

## CHAPTER 4

### FINDINGS AND DISCUSSIONS

#### Findings of the Study

This research was designed to study the effects of TCQ on sleep in a group of elderly people with sleep problems. Purposive sampling was used to recruit subjects from 2 residential care facilities. Seventy-seven subjects from 2 settings agreed to participate in the study; however, 14 subjects withdrew for different reasons. Nine subjects changed their mind after a TCQ demonstration by the researcher, stating that they did not have the confidence to do it. One subject complained of low back pain after practicing for 2 days and two subjects felt too uncomfortable to continue the program in the third week. Also 2 subjects practiced less than 3 times a week leaving sixty-three subjects who followed the program regularly throughout the study. There were no injuries or adverse effects of the exercise program found among these 63 subjects. When the attributes of the subjects from the two settings were examined, there were no significant differences, between the two settings, except age and education level. (Table F1, Appendix F). There were younger elderly subjects with higher education levels in Phuket Elderly Residential Care Facility than in Chumphon Elderly Residential Care Facility. As the design of the study was one group, pre-post test, the data from the two settings was merged. In addition, the number of subjects would have been inadequate if each setting was analyzed separately. Results of the study are presented in 3 sections.

#### 1. Subjects' demographic data, health, and sleep problems

2. Distribution of sleep parameters, anxiety and depression scores before starting the exercise program

3. Comparisons of sleep parameters, anxiety and depression scores between the four periods: Two weeks before the exercise program and every 2 weeks during the 6 weeks of exercise Program

### **Subjects' Demographic Data, Health, and Sleep Problems**

Demographic data, health, and sleep problems of the subjects are shown in Tables 1-2 and Table F2 (Appendix F). Table 1 shows that the subjects were aged between 61 and 88 years. There were more males than females (55.56%, 44.44%). All of the subjects were Buddhist (100%). Almost all of them were widowed, divorced or separated (73.01%). More than half of the subjects finished elementary school (60.31%) and had no income (73.02%).

Table 2 shows that more than half of the subjects had chronic health problems (65.08%), and regularly took medication (63.49%). Only a small number of subjects (23.81%) consumed 1-3 cups of coffee or non-herbal tea a day. A small number of subjects (23.40%) smoked. The number of cigarettes smoked varied from 1 to 20 a day. Most of the subjects exercised regularly (96.83%). A small number of subjects had a hobby (25.40%).

Table F2 (Appendix F) presents the subjects' sleep problems. Nearly half of the subjects (46.03%) had one sleep problem. The rest had two or more. The most common problems were prolonged sleep latency (26.98%) and frequent wakings after going to sleep (22.22%).

Table 1 Number and Percentage of Subjects According to Demographic Data (N=63)

Characteristic	Number of subjects	Percentage
Age ( $\bar{X}$ 73, SD 6.5)		
60-69	19	30.16
70-79	34	53.97
80-88	10	15.87
Sex		
Male	35	55.56
Female	28	44.44
Marital status		
Single	8	12.70
Married	9	14.29
Widow/divorced/separated	46	73.01
Religion		
Buddhist	63	100
Education level		
No formal education	16	25.39
Elementary	38	60.31
Higher than elementary school	9	14.30

Table 1 (continued)

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Characteristic	Number of subjects	Percentage
Income		
No income	46	73.02
Family support	6	9.52
Saved money	3	4.76
Part time job	6	12.70

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Table 2 Number and Percentage of Subjects Regarding Health and Health Related Factors (N=63)

Characteristic	Number of subjects	Percentage
<b>Health problems</b>		
No	22	34.92
Yes	41	65.08
<b>Medication taking</b>		
No	23	36.51
Yes	40	63.49
<b>Coffee/non-herbal tea</b>		
No	48	76.19
Yes (1-3 cups/day)	15	23.81
<b>Cigarette</b>		
No	47	74.60
Yes (1-20 cigarettes/day)	16	23.40
<b>Alcohol</b>		
No	62	98.41
Yes	1	1.59
<b>Exercise regularly (3 times a week)</b>		
No	3	3.17
Yes	60	96.83

