

## Medical Education

### Identification of mistakes and their correction by small group discussion as a revision exercise at the end of a teaching module in biochemistry

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#### ABSTRACT

**Background.** Graduate medical students often get less opportunity for clarifying their doubts and to reinforce their concepts after lecture classes. The Medical Council of India (MCI) encourages group discussions among students. We evaluated the effect of identifying mistakes in a given set of wrong statements and their correction by a small group discussion by graduate medical students as a revision exercise.

**Methods.** At the end of a module, a pre-test consisting of multiple-choice questions (MCQs) was conducted. Later, a set of incorrect statements related to the topic was given to the students and they were asked to identify the mistakes and correct them in a small group discussion. The effects on low, medium and high achievers were evaluated by a post-test and delayed post-tests with the same set of MCQs.

**Results.** The mean post-test marks were significantly higher among all the three groups compared to the pre-test marks. The gain from the small group discussion was equal among low, medium and high achievers. The gain from the exercise was retained among low, medium and high achievers after 15 days.

**Conclusion.** Identification of mistakes in statements and their correction by a small group discussion is an effective, but unconventional revision exercise in biochemistry.

Natl Med J India 2014;27:22–3

#### INTRODUCTION

In most medical colleges in India, biochemistry is taught mainly through didactic lectures, tutorials and practical classes, where the role of the student is passive.<sup>1</sup> Little opportunity is available for students to clarify their doubts and reinforce concepts they learnt during the lectures. As a result, often in their later years, students find it difficult to relate a clinical condition with its biochemical concepts.<sup>2</sup> Moreover, students find it difficult to listen to their teachers continuously for many hours without any active participation.<sup>3</sup>

Different methods have been used in the past for revision with variable impacts. In our previous studies, we showed small group discussions and formulation of questions as effective modes of revision for graduate medical students.<sup>4,5</sup> This study explored the usefulness of identification of mistakes by graduate

medical students on a given set of wrong statements as a revision exercise.

We aimed to (i) evaluate the effect of identification of mistakes and their correction by small group discussion as a revision exercise on the understanding of graduate medical students on the topic 'Biological oxidation and bioenergetics', (ii) compare who among the high, medium and low achievers gained the maximum from the exercise, and (iii) assess retention of the gain from the exercise by students after 15 days.

#### METHODS

We enrolled 60 first year MBBS students of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry. They were taught 'Biological oxidation and bioenergetics' by a faculty member in six lectures of 1-hour duration each. A multiple-choice question (MCQ)-based pre-test was conducted. The students were randomized into six groups of 10 each on the basis of their previous internal assessment marks. They were provided with a set of 16 incorrect statements related to the topic and were asked to identify the mistakes and correct the statements through a group discussion in an hour. Some of the incorrect statements were:

1. For an essentially irreversible biochemical reaction, the free energy change is negative and is of low magnitude.
2. When  $\Delta G^0$  is negative, the  $K'_{eq}$  is  $<1$  and when  $\Delta G^0$  is positive, the  $K'_{eq}$  is  $>1$ .
3. The  $\Delta G^0$  for the formation of creatine phosphate from creatine and phosphate is  $+12.6$  kJ/mole. Therefore, it cannot take place in the human body.
4. Succinyl CoA is a high energy compound involved in substrate-level phosphorylation that takes place during glycolysis.

The post-test was done with the same set of MCQs after the group discussion to analyse its effect. The gain score was calculated by subtracting the pre-test score from the post-test score. The students were classified into low, medium and high achievers on the basis of their percentage in the internal assessment. The percentage of internal assessment marks was calculated on the basis of their performance in four previous notified tests. A delayed post-test was done after 15 days with the same set of MCQs to test their retention of the gain from the exercise. A subjective feedback was obtained from the students using the following questionnaire:

1. Do you want such exercises in the future?
2. How frequently do you want such exercises in the future? (a) once a month, (b) at the end of every chapter, (c) once in 6 months.

