

Test Anxiety, Student Preferences and Performance on Different Exam Types in Introductory Psychology

Afshin Gharib and William Phillips

Abstract—The differences between cheat sheet and open book exams were examined in introductory psychology classes. A total of 222 students enrolled in 5 sections of Introduction to Psychology participated in this study. Exam types were counterbalanced across sections. Students were given either cheat sheet or open book exams, and completed a pretest measure of test anxiety, exam preferences and study time. While students did slightly better on open book exams than on cheat sheet exams, exam scores were positively correlated, and students had lower levels of anxiety when taking open book exams compared to cheat sheet exams. Students also reported studying less for open book exams, but preferred open book tests. The decision of what exam type to use depends on a trade-off of student performance, preferences, anxiety levels, and effort.

Index Terms—Test anxiety, exam type, exam performance.

I. INTRODUCTION

What is the best way for teachers to evaluate learning in their students? Instructors want to be fair, would prefer to not create undue stress, and yet be able to accurately measure student learning and distinguish those who have mastered the course material from those that have not. The typical university class relies on some form of examination, usually a closed book and note exam. There is a relatively long history of trial-and-error efforts to improve testing procedures [1], [2]. Increasingly, instructors are experimenting with alternatives to the traditional closed book exam. Particularly with the increasing use of on-line technologies and the prevalence of entirely on-line classes, closed book examinations are less desirable and less practical. Unless students can be monitored or proctored in some way, there is no way to know if students are using their course material or not. An on-line instructor usually cannot be present when students in an on-line class are taking an exam, making alternatives to closed book tests a necessity in these courses.

One alternative to the traditional closed book exam is to use a “cheat sheet” or crib sheet – a sheet of notes that students prepare ahead of time and bring with them to use on the exam. Another alternative is to allow students to have access to all their notes and the textbook in an open book and open note exam. In entirely on-line courses this method of testing is often the most practical, as students are often not local, cannot be on campus for a proctored exam, and take the exam individually and at their convenience on-line.

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In our psychology department, we have moved away from using closed book and note exams in our Introduction to Psychology class because we as instructors felt that traditional exams were unnecessarily stressful in an introductory level course, where many of the students are not psychology majors. Many students who take an introductory course are either fulfilling a general education requirement or are unsure of what they want to major in, and having a positive, non-stressful experience in an introductory course may sway them to take other classes in the discipline, or consider that field as a major. For those students who are majors, or decide to become majors later, any material covered in an introductory course would be repeated in their upper division classes, again arguing for experimenting with alternatives to traditional, high stress, exams in introductory level classes. The question we were faced with was which alternative to a closed book exam to turn to.

The evidence for the benefits of open-book tests is mixed. One argument in favor of an open book exam may be that if students don't have to worry about having to memorize material for an exam, they will instead focus on those parts of the course that they find most interesting and stimulating, and may in the long run actually learn more in the class. However, many instructors may be hesitant to offer open book exams, based on the assumption that even students who do not prepare for the exam will do well with all their notes and their text available. The concern is that open book exams will not allow for discriminating between those students that have put effort into the class and really learned the course material and those that have not. This is one of the major reasons faculty in our own department have been resistant to considering open book exams as an alternative to closed book tests. Some researchers have found higher grades on open-book tests, although the improvement is more modest than might be expected [3]. In addition, open book exams may encourage less studying, particularly among those students who need to study the most. On open book exams weaker students seem to rely more on their notes and texts than academically stronger students, and students that use their notes most end up doing more poorly on these exams [4]. One explanation for this finding may be that students who have not prepared for the exam spend too much time during an open book test looking up answers to questions, and run out of time. More prepared students would be able to answer more questions without using course material, and turn to their material only to find answers to the questions they are not sure of. An open book exam may create a false sense of security for struggling students, leading to less effort and less studying. These issues are again particularly important in on-line courses, where exams given to distance learning students are usually open book and notes by default. If open book exams encourage less

effort on the part of the student, then learning in on-line courses may be compromised.

