

**Research Article**

**Introduction of Pre-Test and Post-Test enhances attentiveness to Physiology lectures – Students’ perceptions in an Indian medical college**

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**Abstract**

**Background:** Traditionally, teacher centered didactic lecture classes even though a passive process was found to be dominating the first year MBBS curriculum. Routine lecture class was restructured with introduction of a pre-test to facilitate student’s attentiveness to the lecture and a post-test to evaluate students learning of the key concepts of Physiology. This study was undertaken to determine the perceptions of first year MBBS students about pre and post-tests and to determine if they were effective in enhancing attentiveness and learning Physiology.

**Methods:** Study subjects were 145 first year MBBS students of a South Indian Medical College.

Structured pre and post-tests were developed for use during Physiology lecture class. Multiple choice questions were derived from the topic to be lectured. Performance with the key points of Physiology was assessed. Perceptions of the students on the use of pre and post-test in learning physiology were obtained by administering a questionnaire.

**Results:** Perceptions of 136 students (93.79%) was that pre-test is a useful method to be focused on the lecture and hence be more attentive and learn the important points of the lecture, which was also evidenced by their performance on the post-test, which showed a significant improvement with an overall mean score in post-test ( $4.32 \pm 0.9$  marks) compared to overall mean score in pre-test ( $0.41 \pm 0.6$  marks) which showed a very high statistical significance with a p value  $\leq 0.001$ .

**Conclusions:** The introduction of a pre and post-test in a didactic lecture proved to have significantly achieved the objective of our study by facilitating attentiveness of the students to the lecture and hence better understanding of the key concepts of Physiology.

**Keywords:** Pre-test, Post-test, Physiology

**1. Introduction**

Traditional lecture methods, in which teachers talk and students listen, a passive way of learning dominates medical teaching. Bonwell C C and Eison J A suggests that “the exclusive use of the lectures in the classroom constrains students learning”<sup>1</sup>. Studies show that students lose their concentration after 15-20 minutes of the lectures<sup>2, 3</sup>. Stuart J and Rutherford R have observed that the case is similar for even highly motivated postgraduate students<sup>4</sup>. Joyner B and Young L suggest that by integrating experiential learning activities in the classroom, students’ interest in the subject matter and understanding of course content can be increased<sup>5</sup>.

Pretests with multiple choice questions enhance learning<sup>6</sup>. By comparing pre and post tests, teachers can see what students actually learned from the lessons that were developed. In addition to assessing learning, pretests can enhance

learning. Pretesting may be beneficial because it encourages more active involvement in learning, perhaps by increasing general interest in the topic. In addition, the pretest may help students to recognize what information is most important or what type of information the teacher is likely to test later. Hamaker suggests that a pretest may lead to better recall for the previously tested information because it directs attention to the need to encode that information when encountered again during subsequent study<sup>7</sup>. Pretests can give students a preview of what will be expected of them. This helps students begin to focus on the key topics that will be covered. Kornell, N in his study has observed that even if students cannot retrieve correct answers in pre-tests, it enhances subsequent learning<sup>8</sup>. J Steven Cramer and Martin C Mahoney have observed that the introduction of a pre-test/post-test instrument supported achievement of the learning objectives with a better understanding and utilization of the concepts of evidence based medicine in journal clubs<sup>9</sup>.

We intended bringing in a change to the passive way of teaching physiology with no active participation by the students by introducing pre and post-tests. The intention of administering a pre-test before the lecture was to both analyse how much the students are aware of the topic and most importantly to make the students be more focused to the lecture and a post-test after the lecture was to evaluate students learning of the key concepts of Physiology. The present study was undertaken to determine the perceptions of first year MBBS students about pre and post-tests; to determine if they were effective in enhancing attentiveness and learning Physiology and to determine if there was any gender wise difference.

## 2. Methods

This study was conducted in a city medical college in Tamil Nadu during the month of September 2011. The study subjects were 145 first year MBBS students out of which 77 were males and 68 were females. Informed consent was obtained from all the student participants.

The regular didactic lecture of the first MBBS class in physiology was restructured with introduction of a pre-test before the lecture and a post-test at the end of the lecture. The pre-test administered contained 5 items of multiple choice type covering the key points pertaining to the lecture to be delivered. The lecture was delivered for about 45 minutes, following which, a post-test comprising a similar set of questions as the pre-test was administered.

