

A STUDY OF EFFECT OF SPACED EDUCATION METHOD IN SUBJECT PATHOLOGY FOR UNDERGRADUATE STUDENT IN MEDICAL COLLEGE

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ABSTRACT

Background: Spaced education is a learning method in which knowledge is provided with repetition over a longer time period. Medical students struggle to retain academic pearls and often forget with time. By spaced education method, student is reminded for academic pearls for longer time. This is an innovative learning method that can be delivered electronically on a mobile smartphone. This study investigated whether online spaced education could prospectively improve students retention of medical knowledge. **Aim & Objective:** To know the effect of spaced education upon learning of the medical students. **Method:** This cross-sectional analytical study was carried out on IInd Prof MBBS student studying pathology subjects. Four topics related to “liver” pathology were taught to them through didactic lectures. Than one group was spaced educated on two topics via WhatsApp group for one month. In the same way other group was spaced educated on other two topics. After completion of one month of ‘spaced education’ of each individual topic, learning of each topic on both groups was assessed by 20 validated multiple-choice questions. **Results:** 54 students met the criteria of the study. The obtained grades were divided in likert scales. Unpaired t-test was applied for comparing the mean of obtained marks. It showed a high statistical significant association with spaced education ($t=7.85$, $p\text{-value} = 0.00001$) **Conclusion:** The present study found highly significant effect of spaced education upon learning of students. Most topics proved to be successful in enhanced learning of students through intervention of spaced education.

Keyword: Academic - pearls, Learning, Spaced Education, WhatsApp,

INTRODUCTION

Retaining medical knowledge among medical students always remains of great concern. Retention can be done by the repetition of concepts. It has been proved that spaced education is a novel, evidence-based form of online education, which helps in knowledge acquisition in randomized trials. (1,2,3) It was seen that the repetition of Clinical pearls was associated with significantly higher test scores in interns(4). The first time Ebbinghaus gave the concept of forgetting curves in 1885. He concluded that 40% forgotten in under 5 minutes It was found that spaced education was a tool which helped him in maintaining the skills in procedures that are not performed frequently in clinical practice. (8) es(5). It

was again proved by a study on retention of cardiopulmonary skills, which showed a rapid linear and substantial decay in skill in the year following training. It showed very few subjects appeared capable of administrating effective CPR after three years – the time at which re-training was likely to take place. It was clear that refresher CPR training should take place much sooner. (6) Paul Kelley was the first researcher to explain the spaced learning techniques. According to this technique, our minds are like a filing room. Every time we learn and absorb new information, it gets filed under temporary and if we repeat that information and reinforce it, then that information gets moved to the

long term memory filing cabinet. If we do not repeat or reinforce this information than after some time, our mind clears it from the temporary cabinet to make room for new learnings. (7) Spaced learning is a powerful tool to make long term memories of information or knowledge. Spaced interval education is a well-validated learning tool that appears underused in medical education. Spaced education was also used twice by a third-year medical student to keep him in touch with the basic sciences during clinical rotations. It was found that spaced education was a tool which helped him in maintaining the skills in procedures that are not performed frequently in clinical practice. (8) Our aim of this study done in pathology subject is to generate long term learning and memories so that medical student become more knowledgeable and better informed medical graduate.

MATERIAL AND METHODS

Study design – Randomized interventional study

Study duration– Three months (Nov. 2018–Jan. 2019)

Inclusion criteria– All IInd M.B.B.S. professional students willing for participation and attended all four didactic lectures and ready to appear in assessment via multiple-choice questions (MCQ) after taking informed consent.

Exclusion criteria– Students unable to attend all four didactic lectures or assessment.

Sample size – Out of 110 students, 54 fulfilled the inclusion criteria and took part in the study.

Methodology of data collection – First of all, all eligible students of IInd professional batch (2017) were delivered didactic lecture in traditional manner on selected four topics of pathology subject on jaundice, Liver function test (LFT), cirrhosis, and alcoholic liver disease(ALD). After that, the whole batch is randomly divided into two different groups (A&B). Both of them underwent intervention through space education one week later on different topics. Initially, group A was provided spaced education on topics of Jaundice and LFT whereas group B was given spaced education on topics cirrhosis and ALD.

The mode of spaced education was sending academic pearls via WhatsApp group. This intervention was continued till one month. After completion of one month, both of these groups had been exchanged their topics for spaced education purpose and it also continued for one month.

Lastly, after completion of two rounds of spaced education in both groups, all were subjected for assessment based on 20 item multiple-choice questions (MCQ). Based on the marks obtained, all students' learning was categorized into four grades using likert scale.

These grades were excellent, good, and average and poor based on the following marks obtained –

Excellent	- >90%
Good	- 80-90%
Average	- 60-80%
Poor	- <60%

All the obtained data was entered compiled and analyzed using SPSS version 23. Chi-square test was applied to show the association between the learning of students and spaced education for each topic separately. Unpaired t-test was also applied to see the effect of spaced education upon learning of students by comparing the mean of marks obtained in assessment by both groups.

Ethical Approval: - Approval was obtained from the institutional ethical committee prior to the commencement of the study.

RESULTS

In present study, all eligible 54 students were divided into two groups and underwent intervention through spaced education on four various topics of pathology. On analysis of marks obtained in assessment, present study found a significant association of learning of students with spaced education by applying chi-square test.

