# EFFECT OF NON-FUNCTIONING DISTRACTORS ON DIFFICULTY INDEX OF PHYSIOLOGY MCQ BANK AT REHMAN MEDICAL COLLEGE, PESHAWAR, KP, PAKISTAN

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## ABSTRACT

**Introduction:** Multiple Choice Questions (MCQs) are one of the efficient and frequently used tools to assess the knowledge of students. The objectives of MCQs assessment are achieved only if MCQs are constructed appropriately; moreover the quality of MCQs is assessed through a process of item analysis including content of Non-functioning Distractors (NFD). The present study aimed to investigate the relationship between the number of Non-Functioning Distractors and Difficulty Indices of MCQs.

**Materials & Methods:** The study was conducted on the MCQs of Physiology End of Term Examination paper held in June 2015. Manually marked results were entered in MS Excel to assess Difficulty Index (p) & frequency of NFDs. Pearson's correlation was performed by SPSS 15.0 between Difficulty Indices & NFDs.

**Results:** Item analysis revealed 58% MCQs in the average difficult category. The proportion of MCQ containing 0,1,2,3 and 4 NFDs was 26%, 20%, 38%, 14% and 2% respectively. The MCQs with more NFDs showed higher difficulty index.

**Conclusion:** The number of Non-Functioning distractors affects the difficulty indices of MCQs; the more the number of NFDs the easier the MCQs.

**Key words:** Multiple Choice Questions; Item Analysis; Difficulty index; Non Functioning Distractors.

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## INTRODUCTION

Research in medical education provides a real-time basis for improvements in the curriculum including its assessments. Multiple Choice Questions (MCQs) are widely utilized as assessment tool for medical education. MCQ format permits instructors to evaluate large numbers of candidates efficiently and to test a wide range of content.[1,2] The first multiple choice question (MCQ) was written by Frederick J. Kelly in 1914 in an attempt to improve standardization and simplify marking compared with assessment methods like Short Answer Questions (SAQs).[3] MCQs are marked objectively. At present a machine (OMR) is utilized for marking that has made marking simple and time efficient.

The MCQs usually consist of two main parts: the stem that states a problem, situation or statement and the options (alternatives) depicting possible solutions to the stem. The options include the one correct/best answer called the Key and several plausible wrong answers, referred to as distractors. The objectives of MCQs assessment are achieved only if the construction of MCQs is done appropriately.

Constructing a good MCQ is a complex, challenging and time consuming process. Item analysis helps to evaluate (after administration of Question paper) the quality of MCQs.[4] Item analysis includes Difficulty Index (p) which describes the difficulty level of MCQ; Discrimination Index distinguishes between high & low scoring students; and Distractor Efficiency elucidates the effectiveness of MCQs.[5, 6]

The present study aimed to help Examiners and the Department of Medical Education by providing feedback in order to improve the formatting and quality of MCQs.

### Objectives:

1. To classify the test items of Physiology End of Term examination of First Professional MBBS based on the proportion of Non-Functioning distractors
2. To determine the correlation of Non Functioning Distractors of an item and its Difficulty Index.

## MATERIALS & METHODS

The descriptive study was conducted in June 2015 at Rehman Medical College Peshawar on the theory MCQs paper of Physiology MBBS 1st Professional conducted in July 2012 on 100 medical students. The paper comprised of 50 MCQs of the One-Best type (having five options including key and four distractors); the duration of the examination was 50 minutes. For each correct option 01 mark was awarded with no negative marking, making a final test score of 50.

### Data Analysis:

After manual marking of 100 MCQs papers, data were entered in MS Excel. Scores were arranged in descending order; top 27 were taken as high achievers and bottom 27 as low achievers. Students who had not answered all the MCQs were excluded from both groups.

The difficulty index was calculated by using the formula: Difficulty Index (p) = (H+L)/N*100 Where N is the number of students in the high and low groups (54), H and L are the number of correct responses in high and low group respectively. Based on the value of the difficulty index, the MCQs were then categorized as Too Easy ($>70\%$), Average difficult ($30.1\%$-$70\%$) and Too difficult ($<30\%$).[7]

Distractors selected by less than 5% of students were considered Nonfunctioning distractors.[4,7,8,9]

The MCQs of the high and low group students were subjected to Distractor analysis; frequencies and proportions of the NFD were obtained for all the 50 items. Difficulty Index was calculated based on the standard formula. Classification of the items was done for Difficulty Levels. Pearson's Correlation was performed between Difficulty index and Non Functioning Distractors using SPSS 15. A $p \leq 0.05$ was considered statistically significant.

