Original paper

A study of student perceptions towards the use of True/False type MCQs at undergraduate medical examinations with time course

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Abstract

The multiple choice questions (MCQs) have been accepted as an effective method of testing knowledge at medical examinations, and are widely used in student evaluation at both undergraduate and postgraduate level. Besides, some studies have demonstrated that the negative scoring system of MCQs, which is the commonly used scoring system has theoretical and logistical advantages, and student anxiety levels have only a minor influence on it. A questionnaire based earlier study carried out among second year medical students has revealed that the Multiple True/False type format MCQs have been accepted by the majority, but not the negative scoring system. So far, no study has been carried out to demonstrate whether there would be a change in attitudes of students in a favorable manner towards True/False type MCQs with time course during their undergraduate career. A simple questionnaire, printed in English, using keys to mark for each item was distributed among a batch of second year students after a pretest, and two years later, the same questionnaire was readministered to the same batch of students using the same procedure.

The study reveals that the majority of students on both occasions preferred the use of MCQs in their evaluation (59.4% in the second year and 87.4% in the fourth year; P<0.05), and consider it to be the most objective method of assessment (59.9% in the second year and 79.5% in the fourth year; P<0.05). However, the majority on both occasions felt that the negative scoring system increase their anxiety (85.3% in the second year and 87.1% in the fourth year; P, N.S), and penalizes them (75.8% in the second year and 82.6% in the fourth year; P, N.S), and agree that the negative marking should not be retained (70.1% in the second year and 73.9% in the fourth year; P, N.S).

With experience and familiarity, students had developed greater acceptance of the use of True/False type MCQs at their undergraduate examinations. However, there is no such favorable shift towards the existing negative scoring system (without carryover effect), despite more experience with time course, and therefore, the present marking system of MCQs should be re-evaluated by the academic staff and educationists.

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Introduction

The Multiple Choice questions (MCQs) are now an inescapable part of the assessment of students at most undergraduate and postgraduate medical examinations. The MCQs are probably the most widely used component of objective tests[1]. They are used as a method of testing knowledge, and for ranking purposes[2]. Of the many formats available, Multiple True/False Completion type is the most widely used format in medical examinations[1].

The True/False type MCQs have been criticized by some[3,4]. However, despite such criticisms, many advantages have also been attributed to this form of assessment. There is no restriction of having only one 'true' or 'false' response, and the length and homogeneity of responses are not mandatory[2]. It is also easier for the candidates to answer as no coding is involved. Some studies have have even observed that properly structured MCQs are capable of testing many different aspects of subject knowledge [5], but with limited test reliability, because of its capability of mostly measuring concept mastery abilities of a candidate, while

tapping a low level of intellectual skills[6]. It has also been demonstrated that a considerable number of questions are needed to ensure a sufficiently reliable score, if essay questions are used instead of MCQs[7,8]. From the point of examiners, MCQs are easy to administer, and correction is less time consuming, and question banks also can be developed with improved items, based on statistical analysis of answers for future use[2].

Rees in 1986 observed that True/False type MCQs help students learn specific components of the subject matter, but would not lead to a general increase of knowledge in the subject[9]. Some items of MCQs also could be reused for future examinations because the test-retest reliability of properly structured MCQs have been found to be high[9,10,11].

Several groups of investigators have also looked into the disadvantages and limitations of True/False type MCQs, and believe that it is not the best method to test higher order cognitive skills, and to measure different taxonomic levels of cognitive domain[3,4,12,13]. It is also incapable of testing or improving other skills such as writing, self directed learning and clinical skills[13,14,15].

There is also much discussion on the negative scoring system of MCQs, which is commonly used for student evaluation at undergraduate medical examinations. There are two types of negative scoring systems: one in which negative marks from one question is carried over to the next as practiced at most postgraduate medical examinations[6], and the other, without carryover effect[16] as in the present study. Two questions, which often arises when using this system are whether (i) students should be penalized for incorrectly answered questions and (ii) it increases student anxiety, and reduce their performance at examinations.