Table 2 (continued)

Characteristic	Number of subjects	Percentage
<b>Hobby</b>		
No	47	74.60
Yes	16	25.40

### **Distribution of Sleep Parameters, Anxiety and Depression Scores before**

#### **Starting the Exercise Program**

Table F3 (Appendix F) shows that sleep latency, number of wakings after sleep onset, periods of waking after sleep onset, sleep quality scores, anxiety and depression score did not have normal distribution. Mostly, the distribution was skewed positively showing that a high proportion of the subjects had low values for the sleep variable, except for total sleep time and sleep quality scores which had negatively skewed distributions.

Table 3 shows that over half of the subjects had more than 30 minutes of sleep latency (68.25%) and more than two wakings during sleep (60.31%). However, most of the subjects (79.37%) took less than 30 minutes to get back to sleep. Nearly half of the subjects (49.21%) reported that they had 6-8 hours of sleep each night. The subjects' sleep quality scores ranged from 5 to 18 (mean scores of 13.59). All subjects had anxiety as well as depression scores within normal limits except one subject who had a depression score of 14.

Table 3 Number and Percentage of Subjects Regarding Sleep Parameters and Anxiety and Depression Scores before Starting the Exercise Program (N=63)

Parameters	Number of subjects	Percentage
Sleep latency (minutes) ( $\bar{X}$ 58.73, SD 47.08)		
10-30	20	31.75
40-60	35	55.56
120-240	8	12.69
Number of wakings after sleep onset (times) ( $\bar{X}$ 3.06, SD 2.78)		
No	7	11.11
1-2	18	28.57
3-6	36	57.14
> 6	2	3.17
Periods of waking after sleep onset (minutes) ( $\bar{X}$ 26.26, SD 20.50)		
No	7	11.11
5-30	43	68.26
40-90	13	20.63
Total sleep time (hours) ( $\bar{X}$ 6.12, SD 2.03)		
< 6	24	38.10
6-8	31	49.21
> 8	8	12.69

Table 3 (continued)

Parameters	Number of subjects	Percentage
Sleep quality scores ( $\bar{X}$ 13.59, SD 3.05)		
5-18	63	100
Anxiety scores ( $\bar{X}$ 2.24, SD 3.12)		
0-11	63	100
Depression scores ( $\bar{X}$ 1.81, SD 2.88)		
0-11	62	98.41
14	1	1.59



**Comparisons of Sleep Parameters, Anxiety and Depression Scores between the Four Periods: Two Weeks before the Exercise Program and every 2 Weeks during the 6 Weeks of the Exercise Program**

RANOVA was used to test the differences of the sleep parameters and anxiety and depression scores between the four periods, the two weeks before starting the exercise program and every 2 weeks during the 6 weeks of the TCQ program. The results (Table 4) showed significant differences in sleep latency ( $F = 3.55, P < .05$ ) and sleep quality scores ( $F = 6.78, P < .01$ ) but no significant differences in the other sleep variables, anxiety and depression scores of the four periods (Table 4). Figure G3 (Appendix G) illustrates shorter sleep latency as the exercise program progressed, whereas Figure G7 shows higher sleep quality scores as the TCQ program progressed.

Paired t- test with Bonferroni's correction was used to test the differences in sleep parameters of the baseline period with the first two weeks, the third to the fourth week and the fifth to the sixth week of the TCQ program. Table 5 shows that

1. Sleep latency during the third through the fourth week and the fifth through the sixth week during the exercise program was significantly shorter than the two weeks before the exercise program.

2. Sleep quality scores of the three periods during the exercise program was significantly higher than the two weeks before the exercise program.

