Original Article

Factors Affecting Learning Achievement of the 2nd Year Medical Cadet at Phramongkutklao College of Medicine in Medical Physiology Course

Phunphen Napradit

Department of Physiology, Phramongkutklao College of Medicine

Abstract:

Background: *Teaching and learning processes in physiology course at Phramongkutklao College of Medicine (PCM) has been developed to effectively facilitate students' learning. Furthermore, PCM's medical curriculum will be reformed in academic year 2016. Therefore, it is necessary to make understand and focus on the factors affecting learning outcome.* ***Objective:*** *To describe learning achievement and their affecting factors in physiology course of the 2nd year PCM medical cadets.* ***Methods:*** *A total of 104 medical cadets enrolled the study in the 1st semester of the academic year 2015. The data were collected through a self-report questionnaires and educational scores in physiology course.* ***Results:*** *A mean and a standard deviation of educational scores were 70.35(7.60). Fifty-six medical cadets were classified as the above mean value group and the rest forty-eight were classified as below mean value group. The former group had 1st year GPA significantly higher than the latter group. The 1st examination score and educational scores were significantly correlated with 1st year GPA. Medical cadets who lived outside Bangkok and vicinity were more likely to have educational scores below mean value. The factors that affected with learning achievement at the beginning of the course were self, medical cadets' adaptation for military environment, lecturers' characteristics, instructional system and learning/teaching process, respectively. At the end of the course, medical cadets' adaptation were developed leading to improve learning achievement.* ***Conclusion:*** *The reform of PCM's medical curriculum is proposed to facilitate medical cadets' learning and the factors affected learning achievement should be appropriate administered.*

Keywords: ● *Learning achievement* ● *Medical cadet* ● *Physiology course*

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Requests for reprints should be addressed to Col. Phunphen Napradit, Department of Physiology, Phramongkutklao College of Medicine, ถนนราชวิถี เขตราชเทวี, Bangkok. 10400

นิพนธ์ต้นฉบับ

ปัจจัยที่มีผลต่อผลสัมฤทธิ์ทางการเรียนในรายวิชาสรีรวิทยาของนักเรียนแพทย์ทหาร วิทยาลัยแพทยศาสตร์พระมงกุฎเกล้า ชั้นปีที่ 2

พรรณเพ็ญ นาประดิษฐ์
ภาควิชาสรีรวิทยา กองการศึกษา วิทยาลัยแพทยศาสตร์พระมงกุฎเกล้า

บทคัดย่อ

ความเป็นมา *กระบวนการเรียนการสอนรายวิชาสรีรวิทยาที่วิทยาลัยแพทยศาสตร์พระมงกุฎเกล้า (วพม.) ได้รับการพัฒนาเพื่อให้การเรียนรู้มีประสิทธิภาพ ประกอบกับในปีการศึกษา 2559 จะมีการปรับปรุงหลักสูตรของ วพม. ดังนั้นจึงจำเป็นที่จะต้องเข้าใจและให้ความสำคัญกับปัจจัยที่มีผลต่อผลการเรียนรู้* ***วัตถุประสงค์*** *เพื่อประเมินผลสัมฤทธิ์ทางการเรียนและปัจจัยที่มีผลต่อการเรียนของนักเรียนแพทย์ทหาร วพม. ในรายวิชาสรีรวิทยา* ***วิธีการ*** *ศึกษาในนักเรียนแพทย์ทหารทั้งหมด 104 นาย ในภาคการศึกษาที่ 1 ปีการศึกษา 2559 โดยใช้แบบสอบถามและคะแนนผลการศึกษารายวิชาสรีรวิทยา* ***ผลการศึกษา*** *คะแนนเฉลี่ยและส่วนเบี่ยงเบนมาตรฐานของผลการศึกษารายวิชาสรีรวิทยาเท่ากับ 70.35 (7.60) นักเรียนแพทย์ทหาร 56 นาย มีคะแนนผลการศึกษาสูงกว่าค่าเฉลี่ยและได้เกรดเฉลี่ยสะสมในชั้นปีที่ 1 สูงกว่ากลุ่มที่มีคะแนนน้อยกว่าค่าเฉลี่ยซึ่งมีจำนวน 48 นาย คะแนนการสอบครั้งที่ 1 และผลการศึกษารายวิชาสรีรวิทยามีความสัมพันธ์กับเกรดเฉลี่ยสะสมในชั้นปีที่ 1 อย่างมีนัยสำคัญทางสถิติ นักเรียนแพทย์ทหารที่มาจากต่างจังหวัดเสี่ยงที่จะได้คะแนนน้อยกว่าค่าคะแนนเฉลี่ย ปัจจัยที่มีผลต่อผลสัมฤทธิ์ทางการเรียนเมื่อเริ่มเรียนได้แก่ ตนเอง การปรับตัวเข้ากับสิ่งแวดล้อมแบบทหาร อาจารย์ กระบวนการจัดการเรียนการสอน ตามลำดับ เมื่อจบรายวิชานักเรียนแพทย์ทหารปรับตัวได้มีผลทำให้ผลสัมฤทธิ์ทางการเรียนดีขึ้น* ***สรุป*** *การปรับปรุงหลักสูตรแพทยศาสตรบัณฑิตของ วพม. และปัจจัยที่มีผลต่อผลสัมฤทธิ์ทางการเรียนควรจะได้รับการบริหารจัดการอย่างเหมาะสมเพื่อส่งเสริมการเรียนรู้ของนักเรียนแพทย์ทหาร*