A questionnaire seeking the student's perception about the effectiveness of pre-test in improving their attentiveness to the lecture & encouraging them to come prepared for the subsequent lectures for better understanding also was administered (Table 1). The 6 items were closed ended questions using a five point Likert scale with 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree and 1 = strongly disagree. The scores were reversed for the sixth question being a negative statement as 1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree and 5 = strongly disagree. The questionnaire was pilot tested to ensure understanding of the items, wording and adequacy of response. Means and standard deviations were calculated. Paired student 't' test was used for comparing pre and post-test scores while unpaired student 't' test was used for comparing the perceptions of male and female students and p values were calculated using IBM SPSS 20. p value < 0.05 was considered as significant.

**Table 1: Questionnaire on perceptions of medical students regarding use of pre and post-tests in learning Physiology.**

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|---|
| <ol style="list-style-type: none"> <li>1. Pre-test helped me to be more focused to the lecture</li> <li>2. Pre-test helped me to answer the questions for which i did not know the answer earlier</li> <li>3. Pretest – Post test is a very useful method to learn the important points of the lecture</li> <li>4 Pre-test will encourage me to study &amp; come for the lecture topic</li> <li>5. Pretest – Post test will be a substitute for the multiple choice questions</li> <li>6. Pretest – Post test is a waste of time</li> </ol> |
|---|

## 3. Results

145 first MBBS students took up the pre-test & post-test out of which, majority of the students perceived that pretest helped them to be more focused to the lecture and hence helped them to answer the post-test questions which they could not answer in pre-test (Item 1 & 2 in Table 2). This was also evidenced by the overall mean scores which showed a highly significant improvement in the post-test scores of all the students compared to their pre-test scores (Table 3). Although both males and females showed highly significant improvement in post-test scores, further analysis revealed that the improvement in post-test score was more significant in the females (Table 4). Most of the students also perceived that pre and post-test is a useful method to learn the important points of the lecture and pre-tests encouraged them to study & come for the subsequent lecture topic (Item 3 & 4 in Table 2). A large group of the students also felt that pre and post-test will be an effective tool in the absence of multiple choice questions (Item 5 in Table 2). Only one student out of 145 (0.69%) felt that pre and post-test was a waste of time (Item 6 in Table 2).

**Table 2: Responses of students to individual items of the questionnaire on the use of pre-test in learning Physiology**

S. No	Variable	Strongly agree	Agree	Total (Strongly agree + agree)	Neutral	Disagree	Strongly disagree
1	Focused to the lecture	76 (52.41%)	60 (41.38%)	136 (93.79%)	9 (6.21%)	0	0
2	Better performance	116 (80.00%)	26 (17.93%)	142 (97.93%)	3 (2.07%)	0	0
3	Learn important points	89 (61.38%)	47 (32.41%)	136 (93.79%)	8 (5.52%)	1 (0.69%)	0
4	Encourages to study	36 (24.83%)	65 (44.83%)	101 (69.66%)	39 (26.90%)	5 (3.45%)	0
5	Substitute for MCQ's	49 (33.79%)	70 (48.28%)	119 (82.07%)	20 (13.79%)	5 (3.45%)	1 (0.69%)
6	Waste of time	0	1 (0.69%)	1 (0.69%)	14 (9.66%)	54 (37.24%)	76 (52.41%)

Results expressed as the number of students (n = 145) and percentage of students (in brackets) who gave a particular response on a 5 point Likert scale to each of the 6 items of the questionnaire

**Table 3: Comparison of the students' scores in the pre-test and post-test.**

	Pre-test		Post-test		Increase		't'	d.f	Significance 'p' value
	Mean	S.D	Mean	S.D	Mean	S.D			
Males (n=77)	0.4	0.6	4.2	0.9	3.8	1.0	33.54	76	0.000*
Females (n=68)	0.4	0.6	4.5	0.8	4.1	0.8	40.26	67	0.000*
Total (n=145)	0.4	0.6	4.3	0.9	3.9	0.9	50.78	144	0.000*

Results are expressed as mean and standard deviation of the total scores obtained in pre-test and post-test. Significance (p value) obtained using a paired 't' test. \*Highly significant.

**Table 4: Comparison of the level of improvement in post-test scores between the males and females**

	Mean	S.D	Difference	't'	d.f	Significance 'p' value
Males (n=77)	3.8	1.0	0.3	2.01	143	p = .046*
Female (n=68)	4.1	0.8				

Results are expressed as mean and standard deviation of the level of increase in post-test scores of males and females. Significance (p value) obtained using an unpaired 't' test.

