Breathing Meditation by Medical Students at Khon Kaen University: Effect on Psychiatric Symptoms, Memory, Intelligence and Academic Acheivement

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Objective: *To examine the short-term effects on fifth-year medical students of a 4-week, breathing meditation-based, stress reduction intervention on psychiatric symptoms, memory function, intelligence, and academic achievement.*

Materials and Method: *Using a randomized control trial, the meditation group practiced every 8.00 to 8.20 a.m. before beginning daily learning schedule. Meditation emphasized mindful awareness of the breath during inhaling and exhaling. The control group went about their normal activities in the other room. The psychiatric symptoms were measured using the Symptom Checklist-90 (SCL-90), the memory used the Wechsler Memory Scale-I (WMS-I), the intelligence used the Raven's Advanced Progressive Matrices (APM), and the academic achievement used psychiatry course MCQ examination score. Analysis was done using Ancova statistic.*

Results: *Fifty-eight volunteer medical students during their psychiatry rotation between June 2008 and May 2009, were randomized into either in the meditation (n = 30) or the control (non-meditation) (n = 28) group. There was no significant difference between the groups in their respective SCL-90, WMS-I, APM, and psychiatry course MCQ examination score.*

Conclusion: *Among normal, intelligent, mentally healthy persons, short-term breathing meditation practice will not likely change psychiatric symptoms, memory function, intellectual performance, and academic achievement.*

***Keywords*:** *Studying medicine, Meditation-based stress reduction, Psychiatric symptoms, Memory function, Intelligence, Academic achievement*

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Studying medicine might be highly strenuous for some, leading to psychological disturbances, psychiatric disorders, and achievement failure[1]. About 25.9% of medical students at Khon Kaen University have psychiatric symptoms that may ultimately interfere with their study performance and quality of life[2].

Meditation is a set of attentional practices leading to an altered state or trait of consciousness characterized by expanded awareness, greater presence, and a more integrated sense of self. These characteristics would be useful in a self-regulated psychological strategy[3] through fostering development of a profound inner calmness, thoughtless awareness, and reigning in reactivity. Therefore, allowing individuals to face, even embrace all aspects of daily life, regardless of circumstances[4]. There are two general types of meditation, the first is concentrative meditation, and the second is mindfulness meditation[5]. Concentrative meditation, best represented by Transcendental Meditation (TM) and the Relaxation Response[6], emphasizes focusing attention onto an object and sustaining that attention until the mind achieves stillness. Relaxation and clarity of mind are the results of continuous practice. Mindfulness meditation emphasizes an open awareness to any contents of the mind that are emerging. After a period of practice, the trainee develops a sustainable, attentive, observational capability without reacting to their own thoughts and emotions[3]. Focusing on awareness, from which a detached observation of the contents of consciousness develop, may represent a powerful cognitive behavioral coping strategy for

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transforming the way a person responds to life events[7]. Breathing is a fundamental strategy for both types of meditation. Relaxation, de-automatization of consciousness, ascendance, descendance, and transcendence are explained for cognitive and emotional changes achieved through meditation[8]. It is easy for even beginners to practice without much preliminary knowledge.

Presently meditation is used worldwide with a wide range of applications[9], *i.e.* treating stress and related disorders, mood and anxiety disorders[10], ADHD[11], and general medical conditions[12,13]. However, a recent review about Meditation Practices for Health indicated that the field of research on meditation practices and their therapeutic applications are beset with uncertainty. Thus, the therapeutic effects of meditation practices cannot be established based on the current literature[14]. In terms of possible adverse effects of meditation, Castillo reported that meditation could cause depersonalization and derealization[15]. There are several published reports about a potential association between meditation and a psychotic state[16-18]. Notwithstanding, meditation is considered safe and culturally appropriate for Thai medical students.

Piyavhatkul et al reported that the use of Consciousness Transformation Program for Stress Management, comprising multimodal meditative components for first-year medical students, yielded some significant decreases in Symptom Checklist-90 scores and increased of self-awareness/ acceptance. However, the study score did not change significantly[19].

Due to uncertainty about its effectiveness, and the lack of controlled study about the effects of meditation on psychological symptoms, memory capacity, intelligence, and academic achievement, the authors aimed to investigate the effects of meditation on these outcomes among medical students.