## RESULTS

The cutoff scores for the high achievers were between 28-40 marks; for the low achievers, these values were 16-26 marks. Figure 1 indicates that 58% of the questions fell in the average difficult category.
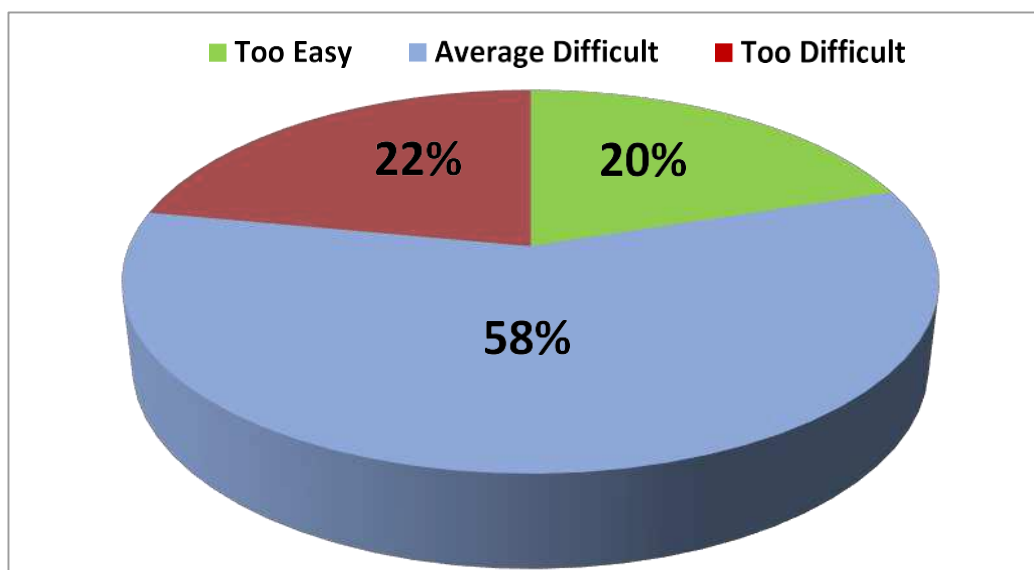


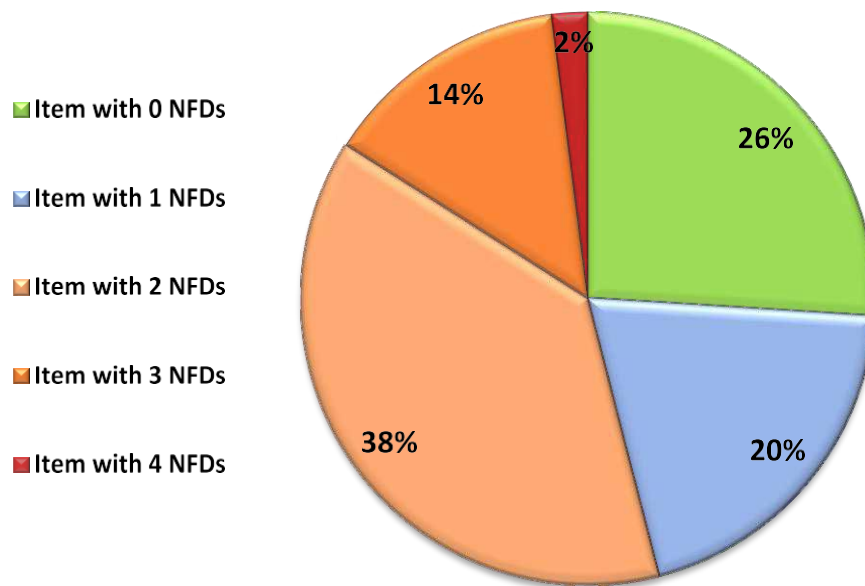**Figure 1: Pie chart of the distribution of Difficulty Level of MCQs**

