Assessment of Knowledge Retention Ability of Undergraduate Medical Students

Farhan Muhammad Qureshi, Muhammad Abdul Azeem, Mehwish Ejaz, Minal Marvi, Sana Soomro, Layla Hasina, Shanila Khan

ABSTRACT

BACKGROUND: Being a natural phenomenon, the knowledge learned by students is quickly forgotten. However, various factors are pertinent for one's memory and knowledge retention ability. This ability is not investigated earlier among pass and fail students of a particular exam.

OBJECTIVES: To determine and compare short term memory and Knowledge retention ability among pass and fail students of mid-term exam.

METHODS: 103 first-year MBBS students were examined in 3 cycles after result of mid-term examination announced. These cycles consisted of 2 components related with short term memory (1st & 2nd cycles) & knowledge retention ability (3rd cycle) with one week duration apart.

RESULTS: Class attendance of pass, fail and absentees groups demonstrated statistically significant ($P<0.0005$) difference among them being in the order of pass> fail > absentees and significant correlation with marks obtained. A comparison between short term memory & knowledge retention ability also demonstrated statistically significant ($P<0.0005$) difference.

CONCLUSION: The quality of learning positively correlates with the class attendance. Short term memory and knowledge retention abilities are significantly better in pass students and statistically correlate with each other. Regular conduct of such tests is suggested to assess short term memory & knowledge retention ability so that appropriate methods to enhance these can be adopted.

KEY WORDS: Medical Education; Undergraduate Education; Short-term memory; knowledge retention; learning ability; class attendance.

INTRODUCTION

Forgetting is ubiquitous as human memory is imperfect. It happens regardless of the nature of the material being taught, regardless of the age or background of the learner[1]. Students at every educational level are challenged by an ever-growing amount of material to review and an ongoing imperative to master new material[1]. Teachers rightfully focus their efforts on helping students to acquire new knowledge and skills, but newly acquired information is vulnerable and easily slips away from the memory[2]. Memory is the mechanism that allows us to retain and retrieve information over time[3]. Short-term memory (STM) contains our moment-to-moment conscious thoughts and perceptions and Long term memory (LTM) is the semi-permanent memory store, which endures for a lifetime and aids us in learning new information[3]. Working memory (WM) is a set of mechanisms that underlies STM and also communicates with LTM. The term "working memory" is defined as a person's ability to temporarily hold and manipulate information for cognitive tasks performed on a daily basis[4]. It is a very useful measure of a student's capability to acquire new information[5].

Testing in medical education has largely served as an instrument of assessment[6]. It is a powerful mean to improve learning and knowledge retention not just its assessment. Later, it also enhances retention, to a phenomenon known as the testing effect[7]. In many circumstances, such as during lecture of a particular course in medical college, tests are given infrequently (often just once or twice a semester) and are generally perceived as a bother by faculty and students alike[7]. However, there is not a single agreed-upon measure of knowledge retention ability (KRA), but a number of different means, which may not always yield equivalent results[8]. In terms of the instructional approaches, the frequent memory tests are powerful vehicles for improving long-term retention[8,9].

It is therefore, hypothesized that students who attend classes regularly have better memory, good in learning, achieve higher marks and have better knowledge retaining ability. Hence, the objective of present study was focused on the mental capability of medical students in terms of KRA by testing STM in

3-cycles to determine and explore the following:

- Relation between class attendance and obtained marks of a test.
- Short term memory and knowledge retention ability among pass & fail students in a test.
- A correlation between STM & KRA.

METHODOLOGY

a) Participants
The entire class of first-year MBBS students (n=103) of UMDC Batch 2014, who earlier went through mid-term exam and declared either passed, fail or absent.

b) Material
Thirty questions were selected from the subject of Physiology, displayed on multi-media screen, one question at a time followed by the display of its correct answer, and the students were allowed to self-assess as per score sheet provided.

c) Design
This observational study was conducted over 6 months (May to October 2015) at Department of Physiology, United Medical & Dental College (UMDC) Karachi, Pakistan. Ethical approval by the ethical research committee of UMDC and informed consent was also taken. Study design comprises of 3-cycles. In Cycle 1, 30 questions were displayed one by one followed by their correct answers and self-assessment scoring (SAS).After 5 min, in Cycle 2 same 30 questions were repeated to assess STM for both the pass and fail group of students. After a week, in Cycle -3 once again same 30 questions were given but as best choice questions with 5 options, followed by the display of their correct answer and self-scoring.

