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Learning pharmacology through peer tutoring☆

Indah Puspasari Kiay Demak[a,*], Andi Alfia Muthmainnah Tanra[b], Nur Syamsi[b], Rosmala Nur[c], Rosa Dwi Wahyuni[d]

[a] Medical Education Unit, Faculty of Medicine, Tadulako University, Indonesia
[b] Department of Pharmacology, Faculty of Medicine, Tadulako University, Indonesia
[c] Public Health Department, Faculty of Public Health, Tadulako University, Indonesia
[d] Doctoral Program of Public Health Faculty, Hasanuddin University, Indonesia

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ABSTRACT

Objective: Knowing the effectiveness of peer tutoring methods in pharmacology learning for medical students.
Method: This was a quasi-experimental study with a post-test only design. Subjects were second-year medical students who were divided into four control groups and four experimental groups. Students in the experimental group experienced peer tutoring methods. The difference in motivation and performance scores in both groups was analyzed using *t*-tests.
Results: Motivation in the experimental group was higher than in the control group, for interest motivation (79.09 ± 13.11 vs 75.24 ± 13.46; $p = 0.411$), value motivation (80.89 ± 11.57 vs 76.54 ± 12.20; $p = 0.292$), perceived motivation (66.26 ± 7.44 vs 666.20 ± 10.09; $p = 0.977$), and as well as total (76.33 ± 9.33 vs 73.31 ± 10.30; $p = 0.159$). The performance score in the control group was higher than the treatment group (60.45 ± 6.39 vs 60.67 ± 4.72; $p = 0.649$).
Conclusion: Quality control, monitoring, and evaluation are required to produce an effective peer tutoring program. One of which is through rigorous peer tutor recruitment, tutor training, and ensuring the commitment of the peer tutors.

Introduction

The demands of the medical profession are currently very high so that medical education institutions are expected to be able to produce competent medical graduates who are ready to provide the best service in their respective workplaces. Therefore, medical education institutions must be able to organize an educational process that can support students in increasing their knowledge, skills, and professional attitude.[1]

Pharmacology is one of the subjects taught in preclinical education in medical education institutions. Without understanding pharmacology, a doctor will have difficulty in providing rational treatment that is based on the accuracy in drug administration, dosage, dosage form, method of administration as well as estimating the effects of drugs given. Rational treatment will guarantee the achievement of safety and efficacy in health services, both for patients and doctors, so as to prevent the occurrence of malpractice that is common in clinical practice.[2]

The problem is that based on data from Medical Faculty Tadulako University, the means score of the pharmacology test ranges from 60 to 70 in each block. These results indicate that the ability of students to comprehend lessons is far from optimal. These results can be influenced by several factors, such as learning styles and learning methods.

Delivering lecture in a large class is one of the conventional methods which is still widely used at the undergraduate medical education. Methods like this depend on the ability of the lecturer to explain the material and generally can only be captured well by students in auditory learning styles. Nowadays, many innovative learning methods have begun to be developed and can fill the shortcomings of the lecture method. Some methods developed include problem-based learning and peered assisted learning.[3,4]

Peer-assisted learning is one method that is considered efficient and innovative in which students are directly involved in the learning process. One form of peer-assisted learning is peer tutoring. Some previous studies show PAL, according to students, is a collaborative and cooperative learning strategy that provides many benefits both for tutees and tutors. This method generates a closer relationship and better communication between students and their tutors than the conventional lecture so that students could better understand the material.

This method can also increase students' confidence and communication skills.[3] Besides, the comfort that arises while implementing this method can reduce the psychological pressure commonly felt in conventional learning so that students can more easily capture the material taught. Furthermore, the peer learning application does not require the presence of a lecturer. This is very helpful for lecturers in managing lecturer time that is already very crowded. Technological developments that allow lecturers to face-to-face with students indirectly using Internet assistance

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* Corresponding author.
E-mail addresses: sashkata@yahoo.com, pmc@agri.unhas.ac.id (I.P.K. Demak).