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TABLE I. Marks obtained by students in various tests (n=60)

Student group	Mean (SD) marks obtained (maximum)				Mean (SD) gain	
	Internal assessment (40)	Pre-test (16)	Post-test (16)	Delayed post-test (16)	Post-test–Pre-test	Delayed post-test–Pre-test
Total (n=60)	—	9.1 (3.07)	13.8 (2.04)*	13.4 (2.37)* (n=45)	—	—
Low achievers (n=14)	11.3 (5.62)	7.2 (2.04)	12.3 (2.09)*	11.3 (2.53)* (n=11)	5.1 (2.73)	4.0 (3.13)
Medium achievers (n=30)	24.4 (3.33)	8.8 (3.02)	13.8 (2.0)*	13.6 (2.06)* (n=21)	5.0 (2.53)	4.3 (2.64)
High achievers (n=16)	33.6 (2.12)	11.4 (2.63)	15.0 (1.09)*	14.8 (1.09)* (n=13)	3.6 (2.18)	3.8 (2.65)

\* p<0.01 compared to pre-test

- How long did you remain active intellectually? (a) throughout, (b) quite often, (c) sometimes.
- How much did you gain from the exercise? (a) very much, (b) little, (c) nothing.

#### Statistical analysis

The data are presented as mean and standard deviation and analysed using one-way ANOVA. Spearman test was used for correlation analysis; p<0.05 was considered significant for all the tests.

#### RESULTS

Marks obtained in post-tests were significantly higher overall among low, medium and high achievers compared to their pre-test marks (Table I). This suggests that identification of mistakes and their correction by a group discussion is effective as a revision exercise for all categories of students. However, there was no statistically significant difference in the delayed post-test score in comparison to the immediate post-test score among the low, medium and high achievers.

There was no significant difference among high, medium and low achievers in the gain from the revision exercise (Table I). There was no statistically significant decrease in the gain from the exercise after 15 days among the low, medium and high achievers. This shows retention of the gain even after 15 days.

Ninety-one per cent of the students preferred such exercises in the future at the end of every chapter. The remaining 9% wanted these conducted once a month. None of the students gave any negative response. Most students (67%) felt that they remained intellectually active 'throughout the exercise', 30% said 'quite often' and the remaining 3% were active 'sometimes'. The majority of students (90%) felt that they gained substantially from the exercise, whereas the remaining 10% had little gain. None of the students felt that the exercise was a waste of time.

#### DISCUSSION

Many creative strategies have been developed in recent years to promote active learning. Problem-based learning and computer-assisted learning which facilitate clinical reasoning processes are being used increasingly in medical colleges.<sup>6,7</sup> However, the main limitations of this type of learning are the time needed and the non-availability of adequate and trained staff.

Group discussions are at the centre of medical education because most students learn clinical aspects more efficiently and retain these longer through such discussions.<sup>8</sup> A small group discussion can allow students to understand meanings, express themselves in the language of the subject, and establish closer

contact with academic staff than is permitted by more formal methods. Discussions can also develop skills of listening, presenting ideas, persuading and working as part of a team.<sup>9,10</sup> Limited studies have assessed the effect of group discussions in graduate medical education.<sup>11</sup> In a previous study, we found a small group discussion followed by a presentation to be an effective revision exercise for graduate medical students.<sup>4</sup>

Identification of mistakes and their correction by a group discussion as a revision exercise is perhaps an unexplored area. By discussing incorrect statements and their subsequent corrections, students can understand the subject better as it induces independent, rational and focused thinking. Moreover, it does not require any elaborate arrangement and time on the part of faculty members. In this study, the marks obtained after the group discussion were significantly higher among all the groups compared to their pre-test marks. Little attention is generally paid towards low achievers due to time constraints. In a group discussion, low achievers get an opportunity to clarify their doubts by interacting with high achievers.

The overall positive subjective response from the students and retention of the gain after 15 days suggest that this could be an effective revision exercise in biochemistry and could be tried in other subjects too.

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