Comparison of sub-scores of female students and male students for each item in the questionnaire on perceptions regarding use of pre-test in Physiology lectures revealed a highly significant difference in perceptions between males and females in helpfulness of pre-test in focusing to the lecture with the females perceiving it more positively than the males (Item 1 in Table 5). The females perceived more positively than the males with a significant difference on the helpfulness of pre-test in encouraging them to study further (Item 4 in Table 5). There was also a significance difference in the perceptions of male and female students about pre-test being a waste of time (Item 6 in Table 5). The other items like pre-test helped in better performance, helped to learn important points and acts as a substitute for multiple choice questions were perceived equally positively by both males and females (Item 2,3 & 5 in Table 5).

**Table 5: Comparison of sub-scores of males and females for each item in the questionnaire on perceptions regarding use of pre-test in Physiology lectures.**

S. No	Variable	Females		Males		't' Value	Significance
		Mean	SD	Mean	SD		
1	Focused to the lecture	4.68	0.5	4.27	0.6	4.18	p ≤ 0.001**
2	Better performance	4.82	0.5	4.74	0.5	1.08	p = 0.282
3	Learn important points	4.53	0.7	4.56	0.5	0.27	p = 0.784
4	Encourages to study	4.07	0.8	3.77	0.8	2.32	p = 0.022*
5	Substitute for MCQ's	4.21	0.8	4.03	0.8	1.33	p = 0.187
6	Waste of time	4.5	0.7	4.3	0.7	2.16	p = 0.033*

Sub-scores for each item in the questionnaire on perceptions regarding use of pre-test in Physiology lectures are expressed as mean ± standard deviation using a five point Likert scale and significance (p value) obtained using an unpaired 't' test. \*\*Highly significant, \*Significant.

#### 4. Discussion

The present study was conducted to determine the perceptions of first year MBBS students about pre and post-tests; to determine if they were effective in enhancing attentiveness and learning Physiology and to determine if there was any gender wise difference.

Results revealed that majority of the students (93.79%) felt that pre-tests helped them to be more focused to the lecture. This could possibly be because the students realized their lacuna after the pretest. Hence, administering pretests before a lecture would increase the attentiveness of the students. 97.93% of the students felt that pre-tests helped them to answer the questions for which they did not know the answer earlier. These perceptions of better performance after the pre-test were also confirmed to be true by actual pre and post-test scores as their overall mean score in post-test (4.32±0.9 marks) was significantly higher ( $p$  value  $\leq 0.001$ ) compared to their mean score in pre-test (0.41±0.6 marks). This finding is in agreement with the findings of J Steven Cramer and Martin C Mahoney who have observed that the introduction of a pre-test/post-test supported achievement of the learning objectives<sup>9</sup>. Little and Bjork also stated that Pretests with multiple choice questions enhance learning<sup>6</sup>.

Post-test scores (4.32±0.9 marks) compared to mean scores in the pre-test (0.41±0.6 marks) also substantiate that the students were attentive to the lecture and so were able to understand the key points of the lecture. Majority of the students (93.79%) also agreed that pre and post-test is a useful method to learn the important points of the lecture. Post-tests normally would give an instant feedback to the students about their level of understanding of that lecture topic.

Elsewhere, multiple choice questions have been the mainstay of undergraduate examinations for a long time. Multiple choice questions are routinely used for the post-graduate entrance examinations. However, the university to which the present college is affiliated does not use multiple choice questions for undergraduate student's assessment. This may be the reason why 82.07% of students of the present study felt that pre and post-test will be an effective tool in the absence of multiple choice questions and hence would keep them on track for their postgraduate competitive exams. Multiple choice questions also trains the students for in depth learning of the subject.

Gender wise analysis of the results of our study showed that although both males and females showed highly significant improvement in post-test scores, the improvement in post-test score was more significant in the females. Analysis of sub scores of questionnaire on perceptions revealed that there was a significant difference only in three items (1, 4 & 6 in table 5) while there was no significant difference in perceptions about the other three items (2, 3 & 5 in table 5). Results of our study therefore seem to prove that female students benefitted more from introduction of pre and post-test in Physiology lecture.

#### 5. Conclusion

Our results suggest that taking a pre-test is beneficial for learning. The student's perception about pre-test improving further study was proved to be significant by actual post-test scores. Since this method has yielded better attentiveness of the students to the lecture and focused learning of the important aspects of Physiology, it is worthwhile to continue the effort. Pretesting can be incorporated with every teacher's lecture to enhance student motivation and responsibility for self directed learning as well as to assure effective utilization of time. This may even be tried in other basic science subjects like Anatomy & Bio-chemistry to see if students respond to active lecturing in all subjects' equally.

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