The Effects of Reading Speed and Retrieval Practice on Reading Comprehension

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Abstract

Although research suggests that speed reading is ineffective, it remains a popular strategy among students. I investigated the impact of an effective strategy (engaging in self-test practice, also known as *retrieval practice*) on speed reading. I had participants read two passages (one at a regular rate and one at an accelerated rate) and they were given quizzes over the material either before or after reading the passages (except for the control group, which never received a quiz). Participants then completed a final comprehension test over the material. I predicted that receiving a quiz before reading would most benefit speed reading, whereas a quiz after reading would most benefit normal reading. The results did not support my hypothesis. Results indicated that regular reading was always the superior strategy *regardless* of quiz placement. These results suggest that speed reading is detrimental to comprehension, even when paired with retrieval practice. Limitations and future directions are discussed.

Keywords: speed reading, retrieval practice, reading speed, comprehension

The Effects of Reading Speed and Retrieval Practice on Reading Comprehension

"Acquiring knowledge without retaining it is a fruitless venture, yet it characterizes the experience of many college students" (Hopkins, Lyle, Hieb, & Ralston, 2016, p. 854). College students attempt to absorb copious amounts of information but do not retain the information over time (Hopkins et al., 2016). Ebbinghaus (1885) originally discovered the forgetting curve, which shows that memory declines sharply within the first few days following acquisition (approximately 70-80% of what is learned is unrecallable within a matter of days; see also Murre and Dros, 2015). Clearly, unless students further process the content, they will forget a large portion of what they have studied relatively quickly.

This problem is compounded by the fact that students engage in suboptimal encoding strategies (see Dunlosky, Rawson, Marsh, Nathan, and Willingham, 2013). In the current study, I explored one particularly poor encoding strategy: speed reading. Presumably, students speed-read when they lack the time to read something at a normal speed. Students are likely to continue using this strategy despite evidence suggesting it is not effective.

Although prior research suggests that speed reading impairs comprehension, perhaps it can be made more efficacious by using a strategy known to improve learning. In particular, one promising learning strategy is known as *retrieval practice* (i.e., attempting to recall information from memory; see Roediger and Karpicke (2006) for a review). Before discussing the potentially interactive effects of these two methods, I first need to explain why speed reading is ineffective and why retrieval practice may help.

Why speed reading is ineffective

Peripheral vision is limited

Some studies investigated the possibility of reading a large portion of a page at a time with peripheral vision. Rayner, Schotter, Masson, Potter, & Treiman (2016)immediately discredited this idea because of the psychological and biological impossibility of performing such an action due to the limitations of visual acuity (i.e., the clarity of sight). Peripheral vision is limited; therefore, it is impossible to use it to read more than a few words at a time.

Subvocalizing is important for comprehension

Researchers have investigated if eliminating the inner voice while reading silently could increase reading speed. For example, Slowiaczek and Clifton (1980) found that subvocalization (i.e., a mental voice) improved the durability of memories and was essential for sentence comprehension. Overall, subvocalization is important for comprehension, as mental voices enable readers to better understand visual material after converting the material into an auditory format (Rayner et al., 2016).

Regressive eye movements are useful

Can reading speed be improved by eliminating regressive eye movements (i.e., backtracking) while reading? Acklin and Papesh (2017) found that comprehension was significantly lower when regressive eye movements were eliminated. These findings were the same regardless of the difficulty of the text. Regressive eye movements are useful, and their elimination could limit comprehension during reading.

Skimming is a Trade-off

Skimming is the act of scanning a passage to find specific information or garner the general idea (Rayner et al., 2016). Rayner et al. (2016) found numerous sources supporting

skimming and strategies associated with skimming (e.g., looking at headings and the table of contents). Rayner et al. (2016) concluded that an increased reading speed will likely result in a decrease of reading comprehension; however, the use of skimming can prove useful in managing large amounts of reading material. Overall, Rayner et al. (2016) concluded that skimming is a trade-off (i.e., it can help manage copious amounts of reading, but does not allow for full comprehension) and the most effective way to improve reading speed and comprehension is through practice.

Does speed reading ever help?

Although speed reading is typically ineffective, there are cases where it has been shown to help. Breznitz and Share (1992) found that comprehension could be improved through the elimination of regressive eye movements, although other researchers have warned against this practice (Rayner et al., 2016). Duggan and Payne (2009) found that comprehension when skimming could be comparable to reading normally; however, they concluded that there are benefits to thoroughly reading. Although these studies show instances in which speed reading could be beneficial, these situations are exceptions to the rule that speed reading is ineffective. The purpose of the current work was to explore whether retrieval practice could improve the effectiveness of speed reading.

Retrieval Practice

Retrieval practice refers to the retrieval of information from memory, such as through testing (e.g., "What is the capital of Australia?"). After engaging in retrieval practice, students typically remember more information and remember the information for a longer period (Karpicke, Butler, & Roediger, 2009). Below, I will review various factors that influence the benefits of retrieval practice.

Retrieval Practice Spacing

Hopkins, Lyle, Hieb and Ralston (2016) investigated spaced- (i.e., test practice distributed across numerous sessions) versus massed- (i.e., test practice crammed into one session) retrieval practice in relation to comprehension and retention. The researchers found that comprehension was higher, for both short- and long-term retention, after using spaced-retrieval practice.

Test Format

Smith and Karpicke (2014) investigated the effects of test format (i.e., short-answer, multiple-choice, and hybrid) on the benefits of retrieval practice. They also explored whether concordance between the quiz and test was necessary for the effects of retrieval practice. The researchers found that the effects of retrieval practice manifested regardless of test format and regardless of whether the quiz and test shared the same format.

