks for chronic diseases (diabetes, hypertension, heart disease), and to maintain their health and functional independence. To increase knowledge and skills relating to healthy eating of the elderly in this study, the nutritional education program was designed using health education strategy that was proved to be effective in promoting healthy eating. The contents of the program covered six lessons including: (1) Thai Food Pyramid Guide, the Dietary Guidelines, and Nutrition Facts labels for Thai elderly (Nutrition Division, the Ministry of Public Health of Thailand, 2005); (2) major nutrients requirements; (3) food choices and purchase; (4) food preparation, safety and storage; (5) the benefits and barriers of healthy eating; and (6) healthy food menu for the Northeastern Thai elders. Those six lessons were provided through group and individual approaches. The contents were designed with consideration of northeastern regional context and physical barriers to learning of the elderly. Therefore, the

educational materials in this study were presented with simple, short and concise contents, and with large print and some attractive pictures. Furthermore, some real food products were also used for demonstration, training, and taste and smell testing.

Furthermore, small group teaching with short lecture not longer than 45 minutes/session using a booklet and flip chart was carefully conducted in the education program from simple to complex, using local dialect for understanding of the elderly. Discussion was also conducted for sharing knowledge and experiences about healthy eating. The discussion session allowed the participants to learn from each other and adapt their eating appropriately. As mentioned by Pender et al. (2002), individuals will be more likely to take a recommended health promoting behavior, if they perceived benefits of that behavior and their perceived benefits outweigh perceived barriers. The researcher did make the participants aware to perceive benefits of healthy eating. A lot of information was provided repeatedly. To reduce perceived barriers to healthy eating, the researcher discussed with participants about problems/ obstacles they had, and gave advice for problem solving. Also, the researcher allowed them to share their experiences in managing barriers. From observation during group discussions, the researcher found that the participants could minimize barriers to eating behaviors from this strategy. Findings of this study were congruent with the previous studies that reported that increasing perceived benefits of healthy eating and reducing perceived barriers to healthy eating in health educational interventions could effectively improve and maintain appropriate eating behaviors for Thai elderly (Athikamanon, 1998; Srisaad, 1997; Wongpeng, 2004).

Regarding perceived self-efficacy which is a strong determinant and predictor of the level of accomplishment that individuals finally attain, the researcher

made sure the participant's self efficacy regarding healthy eating was increased. According to Pender et al. (2002), the elderly who have high level of perceived self-efficacy will continue conducting appropriate eating behaviors, despite barriers. In this study, the program activities were provided step by step for enhancing mastery experiences, verbal persuasion and emotional arousal pertaining to healthy eating that are sources of self-efficacy. The activities for enhancing mastery experiences included: 1) demonstrating of healthy food preparation and food choices; 2) providing skill training and guidance to the participants in performing personal meal plan; and 3) encouraging the participants to set personal goals for achieving healthy eating. Those activities could help the participants learn how to accomplish their goals. From their success in goal achievement, the participants were confident in their ability to perform healthy eating. Moreover, the researcher also used verbal persuasion and emotional arousal activities to increase participant's self-efficacy. The researcher provided adequate information, and paid attention to the participants' experiences and success, and gave positive feedback to the participants, to make them feel good to do healthy eating. From regularly monitoring, the researcher found that the participants felt more and more confident in adopting healthy eating while joining each educational session leading to increase in their healthy eating behaviors. The findings supported that increasing perceived self-efficacy for healthy eating could increase healthy eating for the elderly that were congruent with previous studies (Athikamanon, 1998; Chaisongkarm, 2002; Churthong, 2001; Miller et al., 2002; Purinthrapibal, 1998; Sakulrang, 2001; Srisaad, 1997; Viteri, 2006).

Increasing perceived social support may be another reason for the program's success in this study. It was reported from other studies that social support

from family members was the most common promoter of healthy eating, and it could effectively promote and maintain healthy eating for the elderly (Carpenter et al., 2004; Eikenberry & Smith, 2004; Haber, 1996; Sherman et al., 2000; Wellman, 2004). The family members could assist their elderly parents to achieve healthy eating through their emotional, informational, instrumental, and appraisal supports (Eikenberry & Smith, 2004; House, 1981). Increasing perceived social support from family members helped the elderly solve problems/overcome the barriers; adjust menu plans, realistic goals setting, and self evaluation; and perform and maintain healthy eating (Pender et al., 2002). In this study, the program, therefore, emphasized on motivating the family members to assist the elderly to practice healthy eating. During group teaching and discussions, the researcher emphasized the significance of family support, and roles and responsibilities of family members in assisting and maintaining the elderly's healthy eating behaviors. Those activities may encourage adoption and maintenance of appropriate eating behaviors of the elderly. The findings were congruent with prior studies among Thai elderly living in the central region (Churthong, 2001; Intarapanich, 1994; Panprom, 2002).