An alternative to either closed-book or open-book exams are cheat sheet or crib sheet exams, where the student is given the opportunity to prepare a sheet of notes ahead of time to use on the exam. Some studies find an improvement in performance when students use cheat-sheets [5], while others find no effect [6]. One possible benefit of a cheat sheet exam is that unlike an open book exam, cheat sheet exams may encourage more time spent in preparing for the exam, since at the very least students need to review the course material in order to prepare their cheat sheets. Students need to review their notes and reading, consider which material is most likely to appear on the exam, and select what to include on their cheat sheet. On the other hand, some instructors may worry that crib sheets become a crutch, and students would only study the material they happen to have included on their sheet (usually the main topics and highlighted sections of the textbook) and spend less time on other material which none the less may appear on the exam. Students may also spend so much time preparing their cheat sheets and second guessing what will be on the exam that they spend less time engaged with the material, studying what they find most interesting.

One important benefit of any of the alternatives to closed-book exams is that they may lower test anxiety. Test anxiety – worrying about the outcome of the test and experiencing negative emotions during the test – is associated with poor performance on exams [7], [8]. While moderate levels of anxiety may be motivating for students and improve their studying, excess stress during an exam can result in students not being able to do their best on the test. In addition, excessive anxiety during a course can result in students not enjoying the class or the material as much, and forming a negative emotional association with the subject matter. Students prefer open-book and cheat sheet exams because they feel they would be less anxious during those types of exams and therefore perform better [9]. If students feel less anxious with these alternative exam types, then that alone may be reason enough to replace traditional closed book exams. This would be particularly the case in introductory level classes, where getting students to engage with the course material and enjoy their exposure to the field is perhaps more important than teaching to a test, as discussed earlier.

An important consideration should also be what students themselves prefer. If instructors aim to make their courses as engaging and positive as possible for their students, then student preferences for alternative exam types should be taken into account, and students prefer open book and cheat sheet exams over closed book tests [9].

These considerations suggest that open book and cheat sheet exams may be alternatives to traditional closed book exams, especially in introductory level classes. The current study examined the relationship between exam scores, student preferences, and test anxiety on open book and cheat sheet exams in introductory psychology courses. It was hypothesized that open book exams would lead to the highest exam scores and lowest levels of test anxiety.

II. METHOD

A. Participants

Two hundred and twenty five undergraduate students (176 females, 49 males) enrolled in 5 sections of introductory psychology in a small liberal arts university participated in this study. Students were from various majors (including Biology, Business, Nursing, and Psychology), mostly in their first year at the university. All five sections of the class were taught by the same instructor, had the same texts and assignments, and during a given term, identical exams (non-cumulative, 50 multiple choice questions on each exam, created by the instructor). The classes were taught over 3 terms (2 sections during two terms and one section the third term). During the first two terms, exam type was counterbalanced across sections (one section had an open book exam as the first exam, a cheat sheet as the second exam, and the conditions were reversed in the other section of the class), during the last term, the first exam was open book, the second was cheat sheet. On cheat sheet exams students were allowed to use a single page (8.5 X 11 inches) of notes (with as much information as they could include on both sides, either hand written or typed) during the exam. All exams were the same duration (1 hour 15 minutes), given during regular class periods.

B. Procedure

Immediately prior to taking each exam, all students were asked to report how many hours they had spent studying for the test and were also asked which type of exam they prefer to take, which type of exam they would study most for and which type of exam they thought they would do best on (answer options were Closed Book, Open Book, Cheat Sheet and No Preference). All students also completed a 10 item test anxiety measure—the Pre-Examination Worry-Emotionality Scale [10]. This scale measures both the levels of emotionality (with questions such as “I have an upset, uneasy feeling”) and worry (with questions such as “I feel I may not do as well on this test as I could”) prior to an exam (questions are answered on a 5 point Likert scale). For this study, the combined score (both worry and emotionality) was used.

III. RESULTS

As shown in Fig. 1, students scored slightly but significantly higher on open book compared to cheat sheet exams. A paired samples *t* test found $t(220)=2.94, p < 0.05$. The difference in scores between the two exam types was 2% - an average score of 80.75 (sd= 10.22) on open book exams and 78.55 (sd=12.34) on cheat sheet exams (one additional question answered correctly on a 50 item exam).

