

A survey on the habit to change the answers in multiple choice questions (MCQ) exams: Does the examinee benefit?

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Abstract *Background* Nowadays multiple choice questions (MCQs) are amongst the most accredited type of examination tools. Examinees (students) change their selected answers with the hope to get higher scores, whereas it may decrease their final scores on the contrary. This study evaluates such a habit in medical students.

Materials and methods The medical students' exam papers in dermatology ward during the past nine years were reviewed to check their answer sheets for changing the answers to MCQs. Frequency of changes in changing answers to MCQs, and total effect of these changes in the final scores were evaluated and analyzed.

Results In this study, 614 medical students were considered. At the end of their course in dermatology ward, 472 MCQs were used as the standard examination. Totally 45.5% of the students (41.7% males and 46.5% females) had changed their answers to the MCQs, which had no meaningful difference in terms of gender. Mean total score of both of groups, who had changed and who had not changed their answers, were compared and no changes were seen. Based on the direction of changes, this study showed that 36% of students had corrected their wrong answers, 30.2% had changed their correct answers to wrong ones and 38% had changed wrong answers to other wrong ones. Statistically no meaningful changes were seen. In 40% of students these changes had led to higher scores, 31.5% had got lower scores and 28.5 % had no change in their final scores.

Conclusion Medical students who had taken part in this survey had changed their answers less than what literature explains, and fewer students had corrected their wrong answers and as a result had got lower scores. It seems that temptation to change answers based on the fine attention to MCQs and logical thought might lead to higher scores, but the change by itself had not led to better results, blind change works just by chance as in our students.

Key words

Multiple choice question exams, changing answer, habit.

Introduction

Nowadays multiple choice questions (MCQs) are one of the most common scientific tests that are used in evaluating the capabilities and skills

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of students and estimating different educational learning systems. Based on the obtained results, these types of evaluating exams upgrade learning in students, detect learners' troubles, reduce learners' and educational programs' deficiencies. So factors that have impact on application of these exams and their results are of special importance.

Some of the students at the end of the exam, if they have enough time review the questions and

their selected answers, and if have doubt about them may change their previously selected answers. There is no doubt that changing answers may lead to a better score, but on the other hand, they may choose the wrong answer that results in worse score, as well.

You may have heard the sentence that goes like this: "Don't change the answer; the preselected answer in MCQs is commonly right." This is based on the truth that your brain knows the right answer before starting to think. When you start to think and pay attention to possibilities, you get confused and get far from the right answer. If the above sentences are right, it is better not to change the preselected answer until you have reasonable and sufficient reasons.

Apparently with changing the answer three possibilities are in hand:

- 1- Changing the wrong answer to right one that leads to higher score,
- 2- Changing the right answer to wrong one that leads to lower score,
- 3- Changing the wrong answer to another wrong one that makes no change in the resulting score.

First studies in literature showed that students get higher scores with changing the wrong answers to right ones,¹⁻³ but recent studies have led to doubt in this idea and have implicated other factors such as level of students' knowledge, level of difficulty of exams and the precise amount of these changes.^{4,5} So such survey was planned and accomplished in this university.

Materials and methods

The study was descriptive and in cross sectional design. The duration of survey was nine

complete years, 2001 to 2009. The answer sheets of 5th grade medical students who had taken part in dermatology ward as studentship were analyzed. The exam was designed in form of MCQs with just one right answer for each question and the students were asked to mark their changed answer if any. We divided changing of answers into 3 groups: 1) right to wrong; 2) wrong to right and 3) wrong to wrong. The mean score of students was considered as a tool that expresses their level of knowledge.

The mean point gain was calculated by the following equation: total added score minus reduced score divided by total number of those students who had changed their answers. Recurrent changing of answers was defined if a student had changed answers for a question twice or more.

At the end of the survey, the data in answer sheets were gathered and entered in SPSS software. The frequencies and means were examined and analyzed with chi square and t tests, respectively.