Table 1 show 44.4% students belonging to spaced education group performed excellent learning in assessment of topic of Jaundice while 48.2% performed poor who did not get spaced education. It was found a highly statistically significant association. (X² value =15.06, p-value = 0.001)

Table1. Association between learning of students and spaced education on the topic of Jaundice (n= 54)

Learning	Spaced education		Not spaced education	
	No.	%	No.	%
Excellent	12	44.4	4	14.8
Good	8	29.6	5	18.5
Average	6	22.2	5	18.5
Poor	1	3.8	13	48.2
Total	27	100	27	100

*X² value = 15.06, p value = 0.001

Table 2 shows about 40.8% of students of the spaced education group had average learning whereas 14.8% of students got excellent learning from the non-spaced education group on the topic of LFT.

This finding was also found as statistically significant. (X² value =9.72, p-value = 0.02).

Table2. Association between learning of students and spaced education on the topic of LFT (n= 54)

Learning	Spaced education		Not spaced education	
	No.	%	No.	%
Excellent	6	22.2	3	11.1
Good	8	29.6	5	18.5
Average	11	40.8	7	26.0
Poor	2	7.4	12	44.4
Total	27	100	27	100

* X² value = 9.72, p value = 0.02

There was no statistically significant association on the topic of cirrhosis. (X² value = 6.67, p-value = 0.08) shown in Table 3.

Table3. Association between learning of students and spaced education on the topic of Cirrhosis (n= 54)

Learning	Spaced education		Not spaced education	
	No.	%	No.	%
Excellent	5	18.6	2	7.4
Good	9	33.3	6	22.2
Average	10	37.0	8	29.6
Poor	3	11.1	11	40.8
Total	27	100	27	100

*X² value = 6.67, p value = 0.08

Table 4 showed that on assessment of topic of ALD, 33.3% of students from spaced education group had average learning. On contrast, from the non-spaced education group, only 7.4% of students got excellent learning. It was found a statistically significant association. (X² value =8.71, p-value = 0.03).

Table4. Association between learning of students and spaced education on the topic of ALD (n= 54)

Learning	Spaced education		Not spaced education	
	No.	%	No.	%
Excellent	7	26.0	2	7.4
Good	8	29.6	6	22.2
Average	9	33.3	7	26.0
Poor	3	11.1	12	44.4
Total	27	100	27	100

*X² value = 8.71, p value = 0.03

In the present study, for comparing the mean of marks obtained in assessment by both of these groups, unpaired t-test was applied and it was also found very highly statistically significant (t = 7.85, p-value = < 0.00001)

DISCUSSION

The present study is a novel step to reinforce key academic pearls through applying the concept of spaced education in students IInd prof studying pathology. Spaced education is an evidence-based form of education which has been proved to improve knowledge acquisition and to boost knowledge retention. Spaced education enhances the effect of traditional face-to-face lectures (2). Repeated reinforcement of learning would be expected to improve its retention over time, consistent with previous psychological research. One study done on ‘spaced learning’ on the undergraduate students in pediatrics. It also found that students who received the ‘spaced learning’ improved their performance in the examination; thereby proving the point ‘Spaced learning’ has a positive impact on undergraduate students. They found that there was a statistically significant difference between the test scores. (9). Present study also found high scores in students who were subjected to spaced education in comparison to those who were not. In other studies on spaced education was applied in randomized controlled trials, which was consisting of case scenarios and clinical questions distributed weekly via email. This study demonstrated significant improvement in the retention of medical knowledge. These retention improvements were topic-specific and increased with the duration over which spaced education through e-mails were received (10). In our study, retention of knowledge in students and improvement in scores were not topic-specific. Moreover, present study used must-know academic pearls and they were sent via Whatsapp to the students. Delivery of knowledge was done through the use of internate by the above-mentioned method. This way of delivering academic pearls were liked by most of the students. This was revealed by their feedback- form. Similar feedback was also obtained by other studies. Which also states that students of spaced education group rated the ability of the teacher to fulfill their needs concerning communication significantly better compared to the students of the traditional group. (11) However, most of the previous studies used e-mail as a medium to deliver knowledge. (10,11)

In the present study, spaced education delivered ‘must-know’ and “describe to know “academic

pearls after 1 week of didactic lecture and frequency was one or two posts per week. There are many studies in the literature which suggest different time intervals for delivering academic posts. One study of them kept it Two weeks between the lectures and e-mails containing the spaced education items. (11) Spaced education provides additional educational memorandum to the students via Smartphone, looks promising for improved results. The present study gives clue that didactic lectures combined with spaced education can be used in providing medical education for the desired effect but there are limitations also in different aspects of such teaching-learning method. I feel that this study should be done on larger sample size for a longer period. The same limitation was describe in one study which states that the number of participant was low and as a consequence, the results have to be confirmed in a larger student population. (12) In the present study assessment of spaced education was done through validated MCQ only. Long assay type questions and short answer questions are needed for full expression by the students. However same assessment method was chosen by one study which also stated that assessment done by a limited number of MCQ was a limitation. In present study, spaced education was administered through online which required 1-2 hours in a week for searching and organizing the academic pearls. Same intervention was done in a study on spaced education which was applied on medical residents, where spaced education was all administered electronically, which also required 1 – 2 hours of organizational labor each week. It also said that this intervention is easily reproducible and feasible even within a large and busy medical residency program. (4) In the present study, undergraduate students were able to receive teaching pearls online through the WhatsApp group during their busy study schedule of forthcoming examinations.

CONCLUSION

Spaced education is beneficial to the medical students and leads better recalling of academic knowledge which reflects in their performance during assessments. Adopting spaced education method for better learning in medical education can produce more competent Indian Medical Graduate.

Recommendation – For better learning of students in medical field, one should approach and develop various ways of teaching along with traditional one. One such kind of intervention is to provide spaced

education through Whatsapp group to save resources and give education comprehensively.

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