Scores on the two exams were positively correlated (Fig. 2). A Pearson correlation found $r(219)=0.51, p < 0.05$. Those students who scored high on one type of exam tended to score well on the other exam type as well. This suggests that both exam types distinguished good students from poor students

Figure 3 shows the difference in anxiety scores between open book and closed book exams. Again, the difference is small but significant. A paired samples *t* test found $t(209)=1.98, p < 0.05$. The mean anxiety score was 22.92

(sd=7.39) on open book and 23.98 (sd=8.13) on cheat sheet exams. Students were slightly less anxious during open book exams compared to cheat sheet exams. Anxiety scores were negatively correlated with exam scores on the cheat sheet exam ($r(215)=-0.16, p < 0.05$), but not on the open book exam. The more anxious a student was during a cheat sheet exam, the lower their score on the exam tended to be. On open book exams on the other hand anxiety was not only lower, but unrelated to students performance.

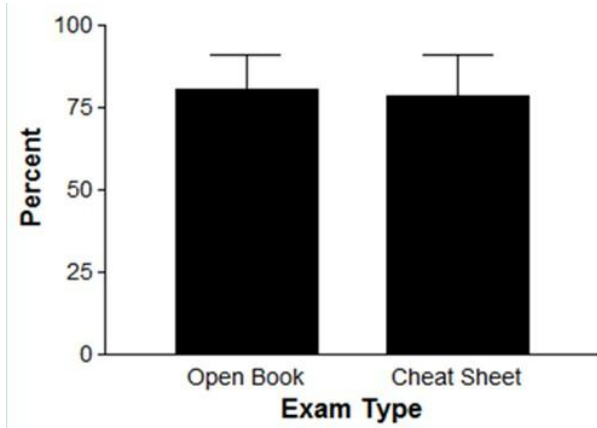


Fig. 1. Exam scores: open book mean = 80.75, standard deviation = 10.22; cheat sheet mean = 78.52, standard deviation = 12.34.

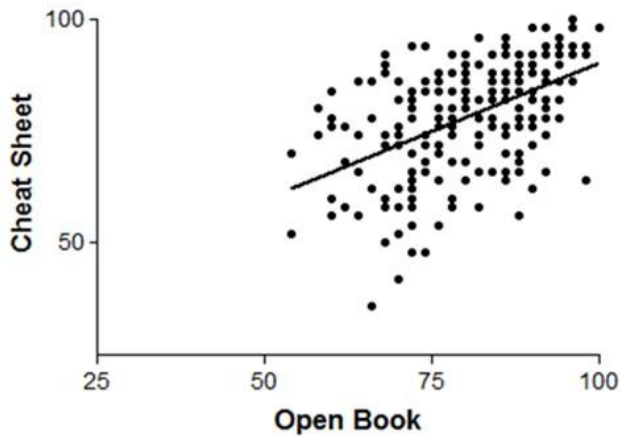


Fig. 2. Correlation between exam scores.

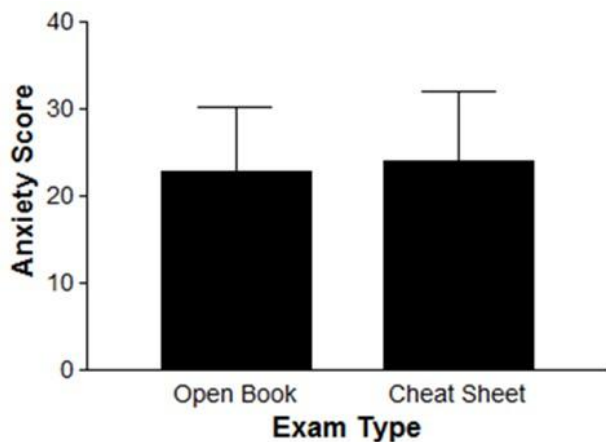


Fig. 3. Anxiety scores: open book mean = 22.92, standard deviation = 7.39; cheat sheet mean = 23.98, standard deviation = 8.13.

