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Students' Challenge in Answer-changing on Multiple-choice Exams; Doubting the Answer or Not? A Systematic Review

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Abstract

Background

It is generally believed that changing the answer in multiple choice exams is not recommended as it usually changes the correct answer. The aim of this study was to evaluate answer-changing among students on multiple choice examinations and to investigate the advantages and disadvantages of these changes.

Materials and Methods: This systematic review was conducted through a systematic search of electronic resources in English, including Medline (via PubMed), Scopus, Web of Science, Cochrane Library, and EMBASE with no time limit from inception up to December 2020, using the following keywords on their own or in combination: "MCQ", "Multiple choice questions", "Students", "Answer-Changing", "Changing", and "Benefits", "Advantages", "Disadvantages", and "Challenges".

Results: Eleven studies (n = 29.450) satisfied the required conditions to be included in the present research. It was found that changes in the answers were mostly from incorrect to correct. The results demonstrated that in 72% of cases, the students who changed their answers in an MCQ test had their scores increased and in 28% of the cases, the test scores decreased. A qualitative study showed that in general, students prefer not to change the answers and also they do not find it useful. The results of another study showed that 51% of students believed that revising their answers would improve their test scores (P <0.001). Another study found that, once students changed their answers, the MCQ test scores were increased in the High Stake test. Further changes in the answers did not increase the test scores.

Conclusion: Doubting once in each option and changing the answer in MCQ tests is useful and rewarding for students.

Key Words: Answer-changing Multiple-choice questions, MCQ, Students.

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INTRODUCTION

Multiple choice, objective response, or MCQ (for multiple choice question) is a form of objective assessment in which respondents are asked to select only the correct answers from the choices offered as a list. The multiple choice format is most frequently used in educational testing, especially in medical universities. These tests could assess a large part of learners' knowledge in a short period of time and are some of the best objective tests in terms of questions' uniformity, low sensitivity to blind guessing, and ease of correcting answers. This type of test has further advantages; it provides quick feedback, its assessment is not affected by the students' way of expression or writing, grading is simple and specific, and a question bank could be created to analyze the questions. It is commonly believed that changing the answer in multiple choice exams is not recommended as it usually changes the correct answer.

MCQ consists of a stem and a set of options. The stem is usually the first part of the assessment that presents the question as a problem to be solved; the question can be an incomplete statement that must be completed, and includes either a graph, a picture, or any other relevant information. The options are the possible answers that the student should choose from, with the correct answer called the key and the incorrect answers called distractors (1-6).

Example:
An outcome based student learning approach consists of 3 main elements, namely

STEM

a) Learning Outcomes, Learning Activities, Assessments
b) Course contents, teaching methods, Exams
c) Group work, Problem Based Learning, Assessments
d) Educational Aims, New teaching concepts, Exams
e) None of the above

KEY

DISTRACTORS

Students often believe that the first answer that comes to their mind in a multiple-choice question is the correct one, and changing it, even if another answer option looks better (after thinking about it), could lower their test score (7). This idea is common among students even though it is not supported by empirical research. On the other hand, several studies have shown this idea to be false in various fields of

education. Their findings indicate that the students doubting and changing their answers in multiple-choice tests can even be helpful in some cases (7-11). However, some studies showed that the students doubting their answers in this type of tests did not have a positive outcome and the first option should, therefore, not be changed (13,12). The results of a study showed that many faculty members (36%) believed that changing the answers usually lowers the test scores (14). Because of the contradictory results about changing the answers in multiple-choice tests and also according to the fact that multiple-choice tests are frequently used for evaluating students in academic settings, it is necessary to evaluate the advantages and disadvantages of changing the answers. Therefore, this study was conducted to investigate answer-changing among students on multiple choice examinations.

2- MATERIALS AND METHODS

2-1. Data sources

The Preferred Reporting Items for Systematic review and Meta-Analysis (PRISMA) checklist was used as a template for this review. A systemic search of electronic databases Medline (via PubMed), SCOPUS, Web of Science, ProQuest, Cochrane Library SID, Magiran, CIVILICA, and Google Scholar search engine was conducted with no time limit up to December 2020. The search was performed independently and in duplicate by two reviewers and any disagreement was solved by the supervisor.

2-2. Eligibility criteria

Participants, interventions, comparators, and outcome (PICO) was used to formulate the review objective and inclusion criteria.

2-2-1. Participants: Not practical.