Results

During 9 years, 614 students were introduced for a one month training course of dermatology and venereology in 45 periods, one month each. The final exam was designed with 472 MCQs and considered for evaluating the students at the end of all courses with a mean of 10.5 MCQs for each one-month course.

Of all the students, 273 (44.5%) had changed their preselected answers, and 341 (55.6%) had not changed their answers. **Table 1** shows changing the answers based on the gender of students. As the table shows around half of the students had changed their preselected answers.

Table 1 The distribution of status of changes in students' answers, based on the level of knowledge and gender

Students' status in answering the MCQs	Number of male students (%)	Number of female students (%)	Total number of students (%)	Mean \pm SD of total student score
Changed	108 (39.5)	165 (60.5)	273 (44.5)	16.06 \pm 3.49
Unchanged	151 (44.3)	190 (55.7)	341 (55.5)	15.96 \pm 3.25
Total	259 (42.2)	355 (57.8)	614 (100)	16.01 \pm 3.19

Chi-square=1.39, $p=0.5$

Table 2 The distribution of direction of changes in answering MCQs, based on gender

Direction of changes in answering	Right to wrong N (%)	Wrong to right N (%)	Wrong to wrong N (%)	Total N (%)
Males	58 (32.4)	64 (35.8)	57 (31.8)	179 (40.3)
Females	86 (28.7)	96 (36.2)	93 (35.1)	165 (59.7)
Total	134 (30.2)	160 (36)	150 (33.8)	444 (100)

Chi-Square= 0.83, $p=0.65$ (based on gender), chi square=2.324, $p=0.313$ (based on direction of changing answer).

Table 3 Frequency distribution of students based on changes in scores after changing the preselected answer.

Status of students' score	N (%)
Unchanged score	86 (31.5)
Increased score	109 (39.9)
1 score	89 (32.6)
2 score	18 (6.6)
3 score	2 (0.7)
Decreased score	78 (28.6)
1 score	68 (24.9)
2 score	9 (3.3)
3 score	1 (0.4)
Total	273 (100)

The difference in frequency based on gender was examined with no meaningful result. (Chi-square= .39, $p=0.500$). The level of knowledge, as mean score and standard deviation also showed no meaningful change ($t=0.24$ and $p=0.8$) [Table 1].

The direction of changes in answers was analyzed and the results based on gender are shown in Table 2. The review of results showed that 273 students had changed 438 answers in total, 1.6 MCQs for each student (with the minimum and maximum of 1 and 6, respectively). As the Table 2 shows, 134 (30.2%) of questions that were reviewed had correct answers and the students had changed the right answers to wrong ones, and the remaining 310 questions (69.8%) had wrong preselected answers. Of the total 444 reviewed

MCQs, 160 (36%) answers were wrong and had changed to correct ones, 134 (30.2%) answers were correct that had changed to wrong ones, and 150 (33.8 %) answers were wrong that had changed to another wrong answer. The difference in direction of change based on the gender of students was analyzed statistically and no meaningful difference was found (chi-square=0.83 and $p=0.65$).

The status of students' score before and after the change in answers was evaluated and its distribution is shown in Table 3. Each correct answer had one positive score. As the table shows the final score of 31.5% of the students who had changed their answers did not lead to a change in score, around 40% obtained higher scores and 28.6% gathered lower scores. The results of changes in students' scores were analyzed and no meaningful difference was found. (chi-square=2.32 and $p=0.31$).

It is worth mentioning that most of these changes (85%) including increase or decrease in final score were about 1 score (5% of the total band score), around 14% were for 2 scores and about 1% for 3 scores, and no students were found to get or lose more than 3 scores. The mean point gain in this study was 0.15 score (0.75% of total band score).

In the current survey only 3 students had changed their answers more than once, they had changed their preselected answer to another one and as they were not satisfied, for the second time they changed the answer and finally all the selected answers were incorrect.