Material and Method

A randomized controlled trial, approved by Khon Kaen University Ethics committee (HE 500738), was carried out between June 2008 and May 2009. Fifth-year medical students doing their 4-week rotation in the Department of Psychiatry, participated in the present study on a volunteer basis. The volunteers gave informed consent before participation. Random allocation, to be either subjects or controls, was done using a block of four designs.

Intervention: The breathing meditation concept used in this research was based on the Buddhist Anapanasati Meditation that emphasizes mindful awareness of the breath during inhaling and exhaling. In so doing, the participant develops mindful awareness, focused attention at the present moment which allows him/her to relax and develops a let it go attitude. The participants continued this passive awareness of his/her breathing without forcible coercion for 20 minutes. The breathing sensations were gently, continually observed.

After the introductory session, the participants in the meditation group meditated in a sitting position, in a quiet, air-conditioned lecture room every weekday from 8.00 to 8.20 a.m. for 28 days. A 20-minute audio CD, prepared by TK who has expertise in meditation therapy, was used to guide the meditation in each session throughout the present study. Meanwhile, the control subjects went about activities (*i.e.,* reading, chatting, napping) in another room. This non-meditating activity served as the control condition.

The outcomes of the present study were any changes in psychiatric symptoms, cognitive abilities. The psychiatric symptoms were measured using the Self Checklists-90 (SCL-90). Three domains of cognitive ability were measured. They included memory (memory quotient - MQ) using the Wechsler Memory Scale form I (WMS-I), intelligence quotient (IQ) using Raven's Advanced Progressive Matrices (APM), and academic achievement using a psychiatry course examination score.

Participants were tested by a licensed clinical psychologist on the first day of their psychiatric block rotation then the day after completing the mediation practice. The SCL-90 and APM were administered to the group while the WMS-I was administered individually. The psychiatric course examination was done on the exit day of the psychiatric rotation. The exclusion criteria included not volunteering to participate or, having a severe psychiatric disorder that interferes with concentration and/or learning ability.

Statistics

Descriptive statistics were used to explore the demographic data. Since the initial psychiatric symptoms and cognitive abilities might have some influence on the outcome, the ANCOVA statistic was used to assess the outcome. A p-value of less than 0.05 was considered statistically significant.

Results

The meditation group included 30 students, of whom 15 were females, all Buddhists. The group was between 21 and 33 years of age (mean ± SD, 23.430 ± 2.596). The grade point average (GPA) before the psychiatry rotation was 2.929 ± 0.396 (minimum-maximum = 2.20-3.98). The control group included 28 students of whom 14 were females, 27 Buddhists and one male Christian. The age ranged between 22 and 33 years (mean ± SD, 23.140 ± 2.068). The GPA before the psychiatry rotation was 3.174 ± 0.362 (min-max = 2.40-3.80). The baseline characteristics between groups were not significantly different for sex ($p = 1.000$) and age ($p = 0.641$). The GPA of the control group was significantly higher than that of the meditation group ($p = 0.017$, 95% CI of the difference = (-0.445)-(-0.045) (Table 1).

After the intervention period, the mean difference (before-after) of each SCL-90 dimension trended to be larger in the meditation group (Table 2). However, the difference between both groups did not reach statistical significance (Table 2).

The WMS-I (its subscales and the total scale, MQ) and APM test (IQ) scores after the intervention period, both for the meditation and the control groups were similar to their baseline scores. There was no statistically significant difference (before-after scores) between groups on either the WMS-I (subscales and MQ) or APM scores (Table 2). Since the line graph presentations of the responses by the meditation and control groups were quite similar, the authors will present only the meditation group (Fig. 1, 2). The score for the psychiatry course examination between the intervention and control groups was also not significantly different (Table 3).

During the study, about half of the participants from both groups indicated that their major stress(es) was academic, economic, and boy/girlfriend issue, of which academic stress was the most prominent (Table 4).

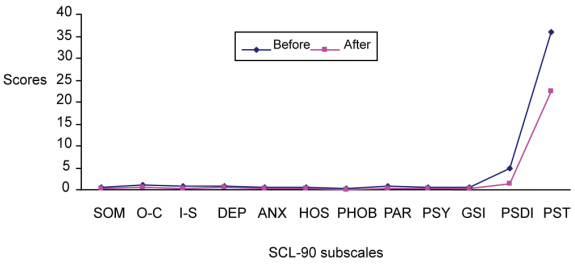

Fig. 1 Comparison of SCL-90 obtained before and after meditation in meditation group