Quiz Placement

Burns and Vinchur (1992) investigated the benefits and restrictions of post-lecture quizzes on comprehension. They found that post-lecture quizzes were only beneficial when the content and difficulty level were similar to those found on the final exam. Narloch, Garbin, and Turnage (2006) conducted a follow-up study to learn if the same limitations applied to pre-lecture quizzes. The study was conducted over five semesters, which allowed for a within-subjects design. Two semesters had no quizzes and functioned as a control. The other three semesters had quizzes administered to the students at the beginning of class at the start of each chapter. The researchers also investigated quiz format (i.e., matching versus fill-in-the-blank) for which they found no significant difference in student performance. The investigators did find that student performance was significantly better during semesters with a quiz than during the

control semesters. The researchers did not find evidence of limiting factors for pre-lecture quizzes, such as those found by Burns and Vinchur (1992) for post-lecture quizzes (Narloch, Garbin, & Turnage, 2006). This study indicated that quizzes done prior to learning significantly improved subsequent recall of the material. A large body of research has now firmly established the benefits of pre-testing (e.g., Knight, Ball, Brewer, DeWitt, and Marsh, 2012; Kornell, Hays, and Bjork, 2009; Vaughn and Rawson, 2012).

Combining speed reading with retrieval practice

Research has been conducted to assess methods of improving reading comprehension during speed reading; however, no prior studies have investigated the combination of speed reading and retrieval practice.

The current study examines the relationship between speed reading and reading comprehension to determine the effect speed reading has on reading comprehension. More specifically, the purpose of the study was to determine if retrieval practice would improve reading comprehension following speed reading. I also investigated the effect retrieval practice has on reading comprehension in conjunction with both a normal reading rate and speed reading.

This study is important because no prior research has investigated the interaction between speed reading (generally accepted as detrimental to reading comprehension) and retrieval practice (widely accepted as beneficial to learning). In the present study, participants engaged in one of two retrieval practice conditions (pre-quiz versus post-quiz) or a control condition (no-quiz) which did not engage in retrieval practice. In the pre-quiz condition, participants completed a quiz *before* they read the passage. In the post-quiz condition, participants completed a quiz *after* they read the passage. For both quiz types, the quiz questions were identical. The participants in each of these conditions read two passages, one at a slightly-lower-than-normal

rate of speed (150 wpm) and the other at an increased rate of speed (750 wpm) (see Figure 1 for a schematic of the possible conditions).

Hypotheses

Throughout the study, I investigated numerous hypotheses converging on the hypothesis that reading comprehension would be greater for participants when reading at a normal rate than when speed reading. I hypothesized that the use of retrieval practice would improve reading comprehension; however, the margin of improvement would be dependent upon additional factors, as outlined below.

Normal Reading Rate. I hypothesized that the participants in the regular reading group would have the best reading comprehension scores when given a post-quiz. I hypothesized this because I believed that the post-quiz would catalyze the testing effect, thus improving performance on the final test.

Speed reading Rate. I hypothesized that the participants in the speed-reading group would exhibit the worst reading comprehension scores when given no quiz; however, I hypothesized that retrieval practice would improve reading comprehension, even for the speed-reading group. More specifically, I hypothesized that pre-quizzes would most benefit the speed-reading condition. I anticipated that the pre-quiz would prime the information and cause related information in the passage to stand out to the readers.

Method

Participants

The participants were 128 college students (23 males, 96 females, 2 non-binaries; *M*age = 20.23, range: 18-44 years) and were recruited via SONA. Participants accessed the study through SONA in a lab setting ($n = 26$) or online ($n = 102$). According to self-reported demographics, the

sample was predominantly White, Non-Hispanic (81.1%), with some individuals identifying as African American, Non-Hispanic (5.5%), Hispanic/Latino (3.9%), Asian/Pacific Islander (3.9%), and Other (0.8%). The participants consisted of freshmen (53.5%), sophomores (16.5%), juniors (10.2%), and seniors (13.4%) with a variety of majors, such as nursing (27.6%), psychology (21.3%) and pre-nursing (10.2%) (*M* GPA = 3.40, range: 1.60-4.00). They received 2 SONA credits for their participation in the study.

Participants were excluded if they restarted or did not finish the experiment ($n = 17$) or if they wished not to be included in the final analyses ($n = 1$). Although some participants indicated that they had completed the experiment before ($n = 1$), I did not exclude them because this was our first experiment using these materials and participants could not have completed it more than once due to SONA naturally restricting based on NKU email.

Participants completed a survey to provide an estimate of the number of books they have read outside of school in the past year ($M = 8.37$, $SD = 24.72$; median = 3) and if they identify as an avid reader (30.7%), not an avid reader (64.6%), or preferred not to answer (4.7%). In a subsequent question, participants described their self-classification as an extrovert (41.7%) or introvert (53.5%), or they indicated that they preferred not to answer (4.7%). They also reported how often they engage in speed reading (see Table 1). Results indicated that, although some students avoid using the strategy completely, many students engage in speed reading (even if only sporadically). Additionally, I asked students to rate the effectiveness of speed reading compared to regular reading (see Table 2). Results indicated that almost half of the students believe that speed reading is at least somewhat effective, whereas half believe that speed reading is entirely ineffective.

Materials

The materials included two passages, a quiz, and a reading comprehension test. The passages were about sharks and the Maori people (see Appendix A and Appendix B, respectively). The passages had 350 words each. Each passage was presented on a white background with black font. The quiz consisted of five multiple-choice questions selected from the comprehension test. The comprehension test included ten multiple-choice questions (see Appendix C and D, respectively), encompassing the main ideas and information presented in the passage. After completing the study, participants completed a survey. In this survey, participants were asked to provide an estimate of the number of books they have read outside of school in the past year, if they identify as an avid reader, and their self-classification of extrovert or introvert.

Design

The experiment was a 3 (Quiz Placement: pre-quiz versus post-quiz versus no quiz) x 2 (Reading Speed: regular reading versus speed reading) x 2 (Passage: Maori versus Sharks) x 2 (Location: Lab or Online) design, counterbalanced for the order of presentation (i.e., which passage participants read first) and reading rates (i.e., which passage they sped-read).