Table 4 Comparing Means ( $\bar{X}$ s), Standard Deviation (SD), and F-value on Sleep Parameters and Anxiety and Depression Scores at Four Different Periods (N=63)

Parameters	Before	During exercise program			F
	Exercise program	wk 1-2	wk 3-4	wk 5-6	
	n = 63	n = 63	n = 63	n = 63	
	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$ (SD)	$\bar{X}$ (SD)	
Sleep latency (minutes)	58.73 (47.08)	53.97 (55.62)	50.16 (45.47)	43.65 (34.07)	5.18*
Number of wakings after sleep onset (times)	3.06 (2.78)	3.16 (2.93)	2.92 (2.74)	2.89 (2.74)	1.67
Periods of waking after sleep onset (minutes)	26.26 (20.50)	25.4 (19.35)	23.25 (18.30)	25.19 (19.10)	2.51
Total sleep time (hours)	6.12 (2.03)	5.59 (2.03)	6.11 (1.58)	6.20 (2.00)	2.10
Sleep quality scores	13.57 (3.05)	14.25 (2.52)	14.54 (2.19)	14.79 (2.17)	6.78*
Anxiety scores	2.24 (3.12)	2.02 (2.74)	1.63 (2.20)	1.57 (2.03)	1.85
Depression scores	1.81 (2.88)	1.78 (2.69)	1.68 (2.62)	1.63 (2.51)	.18

Note. \*P < .01

Table 5 T-value of Paired t-test on Sleep Latency and Sleep Quality Scores between before Starting the Exercise Program (wk0) and during the Exercise Program (wk1-wk2, wk3-wk4, and wk5-wk6)

Parameters	wk0 with wk1- wk2	wk0 with wk3- wk4	wk0 with wk5- wk6
Sleep latency	1.21	3.18*	3.80**
Sleep quality scores	-2.75*	-3.88**	-4.41**

Note. According to Bonferroni's correction: \*  $p < .01$

\*\* $p < .001$

## Discussion

### Characteristic of Subjects

More than half of the subjects in this study were between 70-79 years old. There were more males than females, although, the elderly populations in both residences had more females (53.33%) than males (46.67%). It is possible that males were healthier and more interested in the TCQ exercise program than females. The characteristics of the subjects and health problems of the subjects were similar to the general population (Jitapunkul & Bunnag, 1997). Common health problems found among the subjects were hypertension, arthritis, and asthma, for which they took medication regularly. More male subjects consumed coffee or non-herbal tea than female subjects. The average number of coffee or non-herbal tea was 1-3 cups a day. There was a high rate of cigarette smoking reported among male subjects. This finding was congruent with a study by Jitapunkul and Bunnag (1997) who stated that either

the elderly male, in urban or rural settings, (35.5% and 58.6%) respectively showed a higher rate of smoking than female. There were only 7.3% and 11.0% of female smokers in urban and rural settings, respectively. A high rate of alcoholic drinking was reported among male elderly. The most common problems of the subjects were prolonged sleep latency and awaking frequently after going to sleep. Other sleep problems, included difficulty getting back to sleep, sleeping less than 5 hours, and sleep dissatisfaction. These sleep problems were also reported in previous studies (Gorbien, 1993; Khumtaveeporn, et al. 1995; Mayer, 1998; Ancoil-Iseael, 1999; Chieu, et al., 1999; Gelder, 2000; Laempet, 2001). Only one subject had either depression or anxiety. This is unusual among the elderly as prevalence of depression in elderly people in America was 15% (Holinger, 1999) and 12%-15% of elderly people in Thailand was reported in several studies (Thongtang, et al., 2002; Tubmanee, 1998). Moreover, 12.8% of depressed patients in Canada and Thailand presented symptoms of depression with symptoms of anxiety (Udomratn, 2000). As they lived in residential care facilities, the subjects might have had more social contacts, felt more secure, and the most important 98% of them engaged in regular exercise. All this could contribute to the low anxiety and depression scores among the subjects.