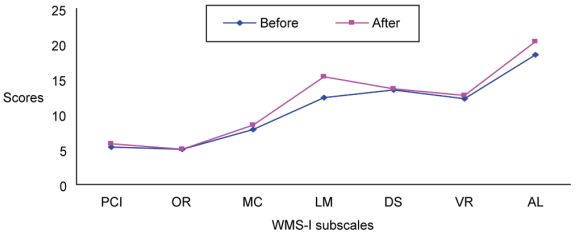

Fig. 2 Comparison of WMS-I obtained before and after meditation in meditation group

During the study, tea and/or caffeine were the substances mostly used by almost half of the participants in either group. Alcohol was consumed by only a few participants in either group. No other substance use was indicated (Table 5).

Discussion

This is the first report about applying meditation to reduce psychiatric symptoms and enhance memory, intelligence, and academic achievement. Based on the results, however, there was no significant change in psychiatric symptoms,

Table 1. Baseline characteristics of participants

Participants	Sex$^{p}_{1}$			Age (year)$^{p}_{2}$			GPA$^{p}_{3}$		
	M	F	Total	Min-Max	Mean	SD	Min-Max	Mean	SD
Meditation group	15	15	30	21-33	23.430	2.596	2.20-3.98	2.929	0.396
Control group	14	14	28	22-33	23.140	2.068	2.40-3.80	3.174	0.362

$^{p}_{1}$ = 1.000 (Chi-square test df = 1)
$^{p}_{2}$ = 0.641 (mean difference = 0.290, SE = 0.619, 95% CI = -0.950-1.531)
$^{p}_{3}$ = 0.017 (mean difference = -0.245, SE = 0.099, 95% CI = -0.445-(-0.045)

Table 2. A comparison of the SCL-90, WMS-I and APM scores before and after interventions in both groups. Parameters ending with '1' indicates 'before intervention', '2''after intervention', 'M' 'meditation group' and 'C' 'control group'

Name of test	Subscales	Range of difference	Mean	Std.	T	df	Sig. (2-tailed)	Adjusted mean difference	SE	t	95% CI	Sig.
SCL90	1. SOM1M–SOM2M	-0.83-0.84	0.118	0.340	1.899	29	0.068					
	SOM1C–SOM2C	-0.33-0.84	0.086	0.224	2.032	27	0.052	0.045	0.057	0.793	-0.069-0.160	0.431
	2. O-C1M–O-C2M	-0.40-1.83	0.458	0.514	4.879	29	0.000					
	O-C1C–O-C2C	-0.50-1.20	0.282	0.395	3.776	27	0.001	-0.074	0.104	-0.708	-0.283-0.135	0.482
	3. I-S1M–I-S2M	-0.45-1.12	0.348	0.407	4.689	29	0.000					
	I-S1C–I-S2C	-0.44-0.78	0.195	0.266	3.880	27	0.001	-0.016	0.072	-0.224	-0.161-0.129	0.824
	4. DEP1M–DEP2M	-0.69-1.08	0.294	0.390	4.122	29	0.000					
	DEP1C–DEP2C	-0.15-1.01	0.221	0.258	4.539	27	0.000	-0.003	0.073	-0.041	-0.149-0.144	0.968
	5. ANX1M–ANX2M	-0.60-1.20	0.303	0.426	3.898	29	0.001					
	ANX1C–ANX2C	-0.50-1.00	0.111	0.275	2.128	27	0.043	-0.006	0.064	-0.090	-0.134-0.123	0.929
	6. HOS1M–HOS2M	-1.00-1.00	0.187	0.426	2.406	29	0.023					
	HOS1C–HOS2C	-0.17-1.83	0.291	0.542	2.840	27	0.003	0.123	0.072	1.695	-0.022-0.268	0.096
	7. PHOB1M–PHOB2M	-0.42-1.00	0.181	0.297	3.344	29	0.002					
	PHOB 1C–PHOB 2C	0.00-1.00	0.168	0.227	3.923	27	0.001	0.070	0.044	1.607	-0.017-0.158	0.114
	8. PAR1M–PAR2M	-0.34-1.83	0.403	0.448	4.936	29	0.000					
	PAR1C–PAR2C	-0.17-2.33	0.179	0.460	2.058	27	0.049	-0.008	0.079	-0.103	-0.166-0.150	0.919
	9. PSY1M–PSY2M	-0.10-1.90	0.367	0.374	5.363	29	0.000					
	PSY1C–PSY2C	-1.80-0.80	0.086	0.440	1.030	27	0.312	-0.172	0.101	-1.705	-0.375-0.030	0.094
	10. GSI1M–GSI2M	-1.10-0.85	0.204	0.387	2.877	29	0.007					
	GSI1C–GSI2C	-0.32-0.59	0.138	0.162	4.492	27	0.000	0.031	0.069	0.444	-0.107-(-0.169)	0.659
	11. PSDI1M–PSDI2M	-0.47-102.35	3.533	18.665	1.037	29	0.308					
	PSDI1C–PSDI2C	-0.84-1.02	0.169	0.359	2.483	27	0.020	0.101	0.084	1.201	-0.067-0.269	0.235
	12. PST1M–PST2M	-25.00-51.00	13.733	18.122	4.151	29	0.000					
	PST1C–PST2C	-19.00-25.00	6.679	8.794	4.019	27	0.000	-0.325	3.539	-0.092	-7.417-6.767	0.927
WMS-I	1. PCI1M–PCI2M	-4.00-1.00	-0.467	0.973	-2.626	29	0.014					
	PCI1C–PCI2C	-2.00-1.00	-0.250	0.585	-2.260	27	0.032	0.121	0.118	1.019	-0.117-0.358	0.313

