Short communication

Effects of multiple-choice item-writing guideline utilization on item and student performance

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Abstract

Objective: To measure differences in student performance on multiple-choice items based on multiple-choice item-writing guideline adherence and non-adherence.

Methods: All test items and item statistics for four examinations given in a single course were retrospectively analyzed for adherence to multiple-choice item-writing guidelines. Mean item difficulty and point biserial correlations were analyzed and compared between two scales: guideline-adherent and guideline-non-adherent items.

Results: Overall, 48.1% ($n = 90$) of items were classified as adherent and 51.8% ($n = 97$) as non-adherent. Of the 31 guidelines, 17 were breached. The majority of guideline deviations involved writing the choices. Mean difficulties between the two scales were 83.7% and 76.3% ($p = 0.01$) for adherent and non-adherent, respectively. Mean point biserial correlation were 0.242 (adherent) and 0.255 (non-adherent) ($p = 0.6$).

Conclusions: Breaching multiple-choice writing guidelines may negatively affect student performance with no beneficial effects on item discrimination. Further research into this area is warranted.

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Keywords: Multiple choice; Student performance; Question-writing guidelines; Test performance; Faculty adherence

Introduction

The multiple-choice item format is arguably the most prevalent question format utilized in colleges of pharmacy and medical education to test students' knowledge, skills, and abilities. This item format lends itself to frequent use due to its ability to test a broad scope of knowledge, its practicality, and ease of grading.[1] Most faculty members have, at some point, struggled in their multiple-choice item writing and have varying degrees of experience in the discipline. Some have had formal training as part of national board examination authoring or faculty-development programs, while others rely on previous experiences as students with multiple-choice exams, possibly supplemented by a self-initiated study and reliance on exam item statistics.

The majority of new faculty members may have little to no training in question writing. Hiring qualifications for new pharmacy faculty positions include clinical and research experience but do not commonly require a teaching certificate or related exposure to instructional methodology.[2] To this point, not even residency training in post-graduate year one or two mandates training in testing skills such as item writing, as evidenced by the American Society of Health-System Pharmacists' desired teaching outcomes.[3,4] Additionally, one study surveyed 800 residency programs that offered teaching experiences and examined the components included. Although some programs did report "formal training in teaching and learning," information on training in classroom assessment or item writing was not specifically mentioned.[5]

Regardless of experience, many faculty members are unaware of item-writing literature due to the fact that the majority of articles addressing this discipline are published outside mainstream medical and pharmacy academic journals. Some faculty members may be surprised to learn that not only item-writing guidelines exist but also objective

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research has been conducted to support many of these guideline recommendations. It is certainly true that research on multiple-choice item analysis has progressed slowly in the field of academic pharmacy, and at the time this article was written, the authors found no published research primarily addressing item writing in pharmacy literature. Only an education primer published in the American Journal of Health-System Pharmacy was found regarding general item-writing principles.[6]

Research into the multiple-choice item format began in the 1970s, but Haladyna and Downing[7–9] in the early 1990s investigated and compiled much of the current body of evidence and have contributed multiple reviews, papers, and guidelines addressing multiple-choice item writing. These references represent the bulk of literature regarding best practices and are based on both objective evidence and expert opinions. Although other guidelines exist in higher education and professional curricula,[10,11] those of Haladyna et al. are a desirable framework from which to work due to their agreement with other compilations, and more importantly because they describe the rationale for each guideline based upon empiric research while summarizing the effects of each guideline concept on item statistics.

There are 31 multiple-choice item-writing guidelines that Haladyna et al.[7] have set forth, based on a thorough review of 27 textbooks on educational testing, and the results of 27 research studies and reviews published since 1990. These guidelines are broken down into five logical categories. These categories include content concerns, formatting concerns, style concerns, writing the stem, and writing the choices. See Table 1 for a summary of the guidelines. Fourteen of the 31 guidelines relate to writing the choices, representing more guidance than the other four categories. Faculty members are likely already abiding by some of the published guidelines, as many of the suggestions offered, such as "use correct grammar" and "avoid opinion-based items," are intuitively known to be good writing practices. Other guidelines may not be as instinctual. Examples of some of these guidelines include "avoid all of the above" as it has been shown to reduce item reliability and "avoid complex multiple-choice (type K) items" as they have been shown to be more difficult but no more discriminating than alternative item formats.[7]

Considering that clinical faculty members are trained to practice evidence-based medicine, it seems logical to apply the available evidence to academic responsibilities as well. Literature suggests that nursing and medical education have identified the importance of guideline utilization to enhance item quality.[12–14] Tarrant et al.[13] described a near 50% guideline non-adherence rate by items on high-stakes nursing exams over a five-year period. Jozefowicz et al.[14] evaluated nine examinations from three U.S. medical schools for item quality. Their findings showed a relatively low quality of in-house examinations and a substantial difference in item quality between items written by National Board of Medical Examiners-trained faculty members

Table 1
Revised taxonomy of multiple choice item-writing guidelines

Guideline
Content concerns
1. Single content and behavior
2. Important, not trivial content
3. Use novel material
4. Keep items independent
5. Avoid over specific/general
6. Avoid opinions
7. Avoid trick items
8. Simple vocabulary
Formatting concerns
9. Avoid complex multiple choice (type K) format
10. Format vertically
Style concerns
11. Edit and proof
12. Correct grammar
13. Minimize reading
Writing the stem
14. Clear directions
15. Central idea in stem
16. Avoid window dressing
17. Use positive, no negatives
Writing the choices
18. Write as many plausible distractors as you can
19. One right answer
20. Vary location of right answer
21. Logical/numerical order
22. Choices not overlapping
23. Choices homogenous
24. Choice length equal
25. Use carefully *None of the above*
26. Avoid *All of the above*
27. Avoid NOT in the choices
28. Avoid clues
29. Make distractors plausible
30. Use common errors of students
31. Use humor sparingly

Adapted from A review of multiple-choice item-writing guideilnes for classroom assessment.[7]

versus non-trained members. Though unstudied, it is likely that these same quality issues could be said of in-house pharmacy school examinations as well.

Given this information and the similarity between medical, nursing, and pharmacy professional schools, the authors hypothesized that variation in item consistency and quality may exist in a professional pharmacy didactic course as well. The objective of this study was to evaluate faculty members' adherence to item-writing guidelines and assess the effects of adherence and non-adherence on student and item performance.

Methods

This project was exempted by the Institutional Review Board and all course instructors were informed of the study and granted permission for their test items to be reviewed.