So far, no study has been carried out to demonstrate whether there would be a change in student perceptions towards True/False type MCQs during their undergraduate career with time course. Hypothesizing that student attitudes towards MCQs change with time course in a favorable manner (i) for the use of MCQs as part of the evaluation at final undergraduate medical examinations and (ii) towards the negative scoring system of the present evaluation, and produce less anxiety with experience, this study was carried out.

Materials and Methods

A simple questionnaire, printed in English, and using keys to mark for each item was distributed among 156 second year medical students at University of Kelaniya, Sri Lanka following a pretest. After two years, the same questionnaire using the same procedure was readministered to 119 students available on the day belonging to the same batch, now in their fourth year. Incomplete questionnaires were rejected and all completed and valid questionnaires were analyzed using the EPIN program.

Results

The study reveals that the majority of medical students in the second year and when they were in the fourth year of academic studies, preferred the use of True/False type MCQs in the evaluation process at their final undergraduate examinations (59.4% in the second year and 84.7% in the fourth year; $P<0.05$; Fig.1). Only 26% and 13.6% of second and fourth year students respectively disagreed. The majority of students also found the MCQ method of evaluation to be the most objective assessment at examinations (79.5% in the second year and 59.9% in the fourth year; $P<0.05$; Table 1). The students also observed that the True/False type MCQ format was the best MCQ format (48.3% in the second year and 61.9% in the fourth year; $P<0.05$; Table 1).

The study has disclosed that the majority of students on both occasions had felt that the negative scoring system (without carry over effect) adopted for marking MCQs should not be retained (70.1% in the second year and 73.9% in the fourth year; P, N.S; Fig. 2; Table 1). It was also revealed that the negative scoring system of MCQs at examinations increases student anxiety (85.3% in

the second year and 87.1% in the fourth year; P, N.S; Fig. 3; Table 1), and reduces their performance (74.1% in the second year and 79.9% in the fourth year; P, N.S; Fig. 3). It has also shown that the existing marking system was found by the majority of students to be penalizing them (75.8% in the second year and 82.6% in the fourth year; P, N.S; Fig. 3, Table 1).

Discussion

(i) Discussion of Methods

The questionnaire was simply worded in English, and keys were used for every item for ease of answering. Therefore, it was unlikely that any difficulties of comprehension would have arisen. Furthermore, a pretest was carried out in a random sample of 16 students in the second year, and with a random sample of 18 students, when in the fourth year, in order to ascertain any difficulties in answering. All the students in the samples on both occasions answered the questionnaires completely. Since the questionnaire were administered to all the students present at the times in that batch of students on both occasions (156 second year students and 119 students in the fourth year), though slightly different in size, the samples were comparative in all respects. Prior to administration of the questionnaire, clear verbal instructions on not to discuss among themselves, while answering were given, and sufficient time allowed (30 min) to complete and hand over the questionnaires.

(ii) Discussion of Results

As shown in Fig. 1 and Table 1, the majority of second year students, and when they were in the fourth year (59.4% of second year students and 84.7% of fourth year students), preferred the use of True/False type MCQs in the assessment at undergraduate medical examinations. A statistically larger percentage of students in the fourth year, compared to when they were in the second year accepted this method of evaluation, most likely due to the greater familiarity with the format and the technique of answering MCQs with time course. The majority of students (48.3% in the second year and 61.9% in the fourth year) also accepted the Multiple True/False format to be the best MCQ format (Table 1).

There are a large number of MCQ formats available for framing MCQs such as the One Best Response (the format used at GCE examinations), Matching type, Multiple True/False Completion type and Assertion-Reason format[1]. Although the medical students were not familiar with all the formats available for MCQ presentation, their advantage and limitations, it is likely that they compared this format to the One best Response, which they were familiar with during secondary school (Table 1). However, these results are in agreement with those of others[1].