SCL-90 subscales: SOM = somatization 12 items; O-C = obsessive compulsive 10 items; I-S = interpersonal sensitivity 9 items; DEP = depression 13 items; ANX = anxiety 10 items; HOS = hostility 6 items; PHOB = phobic anxiety 7 items; PAR = paranoid ideation 6 items; PSY = psychoticism 10 items; GSI = global severity index; PSDI = positive symptom distress; PST = positive symptom total

WMS-I subscales: PCI = personal and current information; OR = orientation; MC = mental control; LM = logical memory; DS = digit span; VR = visual reproduction; AL = associate learning; MQ = memory quotient

APM scale: IQ = intelligence quotient total score

Table 2. (Cont.)

Name of test	Subscales	Range of difference	Mean	Std.	T	df	Sig. (2-tailed)	Adjusted mean difference	SE	t	95% CI	Sig.
WMS-I	2. OR1M–OR2M	-1.00-0.00	-0.033	0.183	-1.000	29	0.326					
	OR1C–OR2C	-1.00-0.00	-0.071	0.262	-1.441	27	0.161	-1.5E-015	0.000	-	-1.53E-015-(-1.53E015)	-
	3. MC1M–MC2M	-3.00-1.00	-0.633	0.999	-3.471	29	0.002					
	MC1C–MC2C	-3.00-2.00	-0.107	1.315	-0.431	27	0.670	0.131	0.240	0.545	-0.350-0.612	0.588
	4. LM1M–LM2M	-6.50-0.50	-2.967	1.814	-8.956	29	0.000					
	LM1C–LM2C	-8.50-1.00	-3.786	2.619	-7.648	27	0.000	-0.460	0.550	-0.837	-1.563-0.642	0.406
	5. DS1M–DS2M	-3.00-3.00	-0.100	1.517	-0.361	29	0.721					
	DS1C–DS2C	-3.00-2.00	-0.357	1.339	-1.411	27	0.170	-0.349	0.323	-1.080	-0.996-0.298	0.285
	6. VR1M–VR2M	-4.00-2.00	-0.500	1.432	-1.912	29	0.066					
	VR1C–VR2C	-3.00-1.00	-0.500	1.202	-2.201	27	0.036	-0.153	0.262	-0.585	-0.679-0.372	0.561
	7. AL1M–AL2M	-6.50-2.50	-1.867	2.092	-4.886	29	0.000					
	AL1C–AL2C	-11.00-3.50	-1.357	2.815	-2.551	27	0.017	0.485	0.416	1.165	-0.349-1.318	0.249
	8. MQ1M–MQ2M	-41.00-7.00	-14.400	10.354	-7.617	29	0.000					
	MQ1C–MQ2C	-37.00-6.00	-14.250	10.284	-7.333	27	0.000	0.023	2.355	0.010	-4.697-4.743	0.992
APM	IQ1M–IQ2M	-7.00-6.00	-1.433	2.873	-2.733	29	0.011					
	IQ1C–IQ2C	-10.00-3.00	-2.107	2.948	-3.782	27	0.001	-0.384	0.651	-0.590	-1.689-0.921	0.558

