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The relationship between time to complete a test and test performance

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One hundred eighty-three students enrolled in an undergraduate psychology statistics course completed three tests comprised of different amounts of closed book and open book test items. For these tests, students also recorded their test completion time, for extra credit. We then combined course-based student data with preexisting demographic variables. We found that test completion time was sometimes negatively correlated with test performance, but not consistently so. Student age was positively correlated with test completion time, and prior term grade point average (GPA) and prior cumulative GPA were both positively correlated with test performance. We discuss these results by exploring possible reasons for the inconsistent relationship between test completion time and test performance, and the advice we might give to students regarding these matters.

The relationship between time to complete a test and test performance

You are an instructor giving the first of five tests in a course. There are 75 minutes available for students to complete your exam, but the first student finishes in 15 minutes. You look surprised, and so do the rest of your students in the room. Did this prompt you to think about whether speedy performance helps or hinders students? Do students who take longer do better on tests? Should the other students remaining in the room be concerned that they have not finished *their* test yet? These types of questions motivated the present study.

The relationship between test completion time and test performance is a topic previously explored in the literature, and the outcomes are both mixed and complicated. For example, some researchers study the order (first, second, third, etc.) in which students complete an exam (Foos, 1989; Paul & Rosenkoetter, 1980; Wierzbicki, 1994), and others study actual time to completion (Bridges, 1985; Feinberg, 2004; Terranova, 1972). Wierzbicki (1994) proposed three possible relationships between completion time and test performance: (a) a linear relationship where faster completing students score better; (b) a curvilinear relationship where students who have middle-of-the-road completion times score better; and (c) a relationship where middle-of-the-road completers exhibit less test score variability as compared to fast and slow completers.

The findings based on order of completion tend to support the conclusion that the order in which students finish a test appears unrelated to test performance (Foos, 1989; Wierzbicki, 1994). But what about the amount of time taken to finish the test? Terranova (1972) found a significant curvilinear regression of time on scores, with higher scores for those finishing during the middle of the test, although Bridges (1985) found that test completion speed was not related to test performance on an untimed test. However, Feinberg (2004) found that increased time on a test had a positive impact on test performance. So what advice should we give to our students about time on test and test performance?

On Tests 2, 3, and 4 of a five-test undergraduate psychology statistics course, we offered students extra credit if they would record their finish time as indicated on a clock on the wall of their classroom. After the semester was over, we linked test performance to completion time for each of the three tests. In addition, we obtained Institutional Review Board (IRB) (ethics) approval and demographic data from our Registrar's Office to explore the relationships between test completion time and test performance.

Based on the first author's experience in teaching the undergraduate statistics course (and consistent with Wierzbicki, 1994), we predicted a negative relationship between test completion time and test performance. That is, students who tended to finish with shorter test completion times would perform better than those who finished with longer test completion times. Why this prediction? We believed that students who became more confident and more adept at using their calculator to complete open book portions of the test would work faster, and perhaps increased confidence and skill are traits associated with higher scores and faster completion times.

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METHOD

Participants

Students (*N* = 183) enrolled in an undergraduate psychology statistics course at a large Western university in the United States comprised the participants of the study. The average age of participants was 24.4 years old (*SD* = 7.95), and 74.7% were female. Regarding year in school, 11.5% were first-year students, 39.9% second-year students, 32.2% third-year students, and 16.4% fourth-year students. Enrolled students came from 21 different departments from the university, with the most common department being psychology (38.8%) – other commonly reported majors were nursing, criminal justice, and health science. In the semester immediately prior to taking the statistical methods course, the students' average semester grade point average (GPA) was 2.96 (*SD* = 0.71) and the students' average cumulative GPA was 2.93 (*SD* = 0.55).

Materials

Although five tests (100 points each) were administered in the undergraduate statistical methods course, only the middle three tests were used to obtain time on test data. The first test was a completely closed book test and tested factual material (multiple choice, true/false, fill-in-the-blank). Test 2 contained 46 points of closed book items (multiple choice and true/false), and 54 points of open book items (descriptive statistics and *z* scores). Test 3 contained 40 points of closed book items (true/false) and 60 points of open book items (confidence intervals and chi-square problems). Test 4 contained 20 points of closed book items (true/false) and 80 points of open book items (correlation, one sample *t* test, independent samples *t* test, paired samples *t* test). The last test was a completely open book test, of 120 minutes in duration, and only presented statistical problems to be worked. During the open book portion of a test, students could use their textbook, class notes, other notes, and a calculator.

Procedure

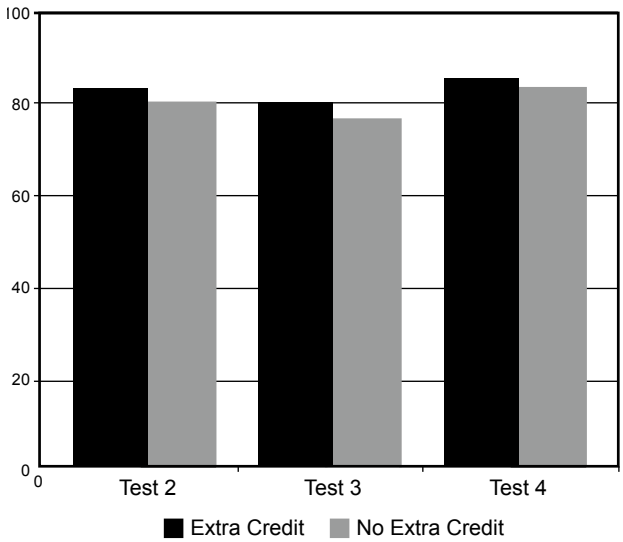
We collected time on test data for Tests 2, 3, and 4 during the course. Students had 75 minutes to complete each of these tests. Students received extra credit for their participation (in these analyses, however, we corrected student test scores to remove the extra credit points from the test score). To receive the extra credit, just before handing in their test, students self-reported their finish time from a clock in the front of the classroom. After the semester was complete, we obtained retrospective IRB approval to consider this research data. We also obtained information from the Registrar's Office not readily available in the instructor's grade book: student major, student department, year in school, gender, prior term GPA, prior cumulative GPA, and age.