คำสำคัญ: ● *ผลสัมฤทธิ์ทางการเรียน* ● *นักเรียนแพทย์ทหาร* ● *รายวิชาสรีรวิทยา*

เวชสารแพทย์ทหารบก 2559;69:151-8.

Introduction

Phramongkutklao College of Medicine (PCM) is Thailand's only military medical school and is an affiliated college of Mahidol University. PCM provides medical cadet with knowledge, skills, attitudes and ethics necessary to become competent physicians. Recruitment is only through the direct admission of the Consortium of Thai Medical Schools. Graduates from PCM are granted degree of Doctor of Medicine of Mahidol University and are appointed as military physicians for Royal Thai Army, Royal Thai Navy, Royal Thai Air Force and as civil physicians for Ministry of Public Health. The medical curriculum of PCM is divided into three program levels of six academic years (12 semesters). Pre-medical program (year 1) is studied at Faculty of Science, Kasetsart University which is a civil university. Pre-clinical program (year 2-3) which is basic medical sciences including: physiology, anatomy, biochemistry, microbiology, pharmacology, pathology and parasitology is provided at PCM. Clinical program (year 4-6) is at Phramongkutklao Hospital and PCM. Apart from the medical curriculum, medical cadets must complete military training throughout their course.

Physiology is a basic science course of medical curriculum. Understanding the mechanisms of the body functions is essential for clinical practice. Teaching physiology by Department of Physiology, PCM is provided to help student's learning process consists of lectures and laboratory exercises with small group session by providing some clinical case studies correlated to previous lectures, formative evaluation, review hours, computer-assisted instruction, documents and mentor advisory group. With an ongoing transformation of healthcare professional education and characteristics of the 21st century learners, teaching and learning processes in physiology course at PCM has been developed to effectively facilitate students' learning. In addition, PCM's medical curriculum will be reformed in next academic year (2016). Therefore, it is important to make understand and focus on the factors affecting learning outcome. Various factors have been similarly presented to affect the learning achievement of medical students, such as individual factors (motivation, ability, learning style, time management), demographic factors (sex, socio-economic status, stressful atmosphere) and instructional factors (curriculum, institutional context, teacher competency, facilities). When medical cadets enter to pre-clinical program at PCM, they have to face hard study in different environment as military medical school. Some medical cadets develop poor learning performance during the beginning of pre-clinical year. Thus, the objective of the present study is to describe learning achievement and their affecting factors in medical physiology course of the 2nd year PCM medical cadets.