Fig. 4 shows the number of hours students reported having studied for each type of exam. A paired samples t test found $t(164)=2.00, p < 0.05$. Students reported spending more time

studying for the cheat sheet exam (Mean hours=4.37, sd=3.55) compared to the open book exam (Mean hours=3.73, sd=4.35). However, again the difference is relatively small – a difference of about half an hour more time spent studying for a cheat sheet exam compared to an open book test. The small difference is particularly surprising given that students would have to spend some time simply writing up the material to include on their cheat sheets.

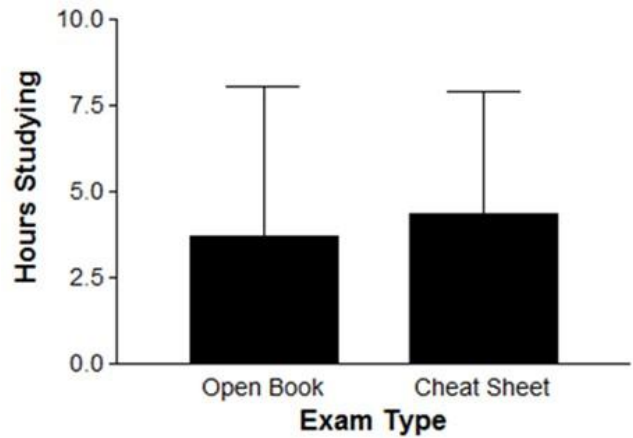


Fig. 4. Time spent studying: open book mean = 3.73, standard deviation = 4.35; cheat sheet mean = 4.37, standard deviation = 3.55

Fig. 5 shows student responses to the question “Which type of test do you prefer to take”. Students clearly preferred both open book and cheat sheet exams over closed book exams, $\chi^2(3) = 129, p < 0.05$. Overall, 51% preferred open book exams and 36% preferred cheat sheet exams (only 1% preferred closed book tests). Open book exams were the most preferred exam type.

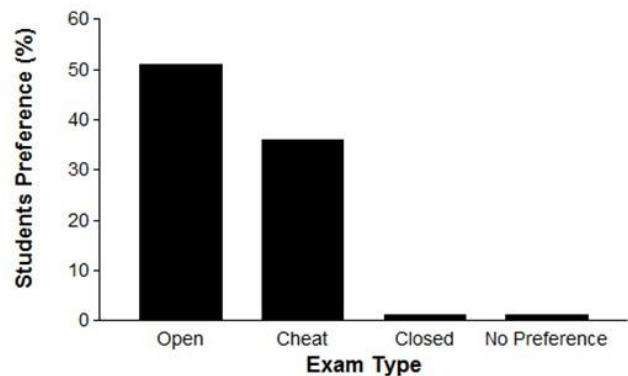


Fig. 5. Student preferences.

Fig. 6 shows the students responses to the question of which type of exam they would predict they would do the best on. Most students (54%) predicted that they would do better on open book exams, 34% felt they would do best on cheat sheet exams and only 6% felt their best performance would be on closed book tests, $\chi^2(3) = 144, p < 0.05$.

Fig. 7 shows students response to the question of which type of exam they would study the most for. For this question, students overwhelmingly stated that they would study most for closed book exams (75%), followed by cheat sheet exams (9%) and only 4% stated that they would study the most for an open book exam, $\chi^2(3) = 291, p < 0.05$. Interestingly, 13% reported that the type of test would not make a difference in their studying.

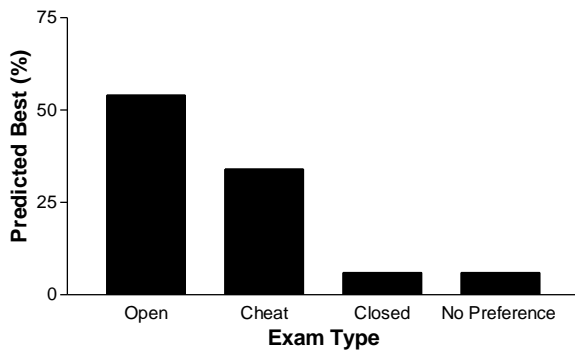


Fig. 6. Students predictions of their best performance.