2-2-2. Interventions: The included research are non- interventional studies, so we did not have comparison group.

2-2-3. Comparators: We did not have a comparison group and intervention.

2-2-4. Outcomes: The advantages and disadvantages of answer-changing on options for MCQs.

2-2. Included and excluded studies

Review articles, systematic reviews, case-control studies, cross-sectional studies, qualitative studies, and descriptive and analytical studies were included in the study. Pilot, preliminary, and case report studies were not included due to the limited sample size and higher risk of bias.

2-3. Study selection

Database search was performed for the relevant studies, abstracts of the studies were screened for identification of eligible studies, full text articles were obtained and assessed, and a final list of included studies was made. This process was performed independently and in duplicate by two reviewers and any disagreement was resolved by the third reviewer. References were organized and managed using EndNote software (version X8).

2-4. Data collection process

A form was developed and followed for each study. The data collected by the two reviewers was combined and compared for accuracy and any discrepancies were solved by a third reviewer.

2-5. Risk of bias in individual studies

The assessment of the risk of bias was done based on the Cochrane Risk of Bias criteria (15) by two reviewers independently and in duplication and any discrepancies were resolved by the third reviewer.

2-6. Synthesis of results

Due to the difference in the included studies, study designs, lack of control groups in some studies, small sample size, and type of intervention used, and duration of treatment and follow-up, meta-analysis was not conducted.

3- RESULTS

Eleven studies with a sample size of n= 29,450 met the required criteria to enter this study (**Figure.1**). The results of a study on nursing students demonstrated that most of the students changed at least one of their answers. Data analysis indicated a significant difference between changing an incorrect answer to the correct one and vice versa. About 55.3% gained points as a result of changing answers, while only 18.3% lost points (8). Another study indicated that learners earn points when they change their answers in multiple-choice questions. This study also demonstrated that most of the students underestimate the benefit of their answer-changing behavior (9).

The results of a study on nursing students showed that learners who had some level of anxiety were more likely to change their answers. Answers were 55.6% from incorrect to correct (10). The results of another research indicated that by considering the students who changed their answers, their test scores were increased by approximately 45% and decreased by approximately 28%. They were also more likely to change their test scores from incorrect to correct (11). In a study on anesthesia nursing students, the results demonstrated that the probability of changing the answer from incorrect to correct was 72% and from correct to incorrect 20%. They also suggested that students should be informed about the benefits of changing answers in multiple-choice exams (7). Another study in Germany indicated that when students changed their answers once, their MCQ test scores in the High Stakes tests were improved. However, further changes in the answers did not improve the scores (16). Another study on dentistry students showed that answers from an incorrect answer to a correct answer accounted for nearly 65% of the total answers changes, whereas changes from a correct answer to an incorrect answer were slightly higher than 10% of the changes. The researchers suggested that dentistry students should be advised to change their answer from the first option to what they feel is a better choice during multiple-choice exams (17). In another study, the findings showed a positive effect of changing the answers in MCQ questions. It was found that students should be encouraged to change their answers after carefully reviewing their choices for more acceptable options (18).

The results of another review indicated that many faculty members (36%) believed that changing the answers usually decreases test scores; however, the majority of students (51%) believed that changing the answers would increase their test scores (χ^2 = 60.52, P< 0.001). During two tests, students changed their answer from an incorrect answer to a correct answer 2.8 times (SD 2.2) compared to 1.0 times (SD 1.4) vice versa. Therefore, on average, students benefited from answer-changing (P <0.001). Furthermore, when comparing two tests in a course, some students are usually more likely to change their answer in comparison with others (adjusted R2 = 0.23, P<0.001), but the effect of changing the answers on the first test benefits from the student' prediction of changing the answer in the second exam (R2 = 0.42, P<0.001 0.42) (14).

The results of a study demonstrated that students who were aware of the benefits of changing their answers would change them (when they are in doubt) far more frequently than students who were not aware; however, the difference in the test scores was not significant (12). A qualitative study also showed that students

prefer not to change their answers and they do not find it useful. Furthermore, regressing did not increase the test scores among these students (13).