Discussion

A survey accomplished by Mathews in 1929 showed that students got higher scores by changing their preselected answers.¹ Many studies done by Lehman in 1928,² Tarret 1948,³ Bath 1967⁴ and Reile and Briggs in 1952⁵ expressed that there is a relationship between quality of these changes and total band score obtained by students, and those students with more knowledge get more benefit from these changes than those with less knowledge.

A study in 1984 by Benjamin⁶ showed that students more commonly change their wrong answers to correct ones than other types of changes. He subdivided these changes to three groups and declared the results as follow: 57.8% of students corrected their wrong answers, 20.2% changed their correct answer with wrong ones and 22.8% of students change their wrong answers with other wrong ones.

A study in 2005 by Fischer *et al.*⁷ in a group of medical students showed that 55% corrected their wrong answers, 25% changed their correct answers with wrong and 20% changed their wrong answers with another wrong answer. In other words the first group raised their final score, the second group decreased and the third group did not change their scores.

Bauer *et al.*⁸ studied 79 medical students (45 females and 34 males) in Munich University. These students were divided into two groups randomly, with the first group being aware of

the results for previous studies concerning changing the answers to MCQs and the second group left unaware of those result as witness group, and both groups took part in examination. The results showed that 72 students (91%) had at least one change. There was a meaningful difference between two groups. Totally 48.2% corrected their wrong answers, 21.6% changed their correct answers with wrong ones and 30.2% changed their wrong answers with another wrong one.

In the current study the mean added score for students was 1.4 score (2.5% of total score) with the minimum and maximum being -2 and 8 respectively. A repeated review was done with a group of 20 students. In this group 18.4% students corrected their wrong answers, 3.7% changed their correct answers with wrong ones and 77.9% changed a wrong answer with another wrong one. There was a meaningful difference regarding number of reviewed questions (4.8 questions in the first group in comparison with 3.3 questions in the witness group).

The mean added score achieved by changing the answers showed no meaningful difference in the two groups (1.8 and 0.9). The total mean score of the two groups showed no meaningful difference as well (53.1 and 51.8). This study showed that students could enhance their score with one review.

A study by Al-Hamly *et al.*⁹ in 2003 showed that 67% of students changed their answers. 44% corrected their wrong answers, and totally 57% and 19% of students increased and decreased their scores respectively. The mean impact of changes was 2.05 %.

The results of the current study showed that around 45% of students had changed their

preselected answers that are comparable with other studies (between 40 and 90% with the mean of 55%).

The direction of changes for students in our study was different from other studies. In most of the studies about 50% had corrected their wrong answers, about 25% had changed their correct answers to wrong ones and 25% had changed their wrong answers to other wrong ones, whilst in our study it was about one third. In other words in most studies the chance for correcting wrong answers to correct ones was two-fold of the correct answers to wrong ones, whereas in our study they were close (36% wrong to correct, 30% correct to wrong and 34% wrong to wrong changes) and there wasn't such a more chance.

After reading a question a student selects an answer that he/she thinks is the correct answer, and by reviewing he/she changes it to another choice as he/she thinks the second choice is correct. Apart from preselected answer, there are three other choices. If the student doesn't know the right answer and wants to choose based on chance, he/she has basically 33% chance that is not more than what there was in our real study. In other words if the student decides to change the preselected answer just based on doubt, he/she would not get any suitable result and it seems that our students have not changed their choices based on enough thinking and scientific documentation, and they have just tried their chances.

In the studies designed and planned by Foot and Belinke¹⁰ and Prinsell *et al.*¹¹ students were divided in two groups based on their opinion whether reviewing the preselected answer is a good idea that leads to a better score, or selection based on chance in first choice is the right method and no change in selection is

desired, and these two groups were examined and the results were analyzed. The mean of 5.3% change in the preselected answer was found that was a bit higher than other studies, but no meaningful difference was seen in two groups.

The mean of correcting the wrong answer in the current study was 48.2% that was similar to most of other studies.