### **Effects of Tai Chi Qigong Exercise on Sleep**

Although, all the parameters moved slightly in the expected direction through the exercise period only sleep latency and sleep quality scores were significantly different. During the exercise program the subjects learnt to calm and relax their mind and body leading to  $\beta$ -endorphin release.  $\beta$ -endorphin produces relaxation and induces

sleep (Townsend, 1996). Furthermore, relaxation during concentration meditation of TCQ exercise produces parasympathetic effects that are decreased physiological activities and decreased metabolism (Kuhn, 1999). These benefits could be reflected in the subjects falling asleep more easily and being more difficult to arouse; hence, giving them a deeper sleep. The average mean of sleep latency was 16 minutes after 6 weeks of TCQ exercise which sleep latency before and after the exercise program were reported as 59 minutes and 43 minutes, respectively. Sleep latency after 6 weeks of the exercise program was still longer than considered normal (American Sleep Disorder Association, 1990). Among the subjects with prolonged sleep latency, 39.68% reported decreased sleep latency. Sleep quality scores were slightly higher during the last two weeks of the exercise program as compared with the sleep quality scores during the two weeks before the exercise program. Small changes in sleep latency and sleep quality scores resulted from TCQ program and how well the subjects performed the exercise.

The results presented the trend that the number of wakings after sleep onset decreased and total sleep time increased as the program progressed but were not statistically significant. These two sleep variables might be strongly influenced by the subjects' sleep environment. In the residences, 20-22 persons shared one sleeping hall. It was possible that the subjects could be awakened and unable to fall asleep by their hall mates' chatting and activities.

The minimal differences of total sleep time before and after TCQ practice could be explained by the changes in sleep patterns among the elderly. People tend to sleep less when they get older (Mayer, 1998); therefore, it was not surprising that total sleep time did not significantly change after participating in the exercise program.

Forty nine point two one percent slept 6-8 hours a night before joining the exercise program. This amount of sleep should be adequate for the elderly. Only 38.1% of the subjects slept less than 6 hours a night which the minimum of total sleep time was one hour a night while the rest (12.6%) slept more than 8 hours. This study reported 12.70% of increased total sleep time after 6 weeks of the exercise program but 25.40% had no change of total sleep time. Despite a short sleep period this group stated that they felt relaxed and refreshed after they got up in the morning.

No significant reduction of anxiety and depression scores could result from the normal baseline of anxiety and depression among the subjects. In fact, three subjects had been diagnosed as depression and treated with tranquilizers. None of the three got anxious during the 6 weeks of TCQ exercise. Only one of the three subjects got higher scores of 14 but this subject felt slightly happier than usual. This finding was congruent with a pilot study by Ross et al. (1999) who found no differences in anxiety and depression of the 17 subjects before they engaged in TCQ practice and after 8 weeks of TCQ program.

Overall the results suggested only a small effect of TCQ on sleep variables, anxiety and depression, which could have resulted from the short length of TCQ practice and the circumstances where the study took place.

After 4 weeks of TCQ exercise, the researcher found that only twenty of the subjects could practice TCQ correctly. The others needed longer practice. Perhaps 6 weeks of TCQ training was not long enough for all subjects to perform TCQ correctly and effectively as TCQ is not only an exercise but also an art. Once the individuals practice correctly, an additional period is required for training in order to gain

significant benefit. Li (2002) has been conducting a study on the effects of a six-month Tai Chi practice in the elderly but the result has not been reported yet.

The study was conducted from the middle of January to the beginning of May, 2002. The weather was quite hot and the schedule took place at the warmest part of the day. The heat might have interfered with the subjects' concentration and effort to do exercise. Although, many complained about heat during the TCQ session in the late afternoon none of the subjects complained about the hot weather during the night. Both residences were located next to the beach and had good ventilation.

Besides TCQ, other events that occurred along the study period might affect the results of the study since there was no control group for comparison. Sleep assessment based on the subjects' reports might be biased. With these limitations, a repeated study with more vigorous design, and objective data is recommended.