Methods

A cross-sectional study was performed from September 2015 to January 2016. All of the 2nd year medical cadets (60 males, 44 females) enrolled in physiology course in the 1st semester of the academic year 2015 were included and informed about the purpose of the study. The data were collected through a self-report questionnaire and educational scores in physiology course. Questions in the questionnaire were provided with tick boxes containing the corresponding answer according to each items and text boxes where participants could give additional opinions or further information about their response choices. The questionnaires included sociodemographic data, pre-medical year cumulative grade point average (1styear cGPA), reason to study at PCM, satisfaction to physiology learning outcome and the factors that might affect their learning outcomes. Five factors were selected and modified after discussion with lecturers of Department of Physiology, PCM before

put in the questionnaires. These factors included individual factors, medical cadets' adaptation for military environment, lecturers' characteristics, instructional system/learning-teaching process and environmental/facilities factors. Participants were also asked to rank the factors and their associated variables in order of importance that affected to their learning achievement 2 times; at the start (October 2015) and the end (January 2016) of the physiology course. The rank order was on scale from 1 (most affecting) to 5 (least affecting) and x (not affecting). The questionnaires were manually distributed to all of the 2nd year medical cadets. The time given for answering questionnaire was 20-30 minutes. Medical cadets who could not complete to rank the factors that affected to their learning achievement both times were excluded.

The physiology course contents of the 1st semester consisted of cell physiology, nerve, muscle, respiratory and cardiovascular system. The number of the physiology course's credit was 4 which the score percentage of lecture: laboratory was 75:25. The outcome for learning achievement used for analysis was educational scores after the end of the physiology course. The 1st examination scores was 19% of lecture scores used as the basis for monitoring learning achievement throughout the physiology course. The pre-medical year cGPA was obtained from registry records.

Statistical analysis

Data were analyzed using SPSS version 23. Reported values for continuous data were presented as mean ± standard deviation (SD) and for categorical data were percentage. Independent-samples T test was used for comparison between two groups. Odds ratio with 95% confidence interval and p-values were calculated by using logistic regression to compare outcomes between groups. To determine the association among the pre-medical year cGPA and educational scores, Pearson's correlation coefficient was used. Statistical significance was defined at p-value less than 0.05.

Results

Demographic comparisons from the questionnaires were shown in Table 1 and Table 2. The male to female ratio was about 3:2. The average age of medical cadet was 19.8 ± 0.7 years (max = 21 yrs, min = 18 yrs). Thirty (28.8%) medical cadets lived outside of Bangkok and vicinity (Nontaburi, Pathumthani, Samutprakan). Most students (55.2%) were able to pass the direct admission to PCM with last ranking (the 4th ranking). The majority had motivation to study medicine. Thirty-six point six percent of medical cadets reported that they intended to study medicine at PCM. The minority (5%) came to study because of parent desires. Almost students had been to tutorial school prior university entrance exam. Fifty-five point nine percent of medical cadets satisfied to learning outcome in physiology course. Some felt unsatisfied and answered open-ended question that they intended to pay more attention further in the 2nd semester.

Table 2 showed that the mean and SD of the 1st examination score and educational scores were 64.50 ± 10.7 and 70.35 ± 7.6, respectively. Both scores were significantly and positively correlated with pre-medical year cGPA ($r = 0.364$ and $r = 0.567$, $p < 0.001$), respectively. The educational scores of physiology course were categorized into 2 groups by using a mean score to discriminate between above mean value group and below mean value group. Fifty-six (53.8%) medical cadets were classified as the above mean value group and the rest forty-eight (46.2%) were classified as below mean value group. The former group had pre-medical year cGPA average significantly higher than the latter group in which 30 (62.5%) were male. When compared

Table 1 Characteristics of medical cadets classified into above mean score and below mean score group