In the current study nearly half of the students (44.5%) had changed their preselected answer that is in concordance with other studies. This value has been about 40 to 90%, mostly being around 50%. The study by Mathews (1929) declared this value around 53%.¹ In a study by Geiger¹³ 95% of patients had changed their preselected answer.

Reile and Briggs (1952)⁵ showed that females change their preselected answers more than males and with a meaningful difference, but total enhancement of their score is less than males. In contrast the study by Bath (1967)⁴ showed that females get a better enhancement in final score than males.⁴ Yet in another study by Geiger it was shown that females have such a behavior more than males with a meaningful difference, but no enhancement in their final score was found in comparison with males.¹³

In the current study no meaningful change was seen, neither regarding gender impact on changing the preselected answer, nor as increase in the final score. Also most of the studies did not show meaningful change based on gender [Copeland 1972, Geiger 1991, Mueller and Shwedel 1975, Reiling and Taylor 2003, Mashaal Al-Hamly 1972].^{9,13-16}

In the current study the mean impact of this behavior in the final score of students was

0.75%, i.e. about 1% of total band score that is in concordance with other studies. Fischer *et al.*⁷ in 2005 and Bauer *et al.*⁸ showed 1.1% and 1.4% for this respectively.

For the first time Green in 1981 explained the stress and anxiety that students feel during session of exam.¹⁷ He showed that those students who have such stress do more changes in their selected answers. He divided students into two groups with mild and severe forms based on the level of anxiety. Also he showed that the more anxiety leads to more frequent change in the preselected answer.

In a study by Al-Hamly *et al.*⁹ in Kuwait (2003) the new concept of anxiety in the session of exam and its impact on this behavior and related results were analyzed. In this survey the 'Test Anxiety Inventory' was performed simultaneously. The results showed that there is not a meaningful correlation between anxiety and changing the preselected answer. But when the students were divided into two groups with mild and severe anxiety, it was shown that the group with less anxiety had less change in the preselected answers, as well. It is interesting that in recent group change in the preselected answer had a meaningful difference for a wrong answer to another wrong one.

In 1980 Videler and Hansen¹⁸ proposed that reviewing the preselected answers mostly occurs for difficult questions. Jacobs *et al.*¹⁹ in 1972 showed that enhancement of score mostly is due to reviewing the easier questions, and reviewing the results for difficult answers has been correlated with fewer enhancements of score. In general they showed that there is a meaningful correlation between reviewing the answers of difficult questions and enhancement of final score. In the current study we did not assess the

difficulty of questions and its relationship with reviewing of answers.

Several surveys studied the opinion of students about reviewing answers to MCQs, and explained that most of the students express that first selected answer would be correct.²⁰⁻²² A few surveys studied the feelings and understanding of students about reviewing answers to MCQs, and mostly confirmed the above conclusion.^{1,15,19,23} In 1991 Geiger studied feelings and function of students and declared that most of them believe that changing the preselected answer leads to decrease in their final scores.¹³

In this study students' opinion about changing the preselected answer was asked in the exam. The results showed that 12% of the students believe that changing the preselected answer results in an increase in the final score, whereas 69% explained the opposite opinion and 19% no change at all. It was interesting that these three groups had similar behavior in changing the preselected answers and no meaningful difference was found. The final score for all three groups were increased by changing the preselected answers, even those groups that believed changing the preselected answer would decrease their final scores, and statistically there was meaningful difference between these groups (the group that believed changing the preselected answer would lead to increased score got higher final score), but no meaningful difference found based on gender.

Finally the current study is the only survey done in Iran so far. The studied community in our survey was similar in changes of number and gender to other studies, but in terms of quality of changes a considerable difference was found. In most studies around half of the changes had led to an increase in final scores, but in the current

study about one third of the students got higher scores due to change in preselected answers that is not acceptable and needs more studies to be done.

Also more studies are needed to clarify the correlation of these changes with level of difficulty in MCQs, presence and severity of anxiety in students during session of exam.

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