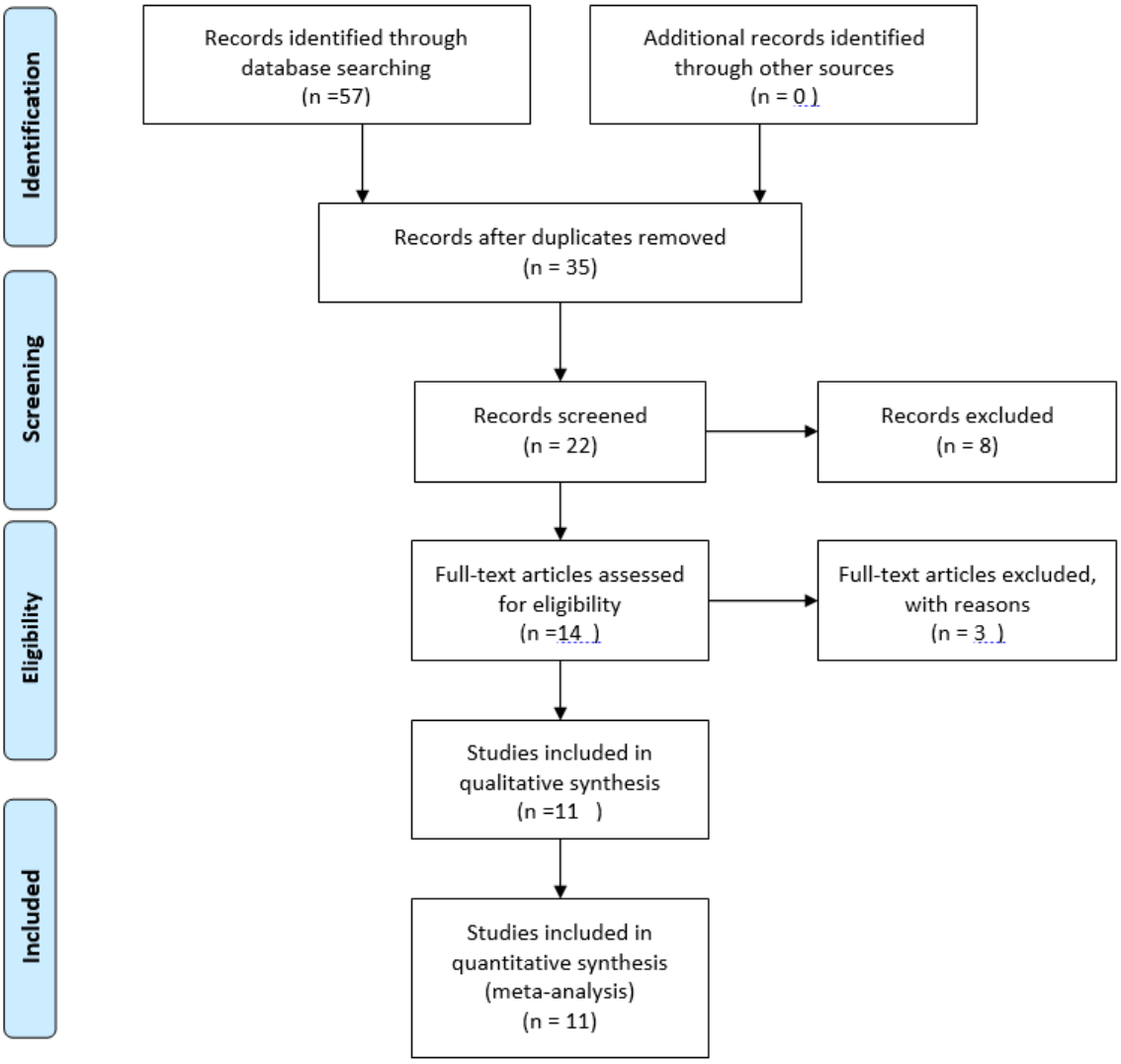

Fig.1: PRISMA Flowchart.

4- DISCUSSION

The purpose of this study was to evaluate answer-changing among students on multiple choice examinations, and to investigate the advantages and disadvantages of these changes. The present study confirms the results of previous studies that students could improve their overall test scores by changing the initial answers when they doubt their correctness. The results of 20 separate studies indicated that the rate of "correct to incorrect" changes is 20.2%, whereas the rate of "incorrect to correct" changes is 57.8%, which is almost three times greater (19). Although the belief that "changing exam answers is not recommended for test scores" is not confirmed by the empirical research, it is still a common idea; students often believe that the first answer of a multiple-choice question (MCQ) that comes to their mind is the best, and changing one answer, even if another answer option seems better by