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can help lecturers monitor how the learning process is carried out by the students themselves. Therefore, the application of peer tutoring in the pharmacological learning process at The Medical Faculty Tadulako University can be an alternative method for maximizing student learning outcomes.

Methods

Design

This was a quasi-experimental study with a post-test only design. The implementation of this research was by giving two different conditions to two groups of students. The peer tutoring method was applied to the experimental group.

Population and study setting

The subjects were 86 second-year students of Medical School Tadulako University, Palu. They were divided into both four experimental and control groups by considering the equality of the characteristics of pharmacological scores and GPA (Grade Point Average). Those in the experimental group were called tutees. At the same time, there were four third-year students that became tutors. Tutors were chosen from assistant lecturers at the Pharmacology Department. Both tutees and tutors have attended separated training in peer tutoring.

The research began with Peer tutoring training for 3×2 h of teaching assistants with the role of peer tutors and specific pharmacological themes discussed. After that, the tutee training was conducted for about two hours about how the peer tutoring process.

The Peer tutoring method is applied after the lecture, and practical material is given by lecturers. Students were given a worksheet that must be discussed together as a group and must be answered. The peer tutoring method will be facilitated by a tutor for each group at the specified time in the campus environment. Students will express their opinions in accordance with the worksheet obtained. Students may see references either from books or from the Internet. The tutor will help direct the student discussion by asking questions or answering the problem. The peer tutoring process lasted for two hours and was monitored directly by a lecturer online.

In the final stage, all students were conducting a plenary discussion to present the results of their discussions during the peer tutoring implementation. Every student is connected to the Internet connection with the lecturer, who leads the plenary. Plenary takes place remotely for 2 h.

Variables

The variables of this study were performance, which was gathered from both practical and final tests, and motivation of the experimental and control group.

Table 1
Subjects characteristic.

Characteristic	Total	Percentage
Sex		
Male	30	34.9%
Female	56	65.1%
Age		
17	1	1.2%
18	1	1.2%
19	30	34.9%
20	53	61.6%
21	1	1.2%

Data collection

Students' comprehension of the material provided was assessed in the form of activeness in the plenary discussion and the form of practical and final examinations; both tests were conducted after peer tutoring. Practicum exams were carried out by doing essay assignments. Furthermore, the final exam consisted of five multiple-choice questions. The students also filled out the motivation questionnaire after. The questionnaire comprises 22 questions with a four Likert scale, which is strongly agreed, agree, disagree, and strongly disagree. The score of performance and motivation was converse to a 100 maximum score.

Data analysis

Comparison of Pharmacology scores and motivation between the treatment group and the control group were measured using the independent *t*-test.

Ethical aspect

This research was approved by the ethics committee of the Faculty of Medicine Tadulako University.

Results

The study was conducted in April–July 2019. The respondents were second-year 86 medical students. There are more women than men. And the most age is at 20 years.

Tables 1 and 2 show that motivation in the treatment group was higher than in the control group, both interest motivation (79.09 ± 13.11 vs 75.24 ± 13.46; $p = 0.411$), value (80.89 ± 11.57 vs 76.54 ± 12.20; $p = 0.292$), perceived (perceived) 66.26 ± 7.44 vs 666.20 ± 10.09; $p = 0.977$), and total (76.33 ± 9.33 vs 73.31 ± 10.30; $p = 0.159$). Even so for the results of statistical analysis using the t test showed no significance for the difference.

Table 3 shows that the value in the control group was higher than the treatment group (60.45 ± 6.39 vs. 60.67 ± 4.72; $p = 0.649$). Although not statistically significant because of the value of $p > 0.05$.

Table 2
The difference in motivation.