Procedure

All participants received two reading passages, one of which they read normally and the other they sped-read. The participants were allotted 2 minutes and 20 seconds to read at their normal rate (150 wpm) and 28 seconds to speed read (750 wpm). The participants were randomly assigned to one of three groups: pre-quiz (quiz before reading the passage), post-quiz (quiz after reading the passage), and no-quiz. All quizzes consisted of five multiple-choice questions, and participants had 30 seconds to answer each question. All participants completed a distractor task (Tetris); however, the placement of the distractor task varied based upon their

group assignment. The length of the distractor task was varied across groups to ensure equal spacing between reading the passage and taking the final test. Participants in the pre-quiz group and no-quiz group played Tetris for 3 minutes after reading the passage, whereas participants in the post-quiz group played Tetris for 30 seconds after their post-quiz. This final test contained the five quiz questions presented to the pre-quiz group and post-quiz group and five new questions, and participants had an unlimited amount of time to answer each question. The same procedure was repeated for the second passage. As noted in the design section, assignment of reading speed condition (speed reading or normal reading) to passage (sharks or Maori) was approximately counterbalanced across participants. Similarly, the order of the passages (sharks first or Maori first) was approximately counterbalanced across participants.

Results

The independent variables utilized throughout the study were the condition, which passage was read at a normal rate, which passage was read quickly (speed-reading condition), which rate was utilized first, and which passage was read first. The depended variables measured during this study were the total score out of five correct answers on the quizzes and the total score out of ten correct answers on the final tests (for both normal reading and speed reading).

Quiz Performance

Quiz performance is plotted in Figure 2. I conducted a 2 (Speed First: Regular Reading or Speed reading) x 2 (Passage First: Maori or Sharks) x 2 (Location: Lab or Online) x 2 Group (Pre-Quiz or Post-Quiz) Repeated-Measures ANOVA with 2 within-participant levels (Regular reading quiz score and Speed-reading quiz score). There was a main effect of reading speed on quiz performance, $F(1, 76) = 4.42$, $p = .039$. Participants scored significantly higher when reading regularly than when speed reading. Additionally, group had a significant influence on

quiz performance, $F(1, 76) = 35.48$, $p < .001$. Participants scored significantly higher on post-quizzes than on pre-quizzes. Location had a significant effect on performance as well, $F(1, 76) = 4.72$, $p = .033$, with participants performing significantly better in the lab than online. Additionally, speed first * group interacted with quiz performance, $F(1, 76) = 6.93$, $p = .010$. Participants performed best when regular reading first and taking a post-quiz ($M = .68$, $SD = .24$) and worst when regular reading first and taking a pre-quiz ($M = .28$, $SD = .23$). Reading speed * group interacted with quiz performance, $F(1, 76) = 6.00$. $p = .017$. Participants scored the best on post-quizzes when reading normally ($M = .72$, $SD = .22$), followed by performance on post-quizzes when speed reading ($M = .55$, $SD = .26$). Performance on the pre-quiz was the same for both regular reading and speed reading ($M = .32$, $SD = .24$), Lastly, there was a significant 3-way interaction between reading speed, speed first, and passage first, $F(1, 76) = 15.62$, $p < .001$. No other comparisons were significant (all other ps $> .052$). The main effect of reading speed, collapsed across all other variables, is plotted in Figure 3.

Final Test Performance

Final performance is plotted in Figure 4. I conducted a 2 (Speed First: Regular Reading or Speed reading) x 2 (Passage First: Maori or Sharks) x 2 (Location: Lab or Online) x 3 Group (No Quiz, Pre-Quiz, or Post-Quiz) Repeated-Measures ANOVA with 2 within-participant levels (regular reading final test score and speed-reading final test score). Reading speed had a significant effect on final test performance, $F(1, 105) = 27.17$, $p < .001$. Participants scored significantly higher on the final test after reading normally ($M = .62$, $SD = .21$) than after speed reading ($M = .49$, $SD = .21$). There was a significant 3-way interaction between reading speed * speed first * passage first, $F(1, 105) = 28.10$, $p < .001$, with participants performing best on the final test when regular reading first and reading the Sharks passage first ($M = .71$, $SD = .19$).

Participants performed worst on the final test when speed reading the Maori passage second (M = .37, SD = .19) There was also a significant 3-way interaction between reading speed * passage first * group, $F(1, 105) = 4.06$, $p = .020$. Participants scored best on the final test when in the pre-quiz condition, reading normally, with the Maori passage first (M = .64, SD = .27), while they scored worst when in the no quiz condition, speed reading, with the Maori passage first (M = .42, SD = .25). No other comparisons were significant (all other ps > .069). Furthermore, given that there was no main effect of group, no post-hoc comparisons were conducted. The main effect of reading speed is plotted in Figure 5 as a factor of group. I collapsed across all other variables for this figure as they were not significant.

General Discussion

Reading comprehension was always impaired for speed reading compared to reading normally. Taking a quiz did not help improve comprehension after speed reading. Quizzing did not have a significant effect on comprehension scores for either reading speed. The quizzes themselves showed a difference between speed reading and reading normally (with reading normally resulting in higher quiz scores). There was also an influence of location on the quizzes (i.e., participants scored higher on the quizzes when taken in a lab setting); however, this influence did not extend to the final tests.

As hypothesized, reading comprehension was significantly better after reading normally than after speed reading; however, not all the findings were consistent. I had anticipated that the presence of a quiz would influence performance on the final test but found no significant difference between any of the groups. This finding nullified my subsequent prediction of a pre-quiz most benefitting speed reading and a post-quiz most benefitting regular reading, as none of the groups were significantly different from one another.

