Comparison of flawed vs. non-flawed multiple-choice questions when used as preparatory material for a pharmacotherapeutics exam

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Objectives

To assess the impact of using flawed and non-flawed multiple-choice questions (MCQ) as study tools on exam performance.

Based on utilizing MCQ with or without item-writing flaws (IWF) for studying, determine if there is a difference in:

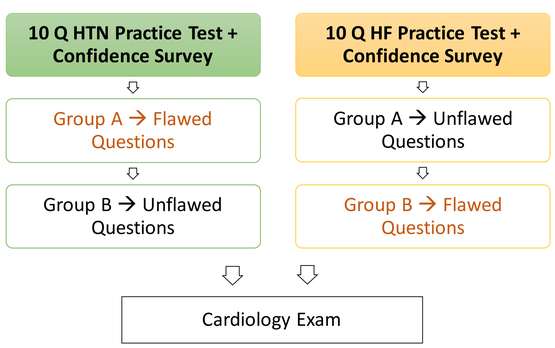
- Exam performance
- Student's self-perceived knowledge confidence
- Amount of preparation study time

Introduction

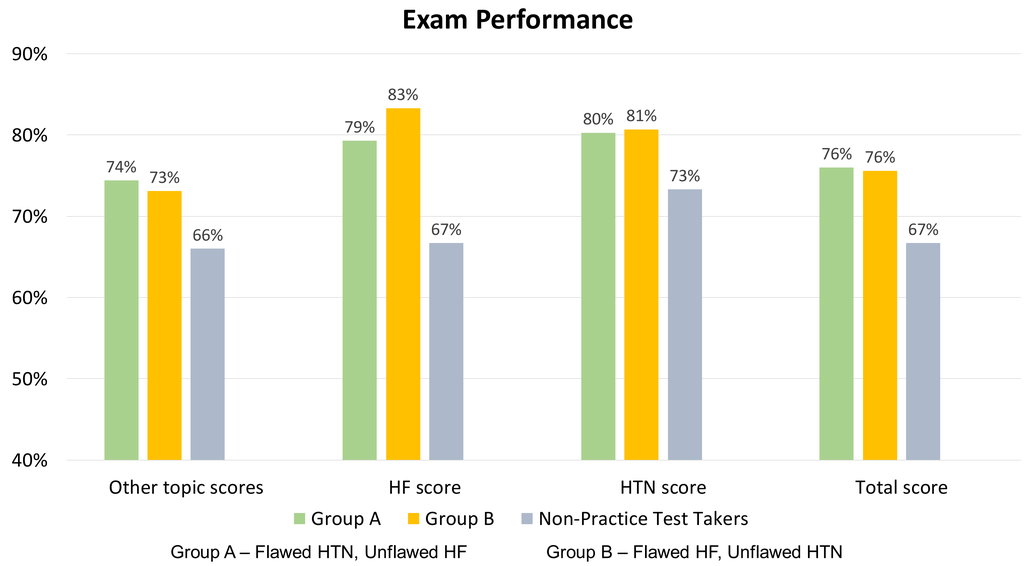
- Use of MCQ's with IWF on an exam can negatively impact high-achieving or knowledgeable test takers and benefit students who are comparatively unknowledgeable.[1]
- Student performance on exams is enhanced when using practice questions.[2]
- The impact of using MCQ's with IWF as study materials has not been evaluated. Anecdotally, high-achieving students may feel frustrated with these study materials. Conversely, students who do not know the information may feel a false sense of confidence if they are a good test taker.