**Figure 2: Distribution of MCQs based on the number of Non Functioning Distractors**

Figure 2 highlighted that 52% MCQs were having 02 or 03 NFDs. Figure 3 shows the relationship between the frequency of Non-Functioning distractors and difficulty level; it is observed that item with the Increasing NFDs fell in too easy group while those with 2> NFDs fell in average or too difficult group.
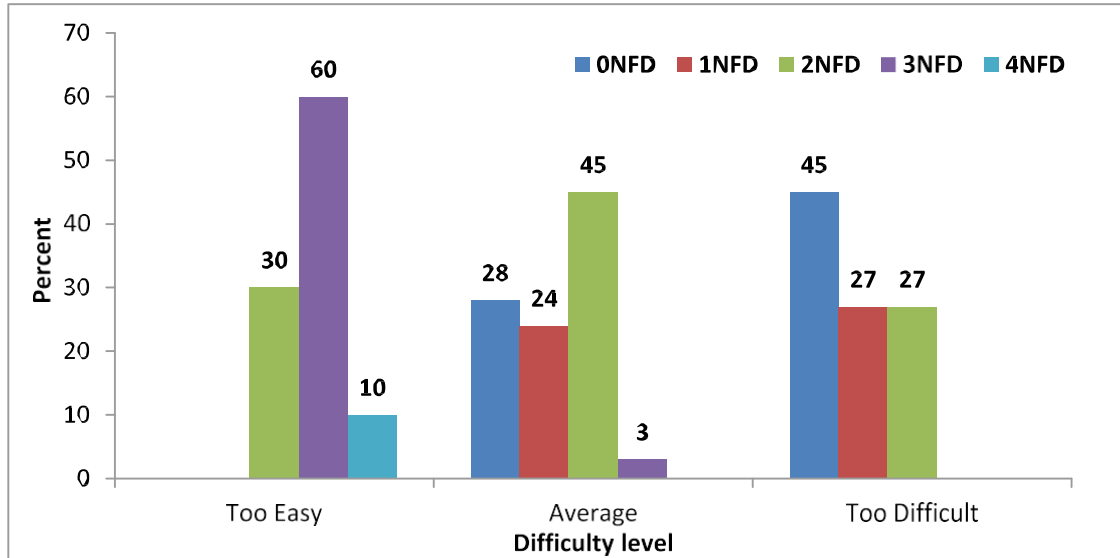


**Figure 3: Bar graph of distribution of Non-functioning Distractors by Difficulty levels.**

Figure 4 shows Pearson's correlation between the difficulty index and the number of Non Functioning distractors for the 50 MCQs. It was found highly significant (r=0.576, p<0.001) indicating strong correlation between the number of Non-Functioning Distractors and difficulty Index.
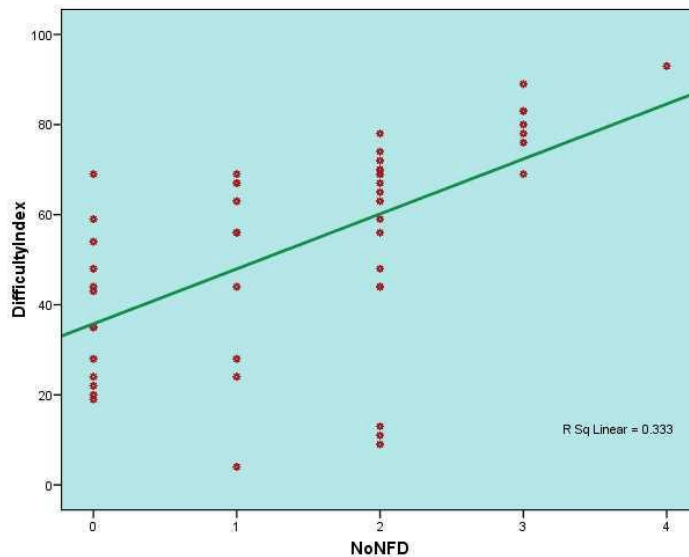
**Figure 4: Scattergraph of Non Functioning Distractors and the Difficulty Index showing a significant positive correlation (r = 0.576, p<0.001)**

## DISCUSSION

Abdulghani HM et al. (2014)[8] investigated the correlation between the number of Non Functioning Distractors and the Difficulty Index of MCQs. Their study concluded that MCQs which have more NFDs are easier.

Suruchi & Rana SS (2014)[10] investigated the relationship between Difficulty level and Discrimination level of test item in an Achievement test in Biology. His result showed that item Discrimination power improved with the increase in difficulty value but got decreased for very easy and very difficult test items.

Mukherjee P & Lahiri SK( 2015)[11] findings shows that more Non-Functioning Distractors in an MCQ increases the p-value and makes the item easy, conversely MCQ with more Functioning distractors decreases the p-value & make the item difficult.

Tarrant M et al (2009)[12] found that item with two functioning distractors were more difficult than item with three functioning distractors.

Chauhan P et al (2015)[13] calculated the P score and distractors effectiveness in order to find out the relationship between P score and distractor effectiveness. Their finding shows that well-chosen distracters improve the quality of MCQs by affecting item difficulty index.

In our study we are tried to find the correlation between Difficulty index and number of Non Functioning Distractors. It was observed that there is strong correlation between the number of Non Functioning Distractors and Difficulty Index. Our finding confirmed the general understanding in the literature that the frequency of Non Functioning Distractors can affect the examination quality by decreasing the difficulty of the MCQs.

## CONCLUSION

The number of Non Functioning Distractors can affect the examination quality by decreasing the difficulty of the MCQs; MCQs which have more NFDs are easier.

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