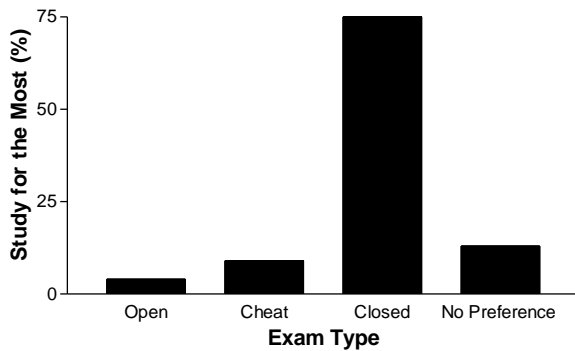


Fig. 7. Students predictions of their studying.

IV. DISCUSSION

While students did slightly better on open book exams compared to cheat sheet tests (getting about one additional question right on open book exams), they reported studying more for and feeling higher levels of anxiety on cheat sheet exams. They also much preferred open book and cheat sheet alternatives to closed book exams, with open book exams being most preferred by students. Students were accurate judges of their own studying and performance – they predicted that they would study least for open book exams and that they would perform best on those exams.

One interesting finding was that exam scores on the two types of tests were strongly correlated – good students tend to do well and poor students tend to underperform regardless of exam type. One way to interpret this finding is that the instructors ultimate decision of what sort of exam to use depends mostly on what the instructor considers most important – if it is desirable to decrease anxiety levels, then open book exams may be the best choice. In introductory level classes for example, the goal is to introduce the discipline to students from various backgrounds, many of whom are not planning to major in psychology. Open book exams create a stress free environment that allows the student to really explore and engage with the subject matter without having to worry about memorizing details for the exam. On the other hand, cheat sheet exams lead to students spending more time studying the course material. In upper division courses, cheat sheets may be a more desirable alternative. Since students who do well on one exam do well on the other, both exam types seem equally well suited to discriminate good students from poor ones.

This finding may be particularly relevant to instructors of on-line courses. Student learning can be effectively assessed

using a variety of testing styles, including open-book and note exams. For on-line classes, which by default may have to be assessed with open book and note exams, given that there is no way to proctor the distance learning student, this result is encouraging. On-line instructors may feel more confident that their open book exams are valid measures of student learning. It is important to point out that in our courses, open-book exams had a time limit – this would be an important variable to consider in on-line courses.

What surprised us most was the modest improvement in grades on an open book exam compared to a cheat sheet test. Given that students had all the course material at their disposal during the exam, it might have been expected that scores would have been much higher on open book tests. In fact, in our department this is the primary reason many instructors have been hesitant to try open book exams – they were concerned that on an open book and note test, everyone would get close to perfect scores. Clearly, this was not the case. There are several factors that could have contributed to the very modest improvement in grades on open book tests. One factor suggested by our results is that students studied less for open book tests. Not only did students report studying less for the open book exams in our classes, they also judged that they would study least for open book exams overall, compared to cheat-sheet or closed book exams. Given that exams in our classes had a time limit (70 minutes regardless of exam type), if students were less familiar with the material, they may not have had the time to look up all the answers they did not know in the material at their disposal. This interpretation conforms to previous research showing that students do not generally improve on open book exams [3] and that they study less for these exams [4]. It would be important, in future research, to evaluate the importance of time as a factor in performance on different exam types. We plan to look at performance on “take home” exams, where the students have a large amount of time (a day or more) to complete an open book and notes test, compared to the timed open book and note exams we used in the present study. We would predict that with more time, students would be able to do much better on open book tests compared to alternatives. This again is an important consideration for on-line courses, if our prediction is supported in future research, then for on-line classes keeping a time limit should be encouraged.