Motivation	Group	Student	Minimum	Maximum	Means	Standard deviation	*p*-Value
Interest	Intervention	41	50	100	79.09	13.11	0.411
	Control	45	42.86	96.43	75.24	13.46	
Value	Intervention	41	58.33	100	80.89	11.57	0.292
	Control	45	52.78	100	76.54	12.20	
Perceived	Intervention	41	54.17	79.17	66.26	7.44	0.977
	Control	45	45.83	91.67	66.20	10.09	
Total	Intervention	41	57.95	93.18	76.33	9.33	0.159
	Control	45	51.14	93.18	73.31	10.30	

Table 3
The difference in performance.

Group	Student	Minimum	Maximum	Means	Standard deviation	*p*-Value
Intervention	41	44.60	75.20	60.45	6.39	0.649
Control	45	48.00	68.60	60.67	4.72	

Discussion

Peer tutoring is a teaching and learning concept in which students teach other students. The teacher is called a tutor, and the student is called tutee. The tutor can be at the same or above level with tutees.[5,6] The tutors in this peer tutoring method are one-year seniors, and they also act as Pharmacology teaching assistants.

Learning can be seen as a modification and adaptation of pre-existing knowledge, while teaching is the medium for implementing it. The stronger the network of knowledge between tutor and tutee, the higher the tutor's understanding and ability to help with tutoring. In order to learn something new, there must be an appropriate distance between prior knowledge and new. This cognitive distance may be more easily felt and channeled by peer tutors than lecturers of the courses. Peer tutoring can also present social congruence where tutors can motivate tutees to use more time and effort to learn.[7] That is why the total value of tutees' motivation was higher in the experimental group than the control group.

Tutoring assistance in teaching lesson material offers interest in empowering tutees and is often considered to be the most valuable outcome of the peer tutoring program.[8,9] Student tutors themselves are considered to understand the students' difficulties in learning better and may determine the tutee's basic knowledge.

The learning environment using the peer tutoring process is more comfortable and cooperative so that students can freely ask questions and discuss their learning issues.[10] This can only be facilitated by cognitive closeness, which provides a better position for the tutor to explain.

Unfortunately, the result of the performance evaluation is somewhat different from motivation. The control group had a higher mean value, although it did not differ significantly from the treatment group. Walsh et al. and Knobe et al. stated that students who are not taught by peer tutors have higher grades than those taught. This is likely due to more complex learning content, especially procedural ones that can only be conveyed better by trained instructors.[11,12]

A review by Williams shows that many other studies perform better in the peer learning group than not even though almost all of them are randomized controlled studies that assess skills.[13] This review shows that peer learning in health colleges is effective in practical training but may not be useful in theoretical learning. In addition, this review also shows that the most benefited party in the peer tutoring process is the tutor.

Some research shows an increase in tutors' grades and abilities in the theory and skills test. Tutors tend to understand and remember the concepts they teach compared to just learning from others. The study also showed that tutors' confidence played a significant role in their performance.

A high standard of peer tutoring implementation can be achieved if tutors can be properly trained and supervised. Various interventional studies have applied this with various duration and content. This preparation class can be added or even replaced with additional lessons such as manuals or self-learning models. Even in some structured training, concepts have been published, such as implementing standard 2×4 h training for all tutors. The training taught how to correctly explain Peyton's 4-step teaching approach, dealing with difficult situations in teaching and recording tutor teaching videos, which then continued with feedback. This process requires proper guidance before tutors are deployed in order to achieve excellent performance as well.[13,14]

Conclusion

Student motivation increases in the experimental group than in the control group, even though it is not statistically significant. In comparison, the performance score is lower than the control group. Therefore, if peer tutoring program wants to continue to be implemented, qualified quality control is required, one of which is through rigorous peer tutor recruitment, tutor training, and ensuring the commitment of the peer tutors. In addition, periodic monitoring and evaluation are needed, especially regarding the implementation of the peer tutoring program, so that problems can be identified and used as an evaluation for the improvements to the program.

Conflict of interests

The authors declare no conflict of interest.

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