It has been observed that the majority of students found the True/False MCQ format to be the most objective of evaluation methods, which is in agreement with earlier results[1]. When compared to other forms of evaluation, such as the Modified Essay Questions(MEQ), Open Ended Questions(OEQ), viva voce, practical assessments etc., it is likely that the preferability reflects the ease with which the MCQs could be scored, since it involves little effort in terms of comprehension, speech and other skills[1,13,14].

The study however, demonstrated that a lesser percentage of fourth year students, when compared to, two years earlier, found MCQs to be the most objective method (59.1% Vs 79.5%; Table 1). The shift in attitude could be explained by the fact that when in the fourth year, they have become familiar with the MCQ format, its advantages and disadvantages and limitations, and some find that it is not suited to test higher order cognitive skills[3,4,13], and the associated negative scoring system was also found to be penalizing [15,16]. Another factor could be the frequent use of undefined imprecise terms such as rare(ly), common(ly), characteristic(ally) etc., and the disproportionate number of 'true' and 'false' items[17]. Candidates have a right to expect the examiners to be fair and accurate, while examination boards must have a moral and ethical duty to ensure the reliability and validity of MCQ examination. The use of undefined imprecise terms is unacceptable with this responsibility[17].

However, despite more experience and familiarity with MCQ answering, the majority of stu-

dents in the second year (70.1%), and when they were in the fourth year (73.9%) still did not accept the negative scoring system of MCQs (Fig. 2; Table 1). There are a large number of studies, which have been carried out to assess the effect of negative marking on student perceptions and the method itself[13,18,19]. According to some studies, the negative scoring system has advantages, such as encouraging the student to make an 'educated guess' when needed, in marking the correct answer, but not 'blind guessing'[18], and it discriminates 'no knowledge' from 'incorrect knowledge'[13,18]. These groups of researchers also state that the negative scoring system of MCQs if not used, then complex and educationally questionable post examination adjustments have to be made to ensure a reasonable spread of marks for ranking, and a plausible mean mark, and thereby achieving a normal distribution of marks can be difficult[13]. These studies do not agree with the findings of the present study. It could be because the (i) students feel that the penalty adds no new information about their knowledge[18], (ii) anxiety caused by this system of marking may unfairly disadvantage more anxious students[15,16,19], (iii) marks subtracted from other areas may result in scores not closely reflecting knowledge[19] and (iv) medical practice has a large component of guessing and any approach, which imposes a penalty for incorrect answers reflect an unusual view of medical practice as an 'exact science'[18].

Table 1

	Year	Agree	Disagree	Not Sure
MCQs should be used in the final exam	2nd	82(59.4%)	36 (26%)	20(14.5%)
	4th	100(84.7%)	16(13.6%)	2(1.7%)
It is the most objective method	2nd	91(59.9%)	52(34.2%)	9(5.9%)
	4th	93(79.5%)	18(15.4%)	6(5.1%)
True/False format is the best	2nd	71(48.3%)	23(15.6%)	53(36.1%)
	4th	73(61.9)	27(22.9)	18(15.3)
Negative scoring should be retained	2nd	31(22.6%	96(70.1%)	10(7.3%)
	4th	22(19.1%)	85(73.9%)	8(7%)
Negative marking increases anxiety	2nd	128(85.3%)	15(10%)	7(4.7%)
	4th	101(87.1%)	12(10.3%)	3(2.6%)
Negative marks penalizes me	2nd	75(75.8%)	13 (13.1)	11(11.1%)
	4th	76(82.6%)	8(8.7%)	8(8.7%)

Table 1. Shows (i) in the Upper panel, the students attitudes towards the use of MCQs and their Objectiveness at the final examinations and (ii) in the Lower panel, the students attitudes towards the negative scoring system (Upper rows in each horizontal column - second year students and lower rows in each horizontal column - fourth year students)