These findings were partly consistent with prior research, as previous studies have supported the claim that speed reading impairs comprehension (e.g., Acklin & Papesh, 2017; Duggan & Payne, 2009; Rayner et al., 2016; Slowiaczek & Clifton, 1980). However, prior research supported the hypothesis that retrieval practice would positively influence final comprehension scores (e.g., Burns & Vinchur, 1992; Narloch, Garbin, & Turnage, 2006), which was not the case.

Most of the constraints of this study stem from the main limitation that it was not comparable to a typical college course. The passages were short (only 350 words), rather than the length of a characteristically assigned course reading. The quiz and final test were conducted in a single session. In most educational settings, quizzes and tests are not conducted on the same day, especially not so close together in time. Finally, the final test was not comparable in length to an exam. The final test for this study was only 10 questions, while a standard college exam contains 50 to 100 questions with varying question types. Other limitations of the study pertain to its online nature. As it was taken on a computer, participants could have copied the text for later reference, or they could have simply chosen not to read the passage. Despite these limitations of an online study, it can be argued that conducting the study online made it more representative of a college setting, as an increasing number of quizzes and exams are given in an online rather than physical format.

There are directions for subsequent investigation into speed reading and comprehension. A longitudinal study may be useful to learn some of the long-term effects of speed reading on retention. This type of study could help make it more representative of a typical college course. For example, there is commonly interference from other courses and life throughout the semester. Such a study would also allow investigation into the influence on retention of re-

reading, or re-speed reading, a text. It would be useful to conduct a study with exams that are longer and more reflective of an actual college exam, including the use of multiple question types (e.g., short-answer, true / false, multiple-choice). In addition to longer exams, longer passages with more context would be more representative of a typical college reading. These passages would also be better suited for both fact-based and inferential questions. An additional path for examination would include the use of multiple types of reading materials (e.g., novels, textbooks, short stories) to investigate whether the findings apply to all types of reading materials, or only a select few. Another possible direction for future studies would be the impact on comprehension of reading electronic versus printed material. This is a pertinent question currently, as classes are moving toward online formats and online textbooks. This line of study also lends itself to the possibility of a cohort effect, as younger generations have grown up using and reading on computers, whereas older generations were not exposed to computers until they were adults.

This study found that speed reading, even when used in conjunction with retrieval practice, did not attain comprehension levels comparable to those when reading normally. Future studies may be able to find some way to improve comprehension when speed reading; however, as of yet, such a method is unknown and reading normally remains the most effective reading strategy.

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Appendix A

The reading passage on Sharks

Sharks belong to a family of fish that have skeletons made of cartilage, a tissue more flexible and lighter than bone. They breathe through a series of five to seven gill slits located on either side of their bodies. All sharks have multiple rows of regenerative teeth, and while they lose teeth on a regular basis, new teeth continue to grow in and replace those they lose. The earliest known sharks date back to more than 420 million years ago. Acanthodians are often referred to as "spiny sharks"; though they are not part of Chondrichthyes proper, they are a paraphyletic assemblage leading to cartilaginous fish as a whole. Since then, sharks have diversified into over 500 species. They range in size from the small dwarf lantern shark, a deep sea species of only 17 centimeters (6.7 in) in length, to the whale shark, the largest fish in the world, which reaches approximately 12 meters (40 ft) in length. Sharks are found in all seas and are common to depths of 2,000 meters (6,600 ft). They generally do not live in freshwater although there are a few known exceptions, such as the bull shark and the river shark, both of which can survive and be found in both seawater and freshwater. Sharks have a covering of dermal denticles that protects their skin from damage and parasites in addition to improving their fluid dynamics. Shark 'skin' is made up of a series of scales that act as an outer skeleton for easy movement and for saving energy in the water. The upper side of a shark is generally dark to blend in with the water from above and their undersides are white or lighter colored to blend in with the lighter surface of the sea from below. This helps to camouflage them from predators and prey. Well-known species such as the great white shark, tiger shark, blue shark, Mako, thresher shark, and hammerhead shark are apex predators—organisms at the top of their underwater.

They regulate the populations of species below them. Despite this, many shark populations are threatened by human activities. [Word Count: 350]

Sources:

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Appendix B

The reading passage on the Maori

The Māori are the indigenous Polynesian people of New Zealand. Evidence from archaeology, linguistics, and physical anthropology indicates that the first settlers came from east Polynesia around 1280 CE, at the end of the medieval warm period, and became the Māori. Māori oral history describes the arrival of ancestors from *Hawaiki* (the mythical homeland in tropical Polynesia), in large ocean-going *waka*. Migration accounts vary among tribes (*iwi*), whose members may identify with several waka in their genealogies (*whakapapa*). In the last few decades, research has allowed an estimate to be made of the number of women in the founding population—between 50 and 100. Atholl Anderson concluded from analysis that the ancestors of Polynesian women came from Taiwan while those of Polynesian men came from New Guinea. Over several centuries in isolation, the Polynesian settlers developed a unique culture, with their own language, a rich mythology, and distinctive crafts and performing arts. Early Māori formed tribal groups based on eastern Polynesian social customs and organization. Horticulture flourished using plants they introduced; later, a prominent warrior culture emerged. The arrival of Europeans to New Zealand, starting in the 17th century, brought enormous changes to the Māori way of life. Māori people gradually adopted many aspects of Western society and culture. Initial relations between Māori and Europeans were largely amicable, and with the signing of the Treaty of Waitangi in 1840, the two cultures coexisted as part of a new British colony. Rising tensions over disputed land sales led to conflict in the 1860s. Social upheaval, decades of conflict and epidemics of introduced disease took a devastating toll on the Māori population, which fell dramatically. By the start of the 20th century, the Māori population had begun to recover, and efforts have been made to increase their standing in wider New

Zealand society and achieve social justice. Traditional Māori culture has thereby enjoyed a significant revival, which was further bolstered by a Māori protest movement that emerged in the 1960s. Since the mid-19th century, Maori have gained 7 seats in Parliament and have played a role in the governing of New Zealand. [Word Count: 350]

