

### Introduction

- 72% of students report using laptops in the classroom (Patterson & Patterson, 2017).
- Laptops allow students to take more organized, as well as comprehensive notes (Gulek & Demirtas, 2005); however, Mueller and Oppenheimer (2014) reported that taking notes using a laptop results in shallow processing of the material, ultimately impairing performance.
- Barrett et al. (2014) found state-dependent learning effects when note-taking conditions matched test-taking conditions using all open-ended questions for a quiz given immediately after lecture material.
- The goal of the current study was to examine state-dependent effects for factual and conceptual questions on a quiz given two days after the material was presented.
- A 2 (note-taking method: by hand or laptop) x 2 (quiz method: by hand or laptop) between subjects design:

Quiz Method	Note-Taking Method	
	Hand	Laptop
Hand	<b>MATCH</b> (n = 17)	Mismatch (n = 18)
Laptop	Mismatch (n = 16)	<b>MATCH</b> (n = 15)

### Method

#### Participants

- Sixty-six undergraduates with a mean age of 19.27 years ( $SD = 1.23$ ) completed the current study; 31 self-identified as male and 35 self-identified as female.

#### Materials

- Four 15-17 minute long TED Talks
- 10 question quiz, made up of five factual and five conceptual questions.
  - Factual questions relied on information taken directly from the video.
  - Conceptual questions required application of lessons from the video to new situations.
- Note pads and laptops

### Procedure

- Participants were instructed to take notes as they would for class by hand or using a laptop.
- 48 hours later, participants studied their notes for 10 minutes before completing a quiz on the video they watched, either by hand or on a laptop.
- These quizzes were scored and the number of words in each participants' notes was recorded for analyses.