In this study, counseling is another key factor for the program's success. Nutritional counseling was found to be benefitcial for improving the elderly's eating behaviors ((Mckinlay, 1995; Pignone et al., 2003). In the program, the researcher set up home visits and telephone contacts to provide individual counseling. Individual counseling was mainly on food selection and problem solving pertaining to their dietary change, adjusting individual menu plan, and realistic goals setting relating to healthy eating. The researcher assisted the participants to eliminate obstacles for healthy eating suitably conforming to their situation. Moreover, individual counseling

by telephone was offered to those who might need it. The participants could call the researcher whenever they needed some help for their problem solving. This could be done since all participants in this study, especially the elderly's family members, had mobile telephones. However, it was found that the telephone counseling is not useful for this group of participants. From interviewing, the participants mentioned decreased hearing and unfamiliarity in explaining, talking and discussing about their eating behaviors by telephone. In this study, most participants contacted the researcher by telephone only for confirming the appointment date, asking for time and place for the interventions, and consulting on other health problems. They said that they preferred face to face contacts during home visits than phone calls. The findings were congruent with previous studies that individual home visits should be used for building interpersonal relationship between the elderly, family members and the researcher. Home visits involved emotional concerns including expressions of empathy, trust, encouragement and caring that were useful for the elderly and their family members who needed to share, to talk, to explain, and to discuss their experiences/ information and problems individually (House, 1981; Kumanyika et al., 1999; Pignone et al., 2003; Sahyoun et al., 2004).

Concerning maintaining healthy eating in this study, the researcher used sending handouts as a planned strategy. Four handouts were sent to the participants after group sessions were complete. The handouts contained nutritional knowledge and skills needed for healthy eating. Since all contents had already been provided in group sessions, sending the handouts with the same contents would remind them to continue their healthy eating. In case that the participants could not recall the contents, the handouts would be useful for them. In this study, most of the

participants were very grateful to receive the mailed handouts. They appreciated the researcher's intention to help them. The benefits of mailed hand outs found in this study were congruent with other previous studies (Higgins & Barkley, 2004; Taylor-Davis et al., 2000; Viteri, 2006).

In this study, monitoring of knowledge, perceived benefits, perceived barriers, and perceived self-efficacy was regularly done to ensure that the program's objectives were met. At the end of each lesson, the researcher evaluated whether or not the educational objectives were accomplished. Also, before the beginning of next lessons, the researcher reviewed briefly the contents of the previous session. Furthermore, the researcher had the participants self-evaluated. Self evaluation was reported as beneficial for maintaining behaviors (Athikamanon, 1998; Neelapaichit, 2001; Thongyord, 2000; Wongpeng, 2004).

Comparison to the previous studies in Thai elderly, this study evaluated the effect of a nutritional education program and found that after 6 months the program was still effective. This study was the only one conducted in northeastern region so far and included family members in the program. In the previous studies, although the effects of programs showed that the programs were also effective, but those studies did not investigate in the long-term evaluation at 6 months. They evaluated the effects of programs in short-term period at 1-3 months. In addition, most of them were conducted in municipalities of the central region and did not include family members in the programs (Athikamanon, 1998; Chaisongkarm, 2002, Churthong, 2001; Neelapaichit, 2001: Purinthrapibal, 1998;; Sakulrang, 2001). Therefore, the nutritional education program in this study certainly proved in promoting and maintaining healthy eating at six months for northeastern elderly.

Although this study showed the effectiveness of the nutritional education program to promote and maintain healthy eating of the elderly in northeastern Thailand, some limitations were found. First, research areas were set at non-municipal areas in the northeastern region. Second, most of the participants were farmers that had low socioeconomic status. Therefore, the results might not be generalized to population in other regions and groups.