Sources:

https://www.britannica.com/topic/Maori

https://en.wikipedia.org/wiki/M%C4%81ori_people

Appendix C

The reading comprehension test on Sharks

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1. Shark skeletons are made from what?
    a. Bone
    b. Keratin
    c. Cartilage
    d. Enamel
2. What is the smallest type of shark?
    a. Spiny shark
    b. Dwarf lantern shark
    c. Mako shark
    d. River shark
3. How far back do the first sharks date?
    a. 420 million years ago
    b. 750 million years ago
    c. 120 million years ago
    d. 360 million years ago
4. Which type of shark can survive in both seawater and freshwater?
    a. Mako shark
    b. Bull shark
    c. Thresher shark
    d. Blue shark
5. How many different species of shark are there?

a. 700

b. 300

c. 200

d. 500

6. Why do sharks have a light underbelly and dark backside?

a. To scare off predators

b. To attract prey

c. To blend in

d. For no reason except genetics

7. The smallest shark is how long?

a. 17 centimeters

b. 25 centimeters

c. 8 centimeters

d. 43 centimeters

8. At what depth is it common for sharks to swim?

a. 500 meters

b. 3000 meters

c. 2000 meters

d. 1800 meters

9. What do the dermal denticles protect sharks from?

a. Parasites

b. The sun

c. Temperature

d. Infection

10. The largest shark is how long?

a. 20 meters

b. 8 meters

c. 40 meters

d. 12 meters

Note. Questions 1, 3, 5, 7, and 9 served as quiz questions.

Appendix D

The reading comprehension test on the Maori

1. From where did the Maori people originate?
    a. Polynesia
    b. Malaysia
    c. China
    d. Madagascar
2. The Maori and Europeans had an amicable relationship due to…
    a. Nothing, the relationship was not amicable
    b. The Treaty of Hawaiki
    c. The Treaty of Waitangi
    d. The Treaty of Whakapaka
3. The Maori protest movement occurred during which years?
    a. 1960s
    b. 1980s
    c. 1950s
    d. 1990s
4. The people that would become the Maori settled in New Zealand in what year?
    a. 1280 CE
    b. 1100 CE
    c. 1370 CE
    d. 980 CE
5. Conflict between the Maori and the Europeans was over what?

a. Civil rights

b. Trade disagreements

c. Independence

d. Land sales

6. When did the conflict between the Maori and the Europeans occur?

a. The 1320s

b. The 1930s

c. The 1540s

d. The 1860s

7. The Maori have how many seats in Parliament?

a. 0

b. 3

c. 7

d. 15

8. When did the Europeans arrive in New Zealand?

a. The 1600s

b. The 1800s

c. The 1700s

d. The 1400s

9. The people that would become the Maori came to New Zealand in what?

a. Wakas

b. Long boats

c. Iwi

d. Ships

10. The Maori had what type of culture?

a. Hunter / Gatherer

b. Warrior

c. Agricultural

d. Nomadic

Note. Questions 1, 3, 5, 7, and 9 served as quiz questions.

Table 1

Self-reported speed-reading usage

	Always		Frequently		Sometimes		Rarely		Never	
Speed Reading Use	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
	2	1.6	24	18.9	34	26.8	38	29.9	23	18.1

Table 2

Self-reported effectiveness of speed reading

	More Effective		Just as Effective		Somewhat Effective		Not Effective at All	
Speed Reading Effectiveness[1]	*n*	%	*n*	%	*n*	%	*n*	%
	4	3.1	4	3.1	50	39.4	63	49.6

Note. Question asked participants to compare the effectiveness of speed reading to regular reading.