SCL-90 subscales: SOM = somatization 12 items; O-C = obsessive compulsive 10 items; I-S = interpersonal sensitivity 9 items; DEP = depression 13 items; ANX = anxiety 10 items; HOS = hostility 6 items; PHOB = phobic anxiety 7 items; PAR = paranoid ideation 6 items; PSY = psychoticism 10 items; GSI = global severity index; PSDI = positive symptom distress; PST = positive symptom total

WMS-I subscales: PCI = personal and current information; OR = orientation; MC = mental control; LM = logical memory; DS = digit span; VR = visual reproduction; AL = associate learning; MQ = memory quotient

APM scale: IQ = intelligence quotient total score

Table 3. Psychiatry MCQ examination marks after intervention

Participants	Marks	
	Means	SD
Meditation group (n = 30)	33.607	3.087
Control group (n = 28)	35.049	2.847

p = 0.070, mean difference = -1.442, SE = 0.781, 95% CI = (-3.007)-0.123

Table 4. Number (percentage) of participants reporting perceived stressor(s) during intervention

Week/stressor	Economic		Academic		Courtship		Family		Others	
	Meditation n (%)	Control n (%)	Meditation n (%)	Control n (%)	Meditation n (%)	Control n (%)	Meditation n (%)	Control n (%)	Meditation n (%)	Control n (%)
1st	18 (60.000)	19 (67.857)	17 (56.667)	17 (60.714)	8 (26.666)	6 (21.429)	5 (16.667)	3 (10.714)	4 (13.333)	5 (17.857)
2nd	14 (46.667)	11 (39.286)	11 (36.667)	4 (14.286)	8 (26.667)	5 (17.857)	3 (10.000)	1 (3.571)	4 (13.333)	4 (14.286)
3rd	17 (56.667)	8 (28.571)	9 (30.000)	8 (28.571)	7 (23.333)	1 (3.571)	1 (3.333)	2 (7.143)	7 (23.333)	1 (3.571)
4th	16 (53.333)	13 (46.429)	15 (50.000)	12 (42.857)	4 (13.333)	2 (7.143)	1 (3.333)	5 (17.857)	5 (16.667)	3 (10.714)

Table 5. Number (percentage) of participants reporting substance(s) using during intervention

Week/substance consuming	Tea/caffeine		Alcohol		Psychotropic (s)		Other (s)	
	Meditation, n (%)	Control, n (%)	Meditation, n (%)	Control, n (%)	Meditation, n (%)	Control, n (%)	Meditation, n (%)	Control, n (%)
1st	16 (53.333)	12 (42.857)	1 (3.333)	2 (7.143)	0 (0.000)	0 (0.000)	0 (0.000)	0 (0.000)
2nd	8 (26.667)	6 (21.429)	2 (6.667)	1 (3.571)	0 (0.000)	0 (0.000)	0 (0.000)	0 (0.000)
3rd	13 (43.333)	10 (35.714)	3 (10.000)	1 (3.571)	0 (0.000)	0 (0.000)	0 (0.000)	0 (0.000)
4th	15 (50.000)	12 (42.857)	2 (6.667)	1 (3.571)	0 (0.000)	0 (0.000)	0 (0.000)	0 (0.000)

memory, intelligence, and academic achievement according to the SCL-90, Wechsler's Memory Scale-I, Raven' Progressive Matrices scales, and psychiatry exit MCQ examination score. Notwithstanding, the meditation group trended to have a decrease in its SCL-90 item score but the difference from the control group was not statistically significant. With respect to the SCL-90 profile, each symptom domain score for both the meditation and control groups was very low at the beginning, which would indicate a bottom effect on the measurement. All of the participants were of sound mental health, so the SCL-90 may not be sensitive for detecting the subtle mental changes due to meditation practice among normal mentally-healthy people. To date, there is strong evidence to support the efficacy of meditation for reducing subjective stressful feelings[4] and non-psychotic mood and anxiety disorder symptoms[10,20]. However, the evidence for the efficacy of mindfulness-based meditation to treat anxiety and depression is weak. The lack of evidence has not diminished the popularity of such interventions among the general Western population[21]. In accord with the capability of meditation to build a profound inner calmness and non-reactivity (emphasizing being, not doing of the mind), a specifically-validated questionnaire is probably needed.