	No. (%)	Mean value of physiology scores	
		> Mean score	< Mean score
All	104 (100%)	56 (53.8%)	48 (46.2%)
Male	60 (57.7%)	30 (50.0%)	30 (50.0%)
Female	44 (42.3%)	26 (59.1%)	18 (40.9%)
Living area			
Bangkok & vicinity	74 (71.2%)	45 (60.8%)	29 (39.2%)
Outside of Bangkok & vicinity	30 (28.8%)	11 (36.7%)	19 (63.3%)
Ranking chosen to PCM with direct admission			
1st	13 (13.5%)	8 (61.5%)	5 (38.5%)
2nd	10 (10.4%)	4 (40%)	6 (60%)
3rd	20 (20.8%)	12 (60%)	8 (40%)
4th	53 (55.2%)	29 (54.7%)	24 (45.3%)
Reason to study at PCM			
Intend	37 (36.6%)	18 (48.6%)	19 (51.4%)
Pass exam	50 (49.5%)	29 (58%)	21 (42%)
Parent desire	5 (5.0%)	2 (40%)	3 (60%)
Other	9 (8.9%)	6 (66.7%)	3 (33.3%)
Tutorial system			
Yes	96 (94.1%)	51 (53.1%)	45 (46.9%)
No	6 (5.9%)	4 (66.7%)	2 (33.3%)
Adaptation level			
Good	11 (10.8%)	9 (81.8%)	2 (18.2%)
Fair	74 (72.5%)	42 (56.8%)	32 (43.2%)
Less	17 (16.7%)	4 (23.5%)	13 (76.5%)
Satisfaction to learning outcome in physiology course			
Satisfied	57 (55.9%)	37 (64.9%)	20 (35.1%)
Unsatisfied	45 (44.1%)	18 (40%)	27 (60%)

Table 2 Mean ± SD of age, premedical year cGPA, 1st examination score and educational scores of physiology course.

	Total	Mean value of educational scores		p value
		> Mean value	< Mean value	
Age (year)	19.8 ± 0.7	19.7 ± 0.7	19.8 ± 0.7	0.31
	(21 - 18)	(21 - 18)	(21 - 19)	
Pre-medical year GPA	3.35 ± 0.35	3.49 ± 0.28	3.18 ± 0.37	< 0.001*
	(3.92 - 2.13)	(3.92 - 2.65)	(3.77 - 2.13)	
1st examination score (%)	64.50 ± 10.7	71.01 ± 8.3	56.89 ± 7.7	< 0.001*
	(86.8 – 38.2)	(86.8 – 54.4)	(70.6 – 38.2)	
Educational scores of	70.35 ± 7.6	75.98 ± 4.2	63.79 ± 5.1	< 0.001*
physiology course (%)	(86.7 – 50.2)	(86.7 – 70.6)	(70.3 – 50.2)	

*Significant different between above mean score and below mean score group, $p < 0.05$. Value in parenthesis are max - min

to gender, logistic regression analysis showed that the percentage of female medical cadet had educational scores above mean value more than male but not significant difference (OR = 1.44, 95%CI: 0.66-3.17; p > 0.05). The Educational scores in physiology course were also significantly associated with living area. Nineteen of thirty (63.3%) medical cadets who lived outside Bangkok and vicinity were more likely to have educational scores below mean value (OR = 2.68, 95%CI: 1.12-6.44; p < 0.05). Most medical cadets answered that they were able to adapt themselves to PCM's environment. But medical cadets who were less adaptation had educational scores below mean score.

The factors that affected learning achievement at the start of the physiology course were their own individual factors, followed by medical cadets' adaptation for new environment, lecturers' characteristics, instructional system/learning-teaching process and PCM's environment/facilities, respectively (Table 3). Individual factors were exhaustion from basic cadet training, careless in study, lack of motivation in studying medicine and playing computer games. Moreover, in depth reasons from the open-ended questions were less time, less adaptation from being civilian to being more discipline in military environment at PCM, health problem (Flu, mental), unreadiness to learn, more extra activities: (sport (syringe game), marching), difficulty of physiology context, frequent exam (every weeks), using English language, inaccessible internet system, limitation to use mobile device, seat location in classroom and etc.

At the end of the course, the percentage of medical cadets who ranked adaptation to military environment factor and environment/facilities factor in order of importance was decreased as shown in Table 3. Medical cadets' adaptation to PCM environment were developed leading to improve learning achievement. The number of medical cadets who was able to pass physiology course in the final examination was more than in the 1st examination. At finally the physiology course score or educational scores was increased as demonstrated in Table 2.