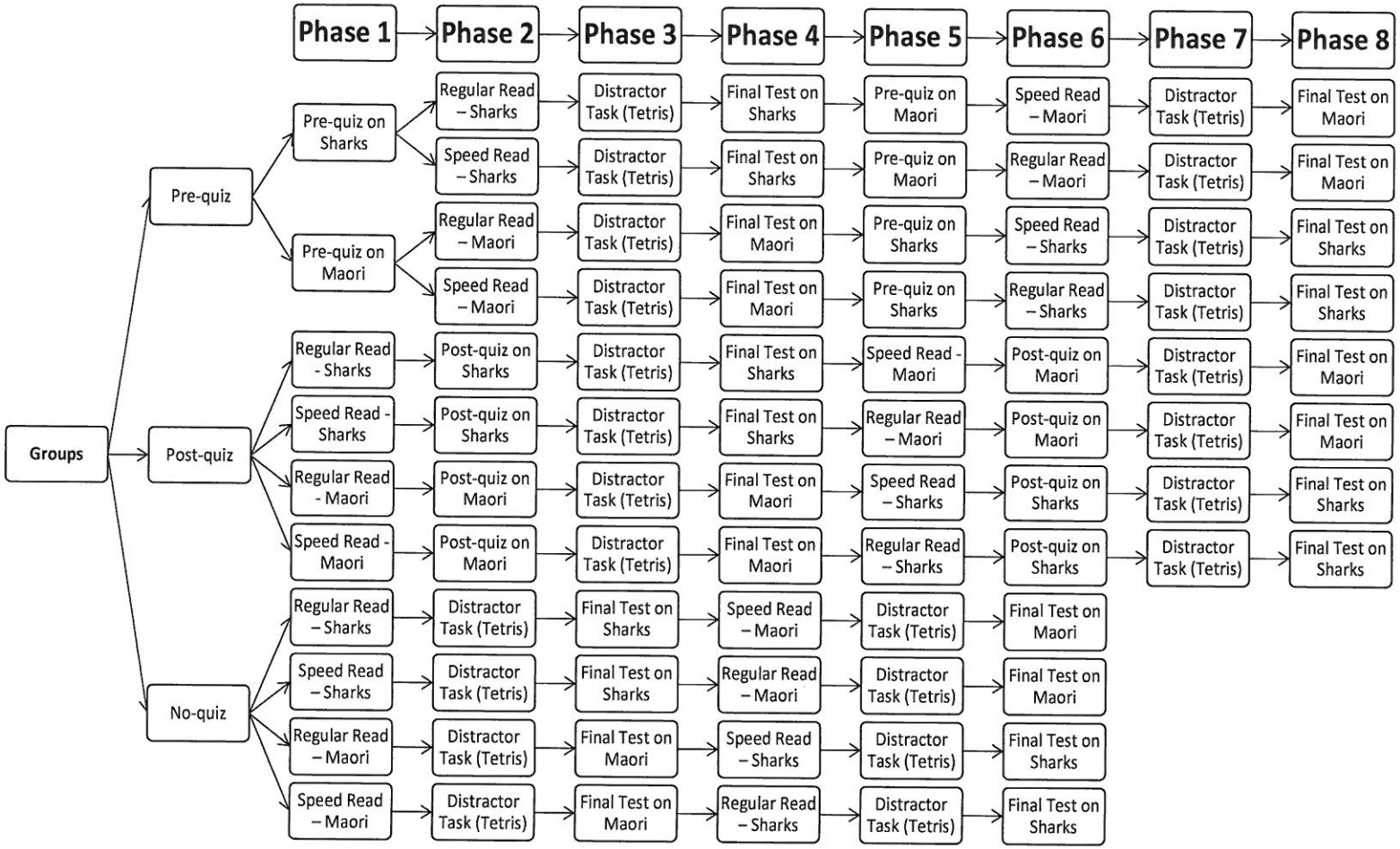

Figure 1. A schematic showing all possible groups for participants in the study.

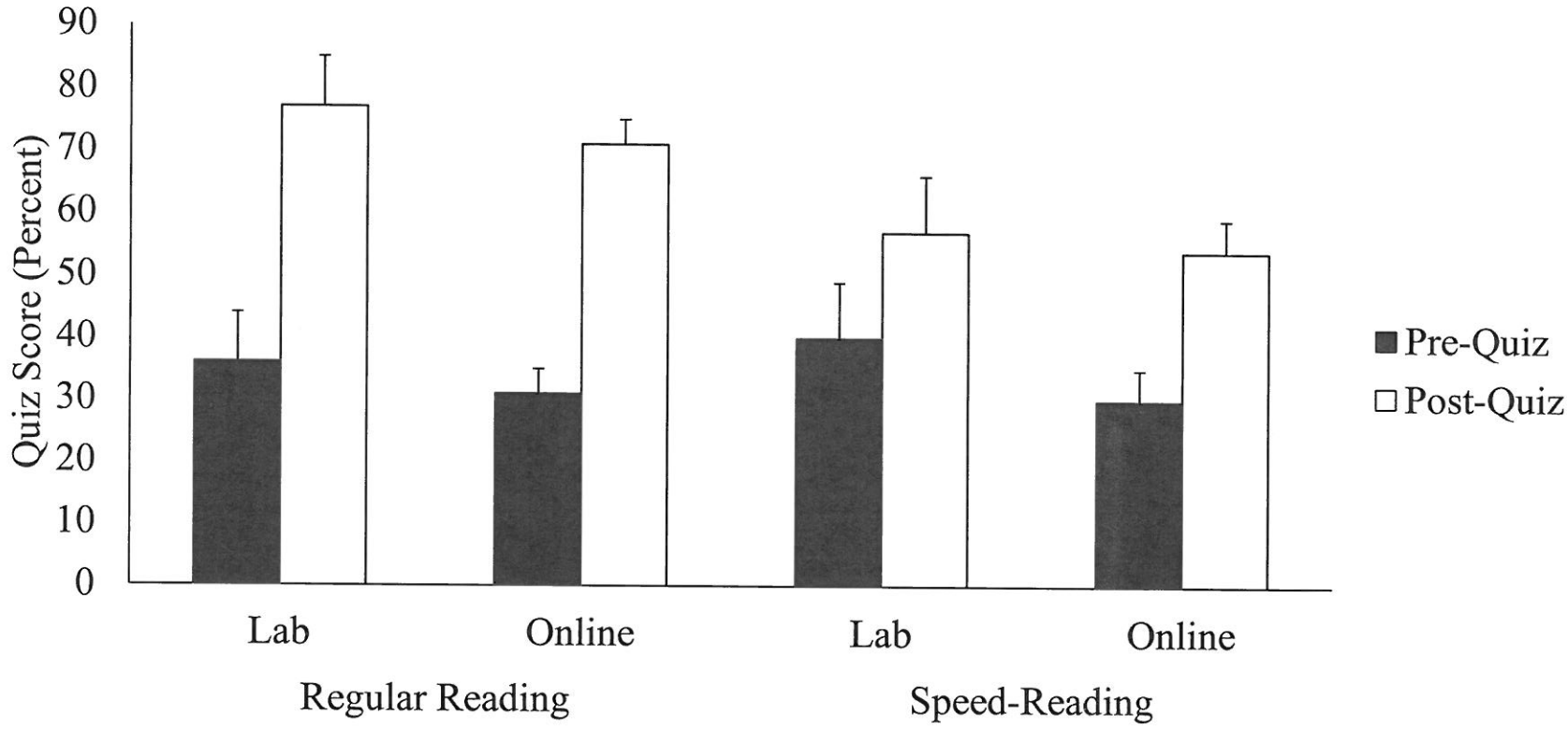

Figure 2. A bar graph of quiz score results. Participants performed significantly better in the lab. They also performed significantly better on the post-quiz than on the pre-quiz.