reviewing it, does not lead to better test scores and it could lead to a decrease in the test scores (7). Several researchers have concluded that changing answers to multiple-choice questions is usually beneficial for students (8-11, 16-18). The theory that students should trust their first instinct and stick to their initial answer on a multiple choice test is a myth that should be discarded. As mentioned above, the probability of changing the answer from incorrect to correct is almost three times higher than that of the opposite (19). In some examination on specific subjects, students might have an accurate first instincts about a particular test item, but that does not mean that all students should trust the first answer that comes to their mind. A test or examination (informally, exam or evaluation) is an educational assessment intended to measure a test-taker's knowledge, skill, aptitude, physical fitness, or any other classification of topics (e.g., beliefs). A test may be administered orally, on paper, on a computer, or in a predetermined place that requires a test taker to demonstrate or perform a set of skills (20).

One of the assessment formats is multiple-choice questions. In this type of test, a test-taker is given a set of answers for each question, and the student/learner must choose the correct answer or a group of answers. There are two groups of multiple-choice questions: true/false question, which requires a learner to choose all of the true (i.e., correct) answers; the second group is known as one-best-answer question and it requires a learner to find the only correct answer from a list of options (21). There are several reasons to use multiple-choice questions in tests. In terms of administration, multiple-choice questions usually require less time for test takers to answer, are easy to score and grade, provide greater coverage of material, and allow for wide degrees of difficulty (22). As an educational tool, multiple-choice-items can evaluate several levels of learning as well as a learner's ability to integrate information and it provides feedback on what differentiated the correct answers from distractors. Nevertheless, there are difficulties associated with the use of multiple-choice questions. As an educational tool, multiple-choice items do not allow learners to demonstrate their knowledge beyond the choices provided and may even encourage guessing or approximation due to the presence of at least one correct answer (1-5, 22).

Multiple-choice tests are used to assess a wide range of students' knowledge; however, they also have disadvantages (1-5). There is still an old belief among students that when they choose an option to answer in a multiple choice test, they should stick to their choice and do not change the answer. This belief is still prevalent among professors and students (7). Many studies have been conducted in this regard with most of them being in support of changing the answer. According to these studies, when a student chooses an answer and then doubts its correctness, they should pay attention to their doubts and check the answer again, which have been in favor of students in most cases (7-11, 14, 16-19).

What matters is that changing the answer can be in favor of the student if 1) they doubt each question only once and 2), they choose the next option with care and rethinking. Studies have indicated that too many contemplations on each question (more than one) are not in the student's favor. Using the following tips can be useful for students in multiple choice exams: 1) reading the questions carefully to make sure they understand what the question is asking, and underlining words like “not” and “always” since they change the meaning of the question; 2) answering the question without looking at the options to come up with the one’s own answer to

identify the correct option, comparing one's answer with the options, and looking for the same ideas and key terms; 3) reading each of the answers and eliminating the ones that are wrong, unrelated to the question, or completely off; in case some options are still remaining, reading the question again, rethinking the answer, and eliminating again. It is okay to rethink the question if the answer seems incorrect; 4) answering all the questions, not wasting time on a question if they don't know the answer. They can skip the question and come back to it later, giving their brains more time to think about that question while solving other questions. Even if they don't know an answer, they can make an educated guess so that there is a chance of getting the marks. But if the question remains unanswered, it's guaranteed a zero; 5) Managing their time; budgeting the time to answer each question, reviewing the answers, and transferring them to the answer sheet. Before writing the answers, they should check the number of questions and divide the time accordingly. For example, if there are have 50 questions in a one-hour test, 10 minutes can be assigned to answer each question and 10 minutes to checking the answers.

5- CONCLUSION

Students should be informed about the benefits of changing initial answers in multiple choice questions once when in reasonable doubt about the answers. It is recommended that students be encouraged, after further reflection, to change their answers in MCQ tests for questions they had doubted their answers. The results of the present research demonstrated that among the students who changed their answers in the MCQ test, 72% had their test scores increased and 28% had the test scores lowered. Once students change their answers, the MCQ test scores in the High Stake tests will be increased.

6- AUTHORS' CONTRIBUTIONS

Study conception or design: SS, MN, and HA; Data analyzing and draft manuscript preparation: MN, MA, NM, AM, and MB; Critical revision of the paper: SS, MN; Supervision of the research: SS and HA; Final approval of the version to be published: SS, MN, MA, NM, MB, AM, and HA.

7- CONFLICT OF INTEREST: None.

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