Discussion

The factors that affect learning achievement are factors associated with learner, learning process and environment factor[1-3]. The factors related to learner are demographic factors (age, gender, family socioeconomic) and motivation, ability, condition of the learner. A previous study[4] found that female medical student had better performance on learning achievement than male medical student. Likewise a study of Sitticharoon et al.[3], no significance difference in physiology scores between genders was detected in the present study. Previous studies[3,5] have demonstrated that pre-medical GPA was related to learning achievement in pre-clini-

Table 3 The percentage of medical cadets ranked the factor that affected to their learning achievement at the start and the end of the physiology course

Factors	The start of course	The end of course
Individual factors	51.4	74
Adaptation for military environment	37.1	12
Instructional system learning/teaching process	8.6	7.9
Environment/facilities	8.6	4
Lecturers' characteristics	2.9	7

cal year. The present result also revealed that the 1st year GPA during the pre-medical class could be used to predict learning achievement in physiology course. Thus, medical students should be stimulated to pay more attention to learn during studying pre-medical class at Kasetsart University. Living area tended to have an influence to physiology score in the present study. To monitor and early advice male students from outside of BKK & vicinity area who have 1st year GPA < 3.18 by advisor could help medical cadet to achieve educational outcomes. Homesickness, language barriers and stress were also important for academic success and may deal to hometown location[1]. However, more structured studies are required before jump into conclusion.

In addition, it is important to focus on the effect of the related factor for physiology learning. One of these factors is adaptation to PCM system at the start of the course. According to the nature of medical cadets, they were quite young and accustomed to tutorial system but not familiar with basic cadet training. Therefore, facing to new environment, following cadets' regulations and rules at the start of pre-clinical program at PCM as well as had not enough extra time could impact their learning performances. Bickerdike and colleges[6] have shown that poor time management factor was associated with reduced academic achievement. In the present study, duration for one semester was about 4 months, some medical cadets could adapt themselves and that might result in higher mean score at the end of physiology course. When medical cadets have adapted themselves and have reached a more mature level in higher year, the effect of these factors would be decreased. Medical cadets who less adapt or choose to learn on the wish of others may have academic problems. A review showed that motivation was one of the important factors for academic achievement[2]. Apart from individual factors, curriculum management, learning activities and lecturer support enhance the student's motivation. There are numerous learning/teaching modules and concepts in digital era that can help increased student's motivation. In order to increase learning achievement in pre-clinical year in PCM, the process of adaptation training from civilian to medical cadets should be in short duration but effectiveness and the curriculum management system should be suitable for PCM's environment. The reform of PCM's medical curriculum was proposed and would be implemented in the next academic year (year 2016) to facilitate medical cadets' learning outcomes. It was transformed from a course-based curriculum to a block-based curriculum involving an integrated normal structure, normal function and more integrated learning of the basic sciences with the clinical program as well as providing a collaborative learning, social skills, interpersonal skills, teamwork skills, communication skills and using information technology. It is anticipated that the reform curriculum will be suited for the medical students in the 21st century. The factors affected academic achievement should also be administered appropriately in accordance with the new curriculum.

In conclusion, the present findings could contribute administrators and lecturers understand medical cadets more and give them guidance to improve learning achievements when they finish the pre-medical year from civil university and enter to military environment in pre-clinical year at PCM. The factors affected learning achievement which medical cadets gave opinion should be discussed and made them better; such as many cadet activities after class, frequent examination, using english language and how to apply basic sciences to clinical class. The characteristics of the

lecturers (the ability to explain, answering students' questions, stimulating students to learn, and making the classroom atmosphere for learning) and teaching methods should be modified. Some medical cadets also have to modify their attitudes, learning style and behavior if they intend to achieve in studying medicine. Facilities (internet system, teaching materials, learning resources) should be provided appropriately. Finally, the policy, goals, structure and content of pre-clinical curriculum, duration and sequencing of courses, appointing course directors should be continually evaluated.

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