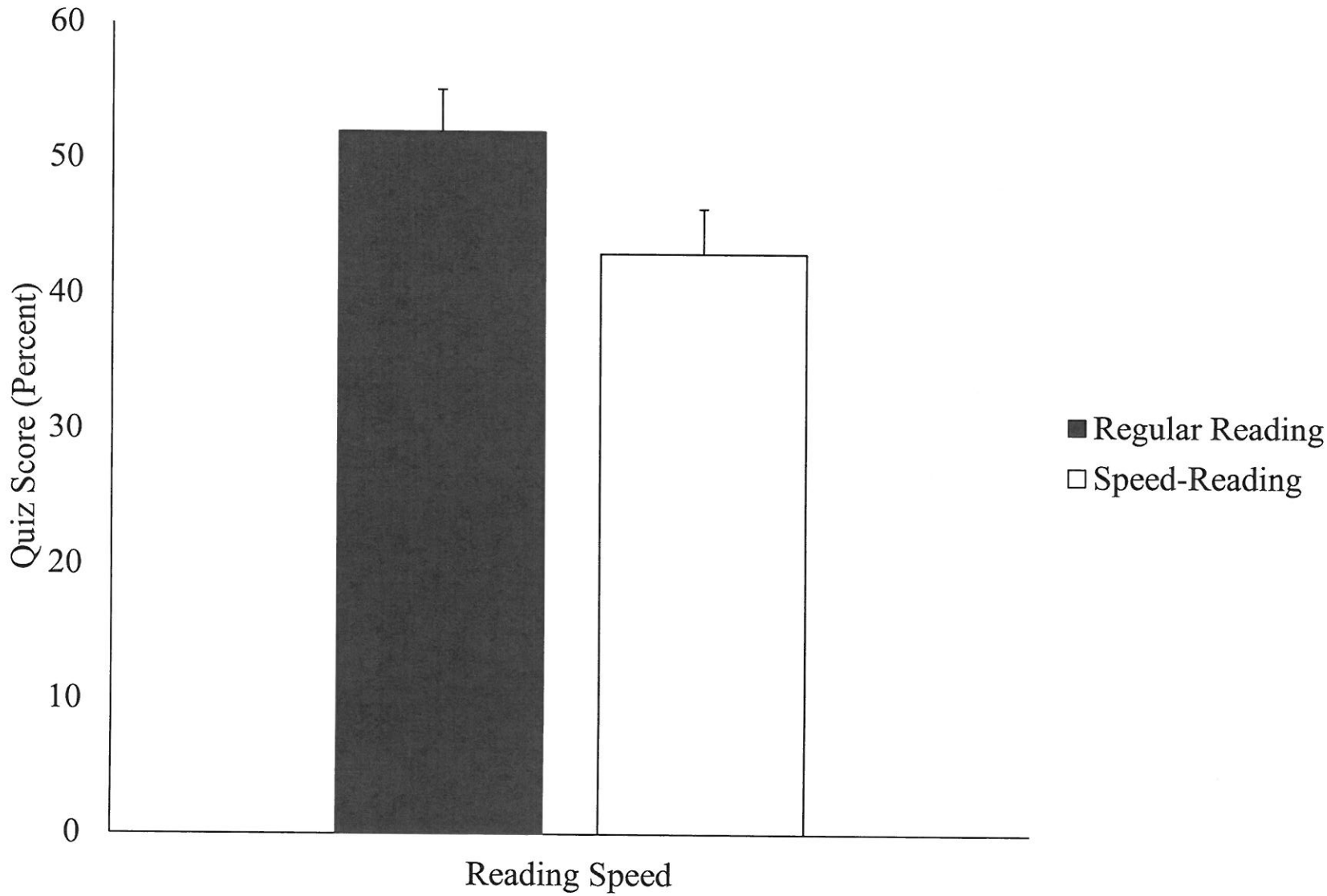

Figure 3. A bar graph showing quiz performance results. Regular reading resulted in significantly better scores than speed reading.