Furthermore, students on both occasions also felt that the negative scoring system increases their anxiety (85.3% in the second year and 87.1% in the fourth year), and reduces their performance (Fig. 3; Table 1). The majority were also of the opinion that this system of marking unfairly penalizes them (Fig. 3, Table 1).The candidates taking True/False type MCQs, which has a negative scoring system also omit items, because of the fear of losing marks[14,15,16]. This is in agreement with the findings of the present study. However, some studies have demonstrated only a minor influence of the negative scoring on student anxiety, and it does not appear to alter student ranking to any significant degree[13]. However, it is quite evident that if the students are advised accordingly on the basis of the items they had omitted at a MCQ examination, they tended to improve their performance, although made more errors, thereby resulting in a rise in the rankings[14]. Another reason for the students to be against a negative scoring system could be because of an element of 'guessing' or any other, such as a genuine mistake, where they may have to alter their initial response, but would not for fear of losing marks. However, another study has found that of the changes made, only about 22% were from correct to incorrect, about 40-45% were incorrect to correct and about 32% from incorrect to incorrect[20]. Therefore, it is apparent that changing the initial response in the presence of a negative scoring system is unlikely to penalize students.

Therefore, it is evident that despite more experience and familiarity with the scoring system of MCQs with time course, students perceptions of the negative scoring system is a negative one in all respects tested in the present study, and therefore, the current marking system needs to be re-evaluated to make it more acceptable to students.

In addition to re-evaluating the negative scoring system, as has been found to be necessary in this study, the improvements, which can be made to expand the scope and objectiveness of MCQs will make True/False type MCQs a more objective and fair means of assessment. Such steps include the proper structuring of MCQs to avoid ambiguity, undefined imprecise terms, double negatives and finding the right balance between 'true' and 'false' items in MCQs[9,10,17,21]. The MCQs could also be structured to test at least some higher domains by having a graph, chart, a set of data or a case history as the stem for interpretation[22].