d) Procedure
At the start of this test, the pass, fail and absent students of mid-term examination were briefed about: a) objectives of test b) 3-cycles of test to be conducted in 2-sessions, c) importance of retrieval power of memory, d) self-assessment test. They were advised to be honest in marking, "1" for the correct answer and "0" for the wrong answer. The memory test was conducted in 2-sessions having 3-cycles by the following procedure: The STM test began with the session-1 by conducting 2-cycles of self-assessment tests. The cycle-1 started to display 30 questions (duration 30Sec for each question) with subsequent answers on multimedia for 5 Sec each. The cycle-2 was conducted after a brief period of 5mins to assess the STM of these students by using the same procedure. After passing a week, the KRA test was conducted as cycle-3. In this cycle, the students were given a multimedia based self-assessment test (SAT) but now questions are converted to best choice questions (SAT- 5 option BCQs) encompassing the same 30 questions displayed in cycle 1 & 2. Each of these

BCQs and their answers were also displayed one by one for 30Sec and 5Sec, respectively. In between display of individual BCQ & its answer students brain stormed for correct answer and then on display of answer they self-scored on the score sheet provided. The statistical analysis of the data regarding this study was done by applying ANOVA, student's t- test and Pearson correlation using SPSS V-22 and XL V-2010.

RESULTS

a) Mid-Term Test
A comparison of class attendance and marks percentage obtained by first year students in mid-term test, categorized as pass and fail groups has been presented in Table I. Accordingly,103 students appeared in mid-term test. Moreover, out of the appeared students only 48 were able to pass examination while 55 students were declared fail, representing pass to fail ratio of 0.87.In order to assess the relation between exam attendance and marks obtained, Table I also demonstrates that passed students who were 42% of the total, attended 82% of the total classes and obtained an average of 63% marks in mid-term exam. It is interesting to note that the class attendance of pass and fail groups demonstrated statistically significant ($P<0.0005$) difference among them.

Pearson's correlation was determined to find any relation between the percentage of attendance and percentage of marks related with mid-term examination. The result presented in Table I also demonstrates statistically significant correlation among them.

b) STM & KRA
The statistical comparison of the data belonging to the students appeared in STM (1st & 2nd Cycle) and KRA (3rd Cycle) tests has been presented in Fig No.I. These tests were performed to compare the ability of 2 categories of students, who were declared, pass and fail in their mid-term examination. Results showed that the marks percentage of STM test was found higher in the pass group as compared to the fail group being 60 & 52% respectively; the marks percentage of KRA test was also significantly higher in the pass group as compared to the fail group being 67 & 47% respectively. Therefore, the statistical comparison also demonstrated significant ($P<0.0005$) difference for STM &KRA among pass and fail students.

c) Correlation between STM & KRA
Table II, demonstrates result of Pearson correlation between marks obtained in STM and KRA tests of the students. It represents significant difference in both the tests at the level of 0.01. Further, it has been observed that 31 out of 74 students who appeared in 1st and 2nd cycle of STM test gave correct answer in 1st cycle but unexpectedly answered incorrectly in 2nd cycle, for the same question, just after 5 min.

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According to Table III, out of 31 students, one of them gave 6 incorrect answers in cycle-2 showing extreme problem in STM, representing 1% of total (n=31) students.While,14 of them gave only 1 incorrect answer showing least problem in STM, representing 19% of the total (n=31) students.

TABLE I: A STATISTICAL COMPARISON OF CLASS ATTENDANCE AMONG PASS & FAIL STUDENTS OF MIDTERM EXAM AND THEIR MARKS PERCENTAGE OF A TOTAL OF 103 STUDENTS

Mid Term Result	Class Attendance %age Mean $\pm$SE (n)	Mid Term Exam Marks Mean $\pm$SE (n)
Passed	82 $\pm$0.79(48)	62.67 $\pm$1.05(48)
P value	P<0.0005	P<0.0005
Failed	75 $\pm$1.27(55)	29.73 $\pm$1.75(55)
Pearson Correlation		
Over All Percentage of Attendance Mean $\pm$SD (n=103)	**Over All Percentage of Marks Mean $\pm$SD (n=103)**	**(significant at 0.01 level; 2-tailed)**
78.472 $\pm$0.839	45.083 $\pm$1.940	.531