### Results

#### Overall Score

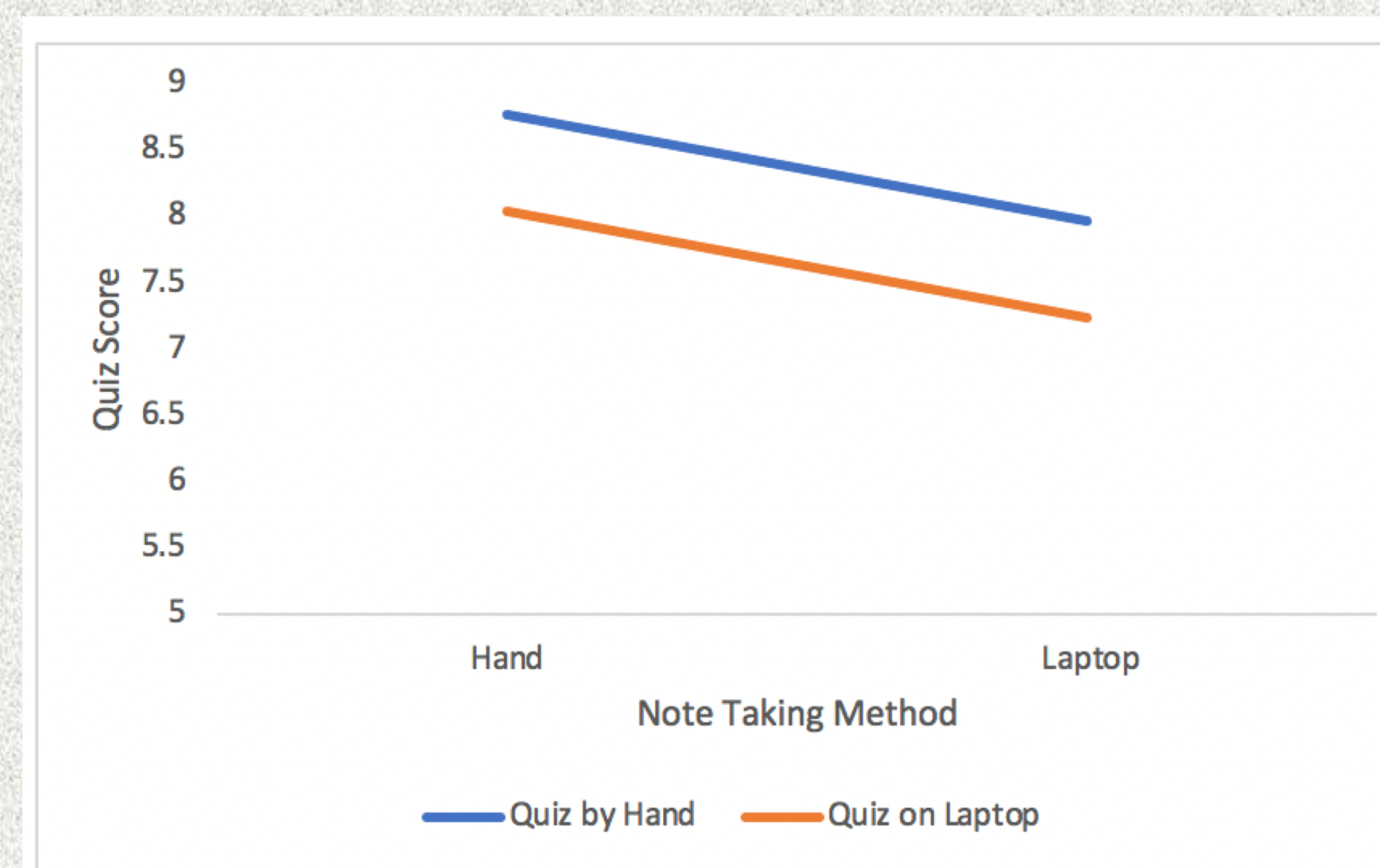


Figure 1. Overall Score on the Quiz

#### Conceptual Questions

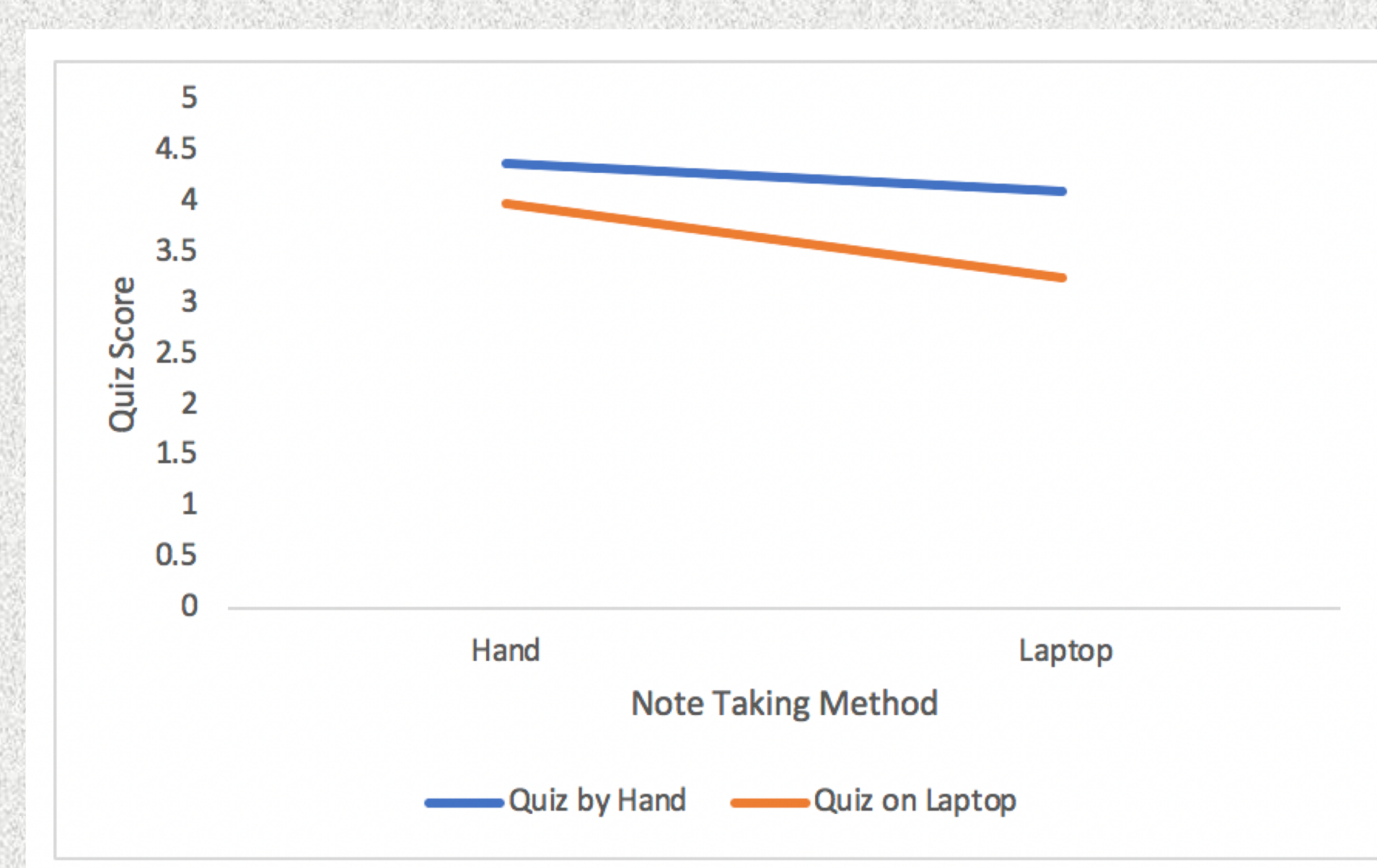


Figure 2. Score for the Conceptual Questions

### Factual Questions

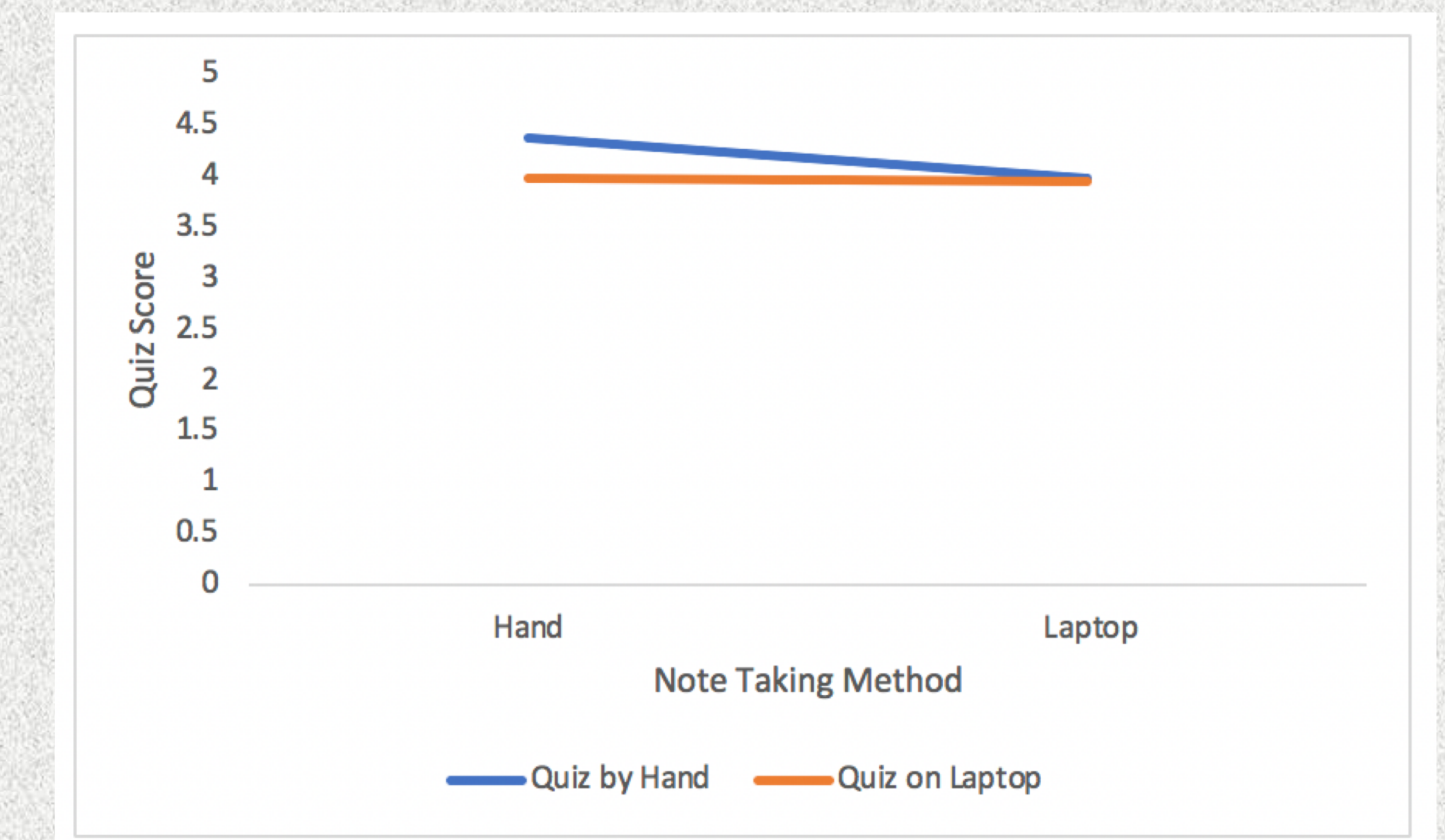


Figure 3. Score for the Factual Questions

### Discussion

- The current study provides additional support for the idea that taking notes by hand improves performance as compared to taking notes using a laptop.
  - Using a laptop may result in shallow encoding of the material. Participants typed more words ( $M = 248, SD = 112$ ) than they could write by hand ( $M = 162, SD = 44$ ),  $t(63) = 4.09, p < .01$
- Unlike Barrett et al. (2014) we failed to find state-dependent effects:
  - Immediate vs. delayed quiz
  - Type of material in the lecture
  - Type of questions on the quiz

### References

- Barrett, M. E. et al. (2014). Technology in note-taking assessment: The effect of congruence on student-performance. *International Journal of Instruction, 7*, 49-58.
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