RESULTS AND DISCUSSION

Did students who completed the extra credit differ in test scores from those not completing extra credit?

The answer is yes, sometimes. See Figure 1 for a comparison of students completing extra credit versus students not completing extra credit across the three tests – using independent samples *t* tests, there were no significant differences for each of the three tests.

Figure 1 No significant differences between extra credit versus non-extra credit participants.



Was test completion time related to test performance on any of the three tests in a predictable manner?

The answer is yes, sometimes. Test 2 scores were significantly negatively correlated with time to complete Test 2, $r(164) = -.30$, $p < .001$, and Test 3 scores were negatively significantly correlated with time to complete Test 3, $r(157) = -.15$, $p = .04$. However, Test 4 scores were not significantly correlated with time to complete Test 4, $r(156) = .01$, $p = .90$. Consistent with some predictions (Wierzbicki, 1994) but contrary to other literature (Feinberg, 2004), we found some of the negative correlations we expected. However, these negative correlations were not consistent over time, and may be explained in part by the changing nature of the content over the course of the class.

To simplify the remaining analyses, we calculated an average score across the three tests and an average completion time across the three tests, for each student.

Did age relate to test completion time or test performance?

Student's age is significantly positively correlated with the average time to complete the three tests, $r(181) = .28$, $p < .001$, but was not significantly correlated with average score across the three tests, $r(181) = .04$, $p = .59$. Thus older students tend to take more time, but age was not significantly related to test score.

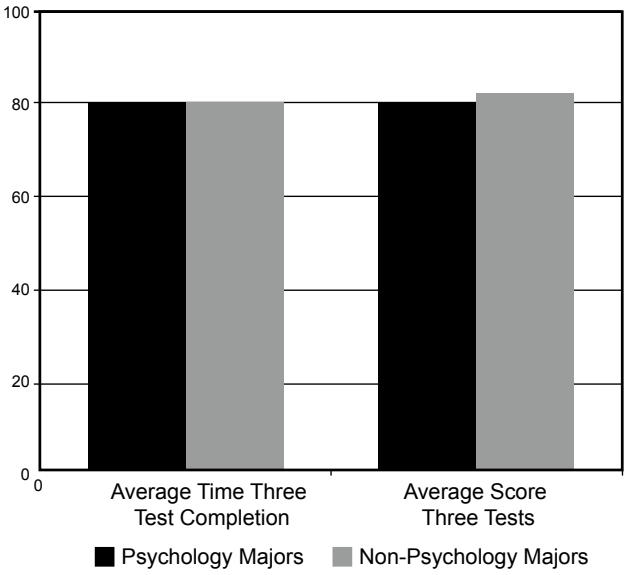
Did prior term GPA or prior cumulative GPA relate to test completion time or test performance?

Neither prior term GPA, $r(118) = -.01$, $p = .83$, nor prior cumulative GPA, $r(180) = -.07$, $p = .32$, were significantly correlated with the average time to complete the three tests. However, prior term GPA was significantly positively correlated with average score across the three tests, $r(118) = .44$, $p < .001$, and prior cumulative GPA was also significantly positively correlated with average score across the three tests, $r(180) = .46$, $p < .001$. A student's prior works seem unrelated to test completion time but moderately positively related to test performance. In other words, students who performed well in their other courses also tended to perform well on these three tests.

Did being a psychology major relate to test completion time and test performance?

The answer, based on independent samples *t* test results, is no on both accounts. See Figure 2 for a comparison of majors and nonmajors on time to completion and average score across the three tests.

Figure 2 No significant differences between psychology majors and non-majors on average time to completion, average quiz score.



So what do we tell our students about the time it takes to finish a test?

Based on the current study, sometimes test completion speed is related to test performance – that is, those who finish faster sometimes score better. It is important to note with our students that this is not a causal relationship. The negative correlation on Test 2 dissipates to a zero correlation by Test 4.

Speculatively, this could be due to the changing format (and content of the tests). Test 2 was roughly half objective items and half calculations, but by Test 4, only 20% of the test was objective and 80% was based on calculations. Perhaps time on test is more related to the format of the test items as compared to the content of the material being tested. However, test completion time is based on self-report data, and caution is urged with this interpretation. Anecdotally, students often seem more comfortable and confident during the open book/ calculations part of the exam than the closed book/ objective items part of the exam. When the bulk of the exam is open book, perhaps test completion time is less related to test score.

Additionally, older students tend to take more time to complete a test, but age was not significantly related to test performance. Prior term and prior cumulative GPA were both positively correlated with test performance, but not time to complete the test. So what is the take-home message for our students? Although younger students tend to finish faster, there is no consistent relationship between time on test and test score. Prior college success (as evidenced by GPA) does tend to positively predict test scores. Our advice to students would be to not worry about the speedy finisher, but to continue to build confidence and mastery in the subject matter regardless of the pace of others.

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