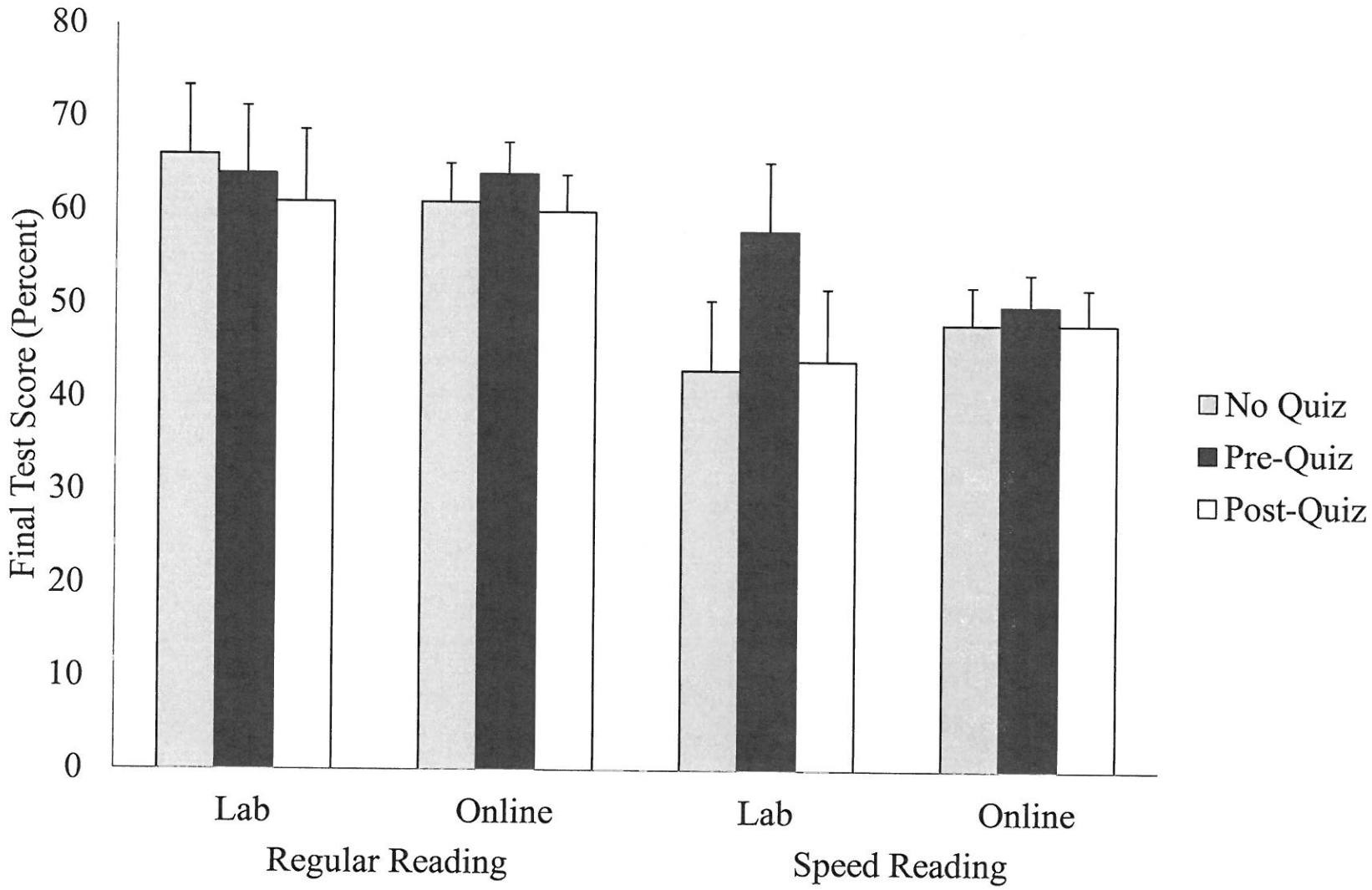

Figure 4. This is a graphic of final test score performance. There was no significant difference between final test scores for participants taking the study in the lab versus online, nor was there a significant difference between quiz type.

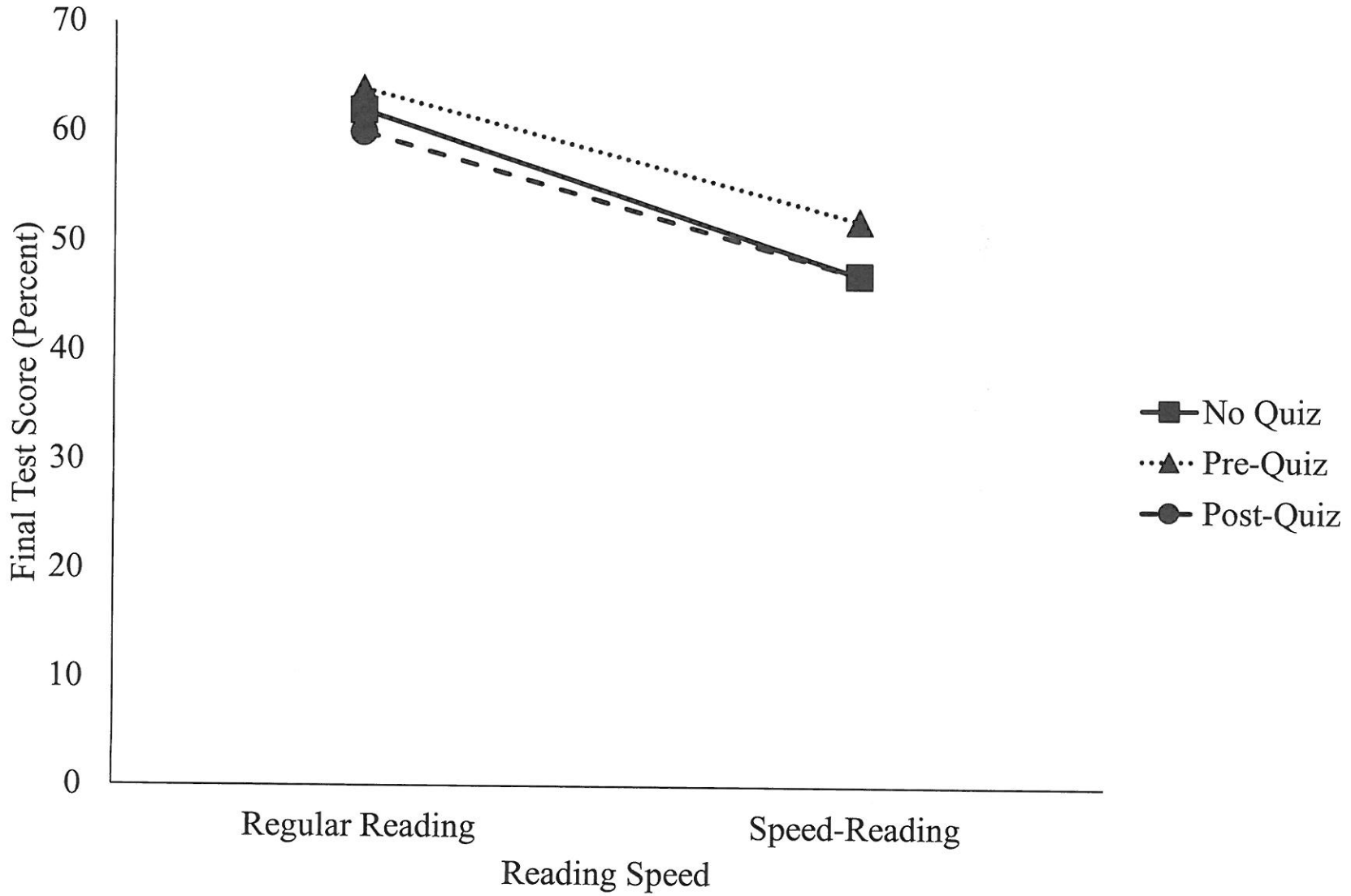

Figure 5. A line graph of final test score results. Regular reading had significantly better scores than speed reading, but there was not a significant difference between groups.