Fig I: Comparison of the Post Mid-Term Exam's Average Marks obtained by Pass & Fail students in Short Term Memory (STM) & Knowledge Retention Ability (KRA) Tests
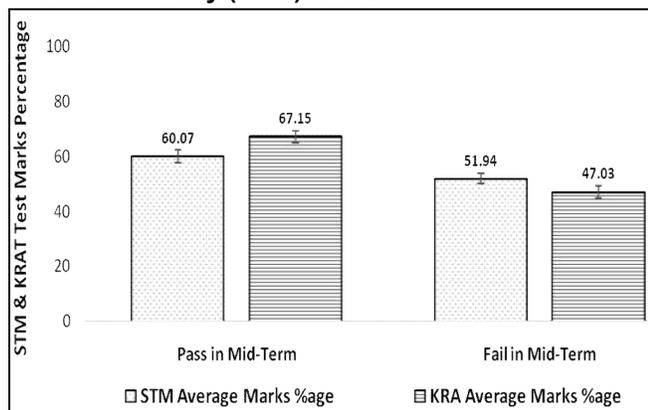

TABLE II: STATISTICAL COMPARISON & CORRELATION OF SHORT TERM MEMORY VS KNOWLEDGE RETENTION ABILITY

Type of Test	Statistics Related to obtained Marks by Students				
	Number of students (n)	Mean	Std. Error Mean	t-Test (2-tail)	Pearson's Correlation (Sig. 2-tails)
Short Term Memory (STM)	74	78.53	1.363	.000*	**.433****
Knowledge Retention Ability(KRA)	74	77.57	1.570		
*Confidence level 95%; **Correlation significant at the level of 0.01					

TABLE III: NUMBER AND PERCENTAGE OF STUDENTS WHO ANSWERED INCORRECTLY FOR THE SAME QUESTION IN CYCLE 2 BUT WERE CORRECT IN EARLIER CYCLE 1

Number of Wrong Answers	31 out of 74 Students who gave wrong answers in Cycle 2	
	Number	Percentage
1	14	19
2	11	15
3	4	5
5	1	1
6	1	1

DISCUSSION

Memory, broadly speaking, refers to our ability to retain information. It reflects our conscious awareness. Memory tests are powerful tools for the improvement of long-term retention of knowledge[9].Memory related to any kind of knowledge can prey to the process of forgetfulness. STM is fleeting and allows us to retain items for a short period of time. It may also forms the basis of our long-term memory and the retention of knowledge, as its contents endure only as long as we are paying attention towards learning, being active learner.

Researchers of the present study hypothesized that a better class attendance is the basis for better learning and getting good marks in exam and STM can help in the ability to retain knowledge. Thus, these were compared among pass and fail students of a mid-term test.

According to the obtained results it is revealed that absenteeism is associated with poor exam performance and the students who attended lectures regularly declared successful and there was a statistically significant difference between percentage of attendance and marks obtained in mid-term exams. This finding is consistent with the results study conducted in Spain[12]. They have shown that there is a positive correlation between attendance and academic assessment. Thus, attendance does matter for academic achievement. In this connection, it is to be noted that those students who attend lectures

more frequently on average, and receive higher grades, indicate their inherent motivation to concentrate during classes. However, attendance, even though critical to the learning process, is not the single most important factor [10]. In this connection, the factors like active learning, involvement in extracurricular activities[14], students' motivation, and level of engagement[11] are also important.

Further, the students showed better results in STM & KRA test in pass group showing statistically significant difference and significant correlation with failed group. It indicates that KRA of students who passed the mid-term test was better than the fail students and the KRA of those students having better STM scores was also better. It is however suggested that such testing can be applied in regular teaching programs repeatedly, as also suggested earlier[9].In addition, the methodology used in the present study to conduct 3-cycles repetition of test, is good for testing the learning ability and retention of knowledge.

Another important aspect of learning found in the present study relates with the problem of STM retrieval. As per results of this study, about 42% of total students who gave incorrect answers in 2nd cycle of STM test after answering correctly in its 1st cycle. In this respect, it is suggested that the problem is in the retrieval of correct information/knowledge during 2nd cycle of STM. It may be speculated that two things might be involved in this problem: First, implicit memory that is referred as hidden memory and uses past experiences to remember things without thinking about them[15].Second, the involved approach to learn. This shows that the participants performed implicit learning without being conscious of it. Therefore, it is suggested that many academic tasks does require a substantial amount of students' attention and mental effort, being an active listener[16] during the learning process. This has been proclaimed by other researchers as well that inability to regulate attention is directly related to student's academic performance[17]. Further, long & short term retention of knowledge does not compromise even if course format is changed[18]. In order to avoid information / knowledge drain, the learners or students need to use and apply a range of cognitive skills which requires both attention and memory[19].

CONCLUSION

The present study has reported a positive correlation between attendance and marks percentage in examination. It is suggested that the educational process should be tailored to shift learning information stored in the brain and retrievable over a long period of time through active learning, resulting in more efficient learning and avoid memory drain problem. In this

respect class attendance and repetitive testing is the important facilitator of academic success.

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