An additional factor that could have resulted in the more modest than expected improvement in scores on open book exams could have been that this was an introductory course, and the class covered a lot of information. Given only 50 questions on the exam, the questions focused on the major topics and main ideas discussed in the class and the text. The most important material, and the material most likely to appear on the exams, may have been obvious to the students, who would then include that material in their cheat sheets. As a result, the material included on a single sheet of paper may have been enough to answer most of the questions on the exam.

Additionally, as this was an introductory course and a general elective option at the university, and most of the students in the class were not majoring in this area, it could have been that students just did not take the opportunity to prepare for either the open book test or the cheat sheet exam they way they should have. While students may put effort

into preparing for a class that is within their major, and may therefore be important in their progress towards a degree, they may only expend minimal effort in a class that is an elective. As a result, perhaps students were poorly prepared for both exam types. One finding that supports this interpretation is that while students reported studying more for a cheat sheet exam, it was not by much. Students studied on average about half an hour more for the cheat sheet exam compared to the open book exam. Given that students would have to put some time in to preparing their cheat sheet, this result suggests that the different types of exam did not lead to any difference in time spent reading over notes and texts. The present study focused on exam performance in introductory psychology classes. In recent work [11], we have extended this research to include upper division courses, where levels of exam anxiety may be higher, and exam items are more specific and detailed. In upper division classes, most of the students are taking the course as a major requirement, and can be expected to take the class more seriously. Our results so far suggest that there is little practical difference in the effects of different exam types in introductory, lower division classes compared to upper division courses [11]. In both types of course, students do slightly better on cheat sheet exams, but have higher levels of anxiety on cheat sheet exams compared to open book tests. Unsurprisingly, students in both lower and upper division courses prefer alternatives to closed book exams [11].

It would be interesting as well to extend this research to other disciplines. It would be particularly interesting to see if there are differences between more demanding and competitive disciplines compared to less competitive ones, where we would expect lower levels of exam anxiety in general, and perhaps a tendency for less preparation on the part of the student. For example, it may be that disciplines that prepare student for further graduate work, where students need to compete for acceptance to a graduate program and undergraduate grades are an important consideration for admission, are more competitive, and encourage more preparation and probably anxiety on the part of the student. It would be interesting to compare student performance and anxiety in these fields compared to less competitive majors.

We also plan to investigate differences between the two exam types studied here and other, even less traditional alternatives to closed book exams, such as group or collaborative exams. Given the structure of our introductory courses, open book and cheat sheet exams seemed like the best alternatives to the traditional closed book exam. In other courses, on-line or even collaborative exams may be worth considering. In a group or collaborative exam, not only are students allowed all their notes and texts, they can also complete the test in a study group and rely on other students for help. It would be interesting to see if group exam scores also correlate with scores on other exam types, such as open book or cheat sheet exams. One concern about group exams is that in the context of a group, weaker students would rely on their better prepared classmates. If this is the case, then scores on group exams should not correlate with scores on exams taken individually, regardless of the type of individual exam. If we find, as in the current study, that exam scores are still correlated, then this should increase instructors confidence

that group exams are a valid way measure student learning. Collaborative open book and note exams may be particularly suited for an on-line format, where the instructor can create virtual collaborative groups to would on an exam together.

It would also be interesting to consider other alternative exam formats. The current study compared only one format of testing (multiple choice questions) in other courses (particularly upper division or graduate level courses) it may be valuable to compare other types of questions. It would be particularly interesting to compare anxiety levels and performance on essay questions with different types of exams. It would also be interesting to consider alternative forms of assessment to exams. For example, it would be interesting to see if student grades on term papers, or on problem based learning assessments correlate with grades on more traditional exam types. For on-line courses, these alternative forms of assessment may be particularly attractive.

V. CONCLUSIONS

Students do slightly better on open book exams compared to cheat sheet exams, and they report studying slightly less for these tests, but they also feel less anxiety during open book exams and preferred these types of exams. Given that the scores on the two exam types were correlated, either type of exam allows instructors to measure student performance and learning. At least for introductory level courses, open book exams may be the best choice, as a way to introduce students to a new topic area in a less stressful and more enjoyable way.

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