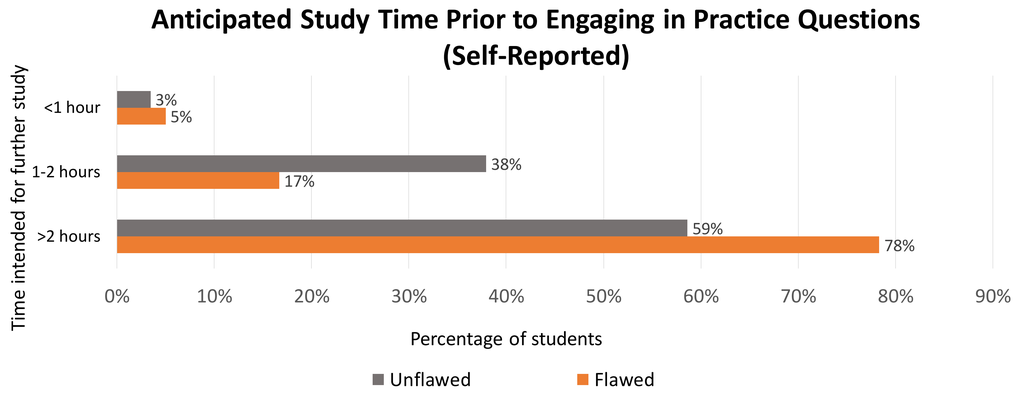
Methods

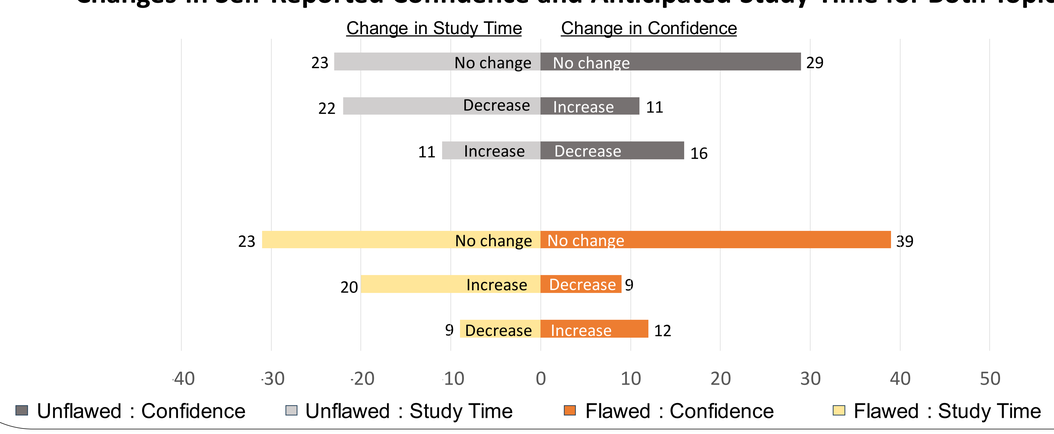
- Prospective crossover study design (program evaluation)
- Students randomized using random number generation by PI. Students and co-investigators blinded.
- Parallel sets of quiz questions created by study team and peer reviewed by content experts for each topic. One set contained IWF, one set written according to best practices.
- Exam scores compared using MANOVA and Student's t-test, and Cohen's d was used to evaluate the effect size



Results







Results

- 59 (93.7%) students engaged in both practice quizzes
- Exam reliability: KR-20 = 0.83
- Mean 74.9%, range 44.6% - 98.6%
- No difference in total exam performance between students who used practice quizzes containing flawed or unflawed questions or in performance on the HF or HTN subsections ($p>0.05$)
- Difference in exam performance on questions relating to HTN and HF, compared to non-practice topics ($p=0.005$; effect size 0.52)

Discussion

Effect on Exam Performance:

- No significant difference found in exam performance between students who used questions with or without flaws as study preparation.
- Potential sample size limitation
- Supports existing literature that utilizing practice questions as preparatory material improves exam performance.[1]

Effect on Confidence & Study Time:

- Most students reported the practice questions did not affect confidence in material
  - May be due to when practice questions were taken (e.g., with significant studying still anticipated).
  - Possible explanation for the lack of correlation between change in confidence and anticipated study time

Implications

- Results are hypothesis generating for future studies
- The results should guide further research into the impact of IWFs in preparatory materials.
  - Larger sample size
  - Evaluating the effect on summative exams where questions are unflawed
- Future studies can assess the impact of relevant variables by controlling for them
  - Availability of practice material
    - Time proximity to examination
  - Numbers of retake attempts
  - Combination of flawed and unflawed questions

References

1.Tarrant M, Ware J. Impact of item-writing flaws in multiple-choice questions on student achievement in high-stakes nursing assessments. Medical Education. 2008;42(2):198- 206. doi:10.1111/j.1365-2923.2007.02957.x.
2.Stewart D, Panus P, Hagemeier N, Thigpen J, Brooks L. Pharmacy student self-testing as a predictor of examination performance. American Journal of Pharmaceutical Education. 2014 Mar 12;78(2).

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