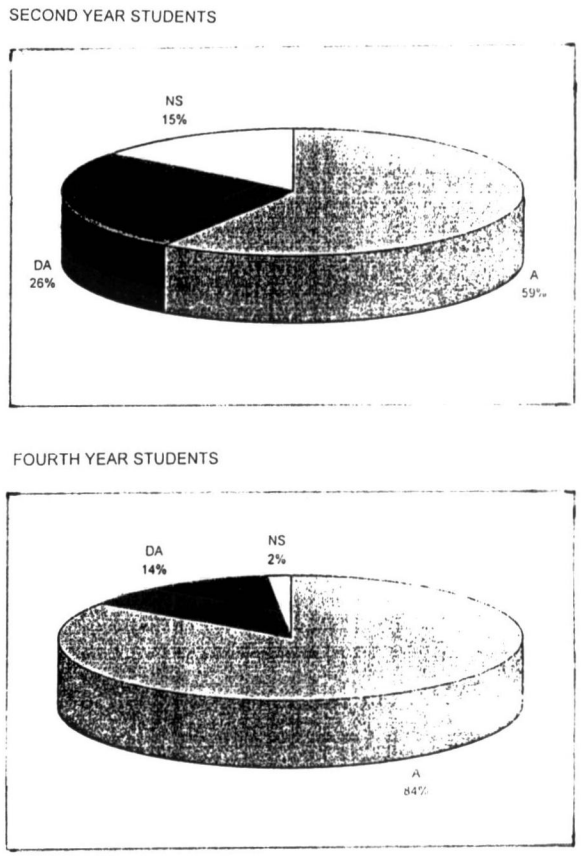
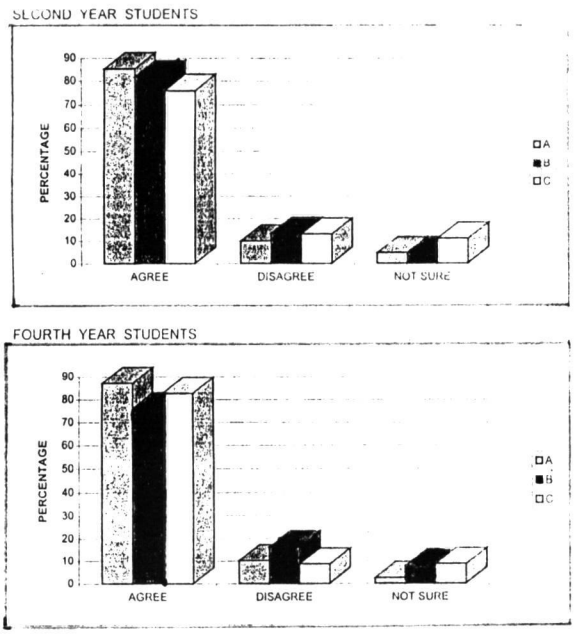
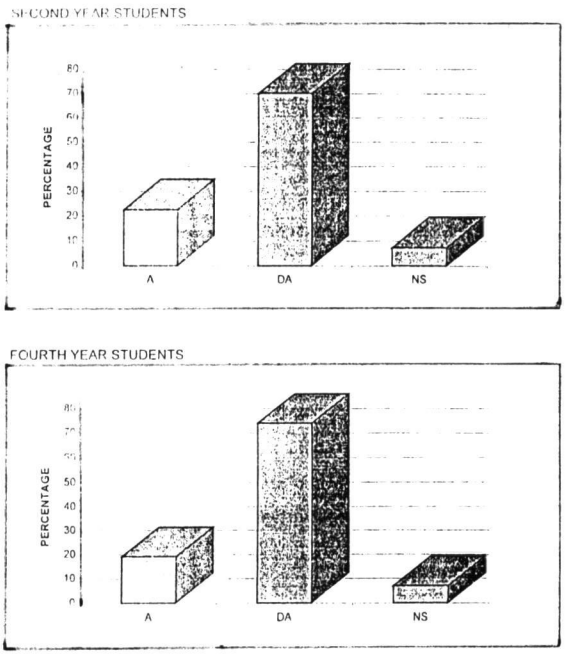


Figure 1. Medical students preference (%) to have Multiple True/False type MCQs at final undergraduate examinations.The Top figure indicates second year students and the Lower figure indicates fouth year students (A, agree; DA, disagree; NS, not sure).



A -ANXIETY INCREASES
B -PERFORMANCE REDUCES
C -PENALIZES ME

Figure 2. The student perceptions of the negative scoring system of Multiple True/ False type MCQ format. Top figure in dicates second year students and Lower figure indicates fourth year students (A, agree; DA, disagree; NS, not sure).



A -AGREE
DA-DISAGREE
NS-NOT SURE

Figure 3. The student perceptions on anxiety, performance and penalizing associatedwith the negative marking. Top figure indicates second year students and Lower figure indicates fourth year students (A, anxiety increased; B, reduced performance; C, scoring system penalizes students).

Conclusions

With more experience and familiarity with Multiple True/False type MCQ format and answering techniques, students had developed greater acceptability of the use of MCQs in the evaluation at their undergraduate medical examinations with time course. The majority of them also find that this method of evaluation to be the most objective of assessment methods adopted. However, despite greater exposure, the majority of medical students did not appear to accept the negative scoring system of MCQs, and would not prefer it to be retained, as they found it to be a penalizing method of marking, which also increased their anxiety, and reduced performance at examinations. Therefore, there appear to be no favorable shift towards the negative scoring system despite more experience and exposure to the method, and the marking system needs to be re-evaluated by the educationists and academic staff. It is also suggested that while improving the scope and objectiveness of True/ False type MCQs by improving its structuring, it is useful to have other methods of evaluation at medical examinations, where MCQs alone had been used.

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