Since the duration of the current study was only four weeks, it might not be sufficient time and practice to assess changes in memory function using Wechsler's Memory Scale form I and intellectual abilities by Raven's Progressive Matrices[22]. From the baseline data, the GPA of the control group was significantly higher than that of the meditation group, but the difference was not large and there was no statistically significant difference in the psychiatry exit multiple choice exam (MCQ) results. These two groups might have approximately the same level of intellectual performance and therefore meditation might not have any influence on their study performance.

Participants of the present study did not have any serious adverse events from meditation practice, consistent with other reports[12].

Due to time constraints and a relatively short duration of meditation practice, the effects of meditation on self-directed goal attainment might not have been measureable. When researching any potential calming effect that might be brought about by meditation, scales for measuring distraction and frequency of ruminative thoughts and behaviors need to be taken into account. Therefore, further study is warranted, especially if it includes qualitative data from each participant to provide more contextual understanding of any changes in phenomenological level of intra-personal experience.

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Potential conflicts of interest

None.

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การทำสมาธิแบบเฝ้าติดตามลมหายใจในนักศึกษาแพทย์มหาวิทยาลัยขอนแก่น: ผลต่ออาการทางจิตเวช ความจำ เชาวน์ปัญญาและผลการเรียน

สุชาติ พหลภาคย์, นวนันท์ ปิยะวัฒน์กูล,พูนศรี รังษีขจี, ธวัชชัย กฤษณะประกรกิจ, สุวรรณา อรุณพงค์ไพศาล, นิรมล พัจนสุนทร, สุรพล วีระศิริ, จินตนา สิงขรอาจ, สมจิตร หร่องบุตรศรี, ชนนิกานต์ อุดมศรี, ชณัติพร ชลไพร, พีรดา อุ่นไพร

วัตถุประสงค์: *เพื่อศึกษาผลของวิธีลดความเครียดด้วยการทำสมาธิแบบเฝ้าติดตามลมหายใจช่วงสั้นนาน 4 สัปดาห์ในนักศึกษาแพทย์ชั้นปีที่ 5 โดยศึกษาผลต่ออาการทางจิตเวชศาสตร์ ความจำ เชาวน์ปัญญา และผลสัมฤทธิ์ของการเรียน*

วัสดุและวิธีการ: *เป็นการศึกษาชนิด randomized control trial กลุ่มที่ทำสมาธิจะทำสมาธิแบบเฝ้าติดตามลมหายใจทั้งขณะหายใจเข้าและหายใจออกระหว่าง 8.00-8.20 น.ทุกวันก่อนที่จะไปเข้าเรียนประจำวัน กลุ่มควบคุมจะทำกิจกรรมตามปกติในอีกห้องหนึ่ง วัดอาการทางจิตด้วยแบบทดสอบ Symptom Checklist-90 (SCL-90) ความจำด้วยแบบทดสอบ Wechsler Memory Scale_I (WMS-I) เชาวน์ปัญญาด้วยแบบทดสอบ Advanced Progressive Matrices (APM) และผลสัมฤทธิ์ของการเรียนด้วยคะแนนสอบปรนัยวิชาจิตเวชศาสตร์ สถิติที่ใช้คือ สถิติ ancova*

ผลการศึกษา: *นักศึกษาแพทย์จำนวน 58 คน ในขณะที่มาเรียนวิชาจิตเวชศาสตร์ระหว่างเดือนมิถุนายน พ.ศ. 2551 ถึงเดือนพฤษภาคม พ.ศ. 2552 สมัครใจเข้าร่วมกับการศึกษา ได้แบ่งนักศึกษาจำนวนนี้ด้วยวิธีสุ่มเป็นกลุ่มที่ฝึกทำสมาธิทุกวัน 30 คน อีกกลุ่มหนึ่งเป็นกลุ่มควบคุม 28 คน ผลการศึกษาพบว่าเมื่อสิ้นสุดการทำสมาธิ กลุ่มทำสมาธิและกลุ่มควบคุมไม่มีความแตกต่างอย่างมีนัยสำคัญในคะแนน SCL-90 WMS-I APM และคะแนนสอบ MCQ วิชาจิตเวชศาสตร์*

สรุป: *ในกลุ่มคนสุขภาพจิตปกติ เชาวน์ปัญญาดี การทำสมาธิช่วงสั้นชนิดเฝ้าติดตามลมหายใจอาจจะไม่ทำให้เกิดการเปลี่ยนแปลงในอาการทางจิตเวช ความจำ เชาวน์ปัญญา และผลสัมฤทธิ์ทางการเรียน*