

Evaluation of Computer-Delivered Spelling Training: Do Effects Generalize to Reading Fluency?

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Introduction

Previous research has demonstrated that knowledge of orthographic-phonological associations is critical in both skilled reading, and skilled spelling (Shankweiler & Lundquist, 1993). Research also demonstrates an importance of knowledge of which letters are often paired together (Adams, 1990). Further, there is support for the notion that training these associations can lead to improved performance in both spelling and reading (Ball & Blachman, 1988; Castiglioni-Spalten & Ehri, 2003). Despite this clear association between spelling and reading abilities, little research has been conducted investigating whether the effects of training one can generalize to the other.

Some previous research has found spelling training to be useful for developing literacy in the context of larger training programs (Penney, 2002; Penney, Drover & Dyck, 2008), but these results do not offer any support for the effectiveness of spelling training on its own. A single study has demonstrated that the effect of spelling training can generalize to reading accuracy, and that this effect may actually be stronger than that of reading training in the context of untrained words (Conrad, 2008). However, such an effect has only been observed in the context of training monosyllabic words grouped by rime unit, so it is unknown whether this trend will continue if larger words with larger grouping units are trained.

The Current Study

The current study builds on previous research by investigating whether generalization from spelling training to reading skill occurs when multisyllabic words, grouped by monosyllabic (eg. -ide, -ite) or disyllabic (eg. bio, thermo, -ium) units, are used (Table 1).

Overall error frequency, frequency of good responses (including more acceptable errors), and reading speed are used as dependent measures of reading skill, and it is hypothesized that all three should show improvement following spelling training.

Methodology

The sample consisted of 48 ninth-grade students recruited from junior high schools in St. John's, Newfoundland; however, the present analyses are restricted to the 22 people who completed all measures and provided parental consent. Participants completed initial measures of spelling and reading ability, after which they were assigned to receive either two weeks of spelling training, or two weeks of arithmetic training. At the end of the intervention period, participants completed follow-up measures of spelling and reading ability.

The spelling measure consisted of a 40-word pencil-and-paper spelling test, composed of 25 words included in spelling training, and 15 words that were not trained, but shared a unit with a trained word group (Table 1).

The reading measure consisted of two list-reading tests. The first list contained the 54 trained words included in the spelling intervention, while the second list contained 46 untrained words that shared a unit with the trained word groups (Table 1). Reading tests were audio-recorded, and scored in terms of time from start to finish, as well as in terms of frequency of errors. Error categories included legal mispronunciations, sounding words out, skipping words, and illegal mispronunciations, with the latter two categories being considered less acceptable.

Spelling training consisted of a computer-delivered program that had participants spell words using the computer keyboard as the words were read aloud. Sessions involved the training of between 7 and 11 age-appropriate science words, with words in any particular session all sharing a common unit (Table 1). Participants were required to complete a minimum of 15 sessions, at their leisure, during the two-week training period. (See Figure 5 and Figure 6 for additional information.)

Control group participants completed arithmetic training sessions through a similar computer program to that used by spelling-trained participants. Sessions consisted of 40 simple arithmetic problems using the numbers 1 through 12, with addition, subtraction, multiplication, and division operations presented in equal proportions.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Trained	ore carnivore carnivorous herbivore herbivorous herbicide omnivore omnivorous insectivore insecticide	calcium sodium chromium potassium magnesium selenium ammonium lithium titanium aluminum corundum	chlorine chloride fluorine fluoride oxide dioxide hydroxide	pyrite calcite barite graphite north anorthosite hematite labradorite peridotite granite	thermal geothermal thermo thermogram thermoscope thermoscope thermometer hypothermia	bio biotic abiotic biology biological biological symbiosis symbiotic
Untrained	actinium allium condominium cesium cadmium millennium auditorium atrium arthurium americium	suicide conicide fratricide genocide germicide homicide infanticide atrium matricide	ammonite antiseptic backbite campfire concrete dendrite dolomite dynamic excitement extract fossil ghostwriter hypochlorite igne	teletypewriter thermodynamic thermoelectric thermoplastic thermoreceptor thermosphere thermostatic	antibiotic biotechnology nonsymbiotic microbiology neurobiology paleobiology sociobiology	

Table 1. Lists of Trained Words Used in Spelling Training, Spelling Tests, and Reading Tests, and Untrained Words Used in Spelling Tests and Reading Tests



Figure 5. Spelling and Math Training Program Login Screen

Participants in both groups were given access to the same website, however, the unique ID-Code assigned to each participant allowed them to complete only the training program they were assigned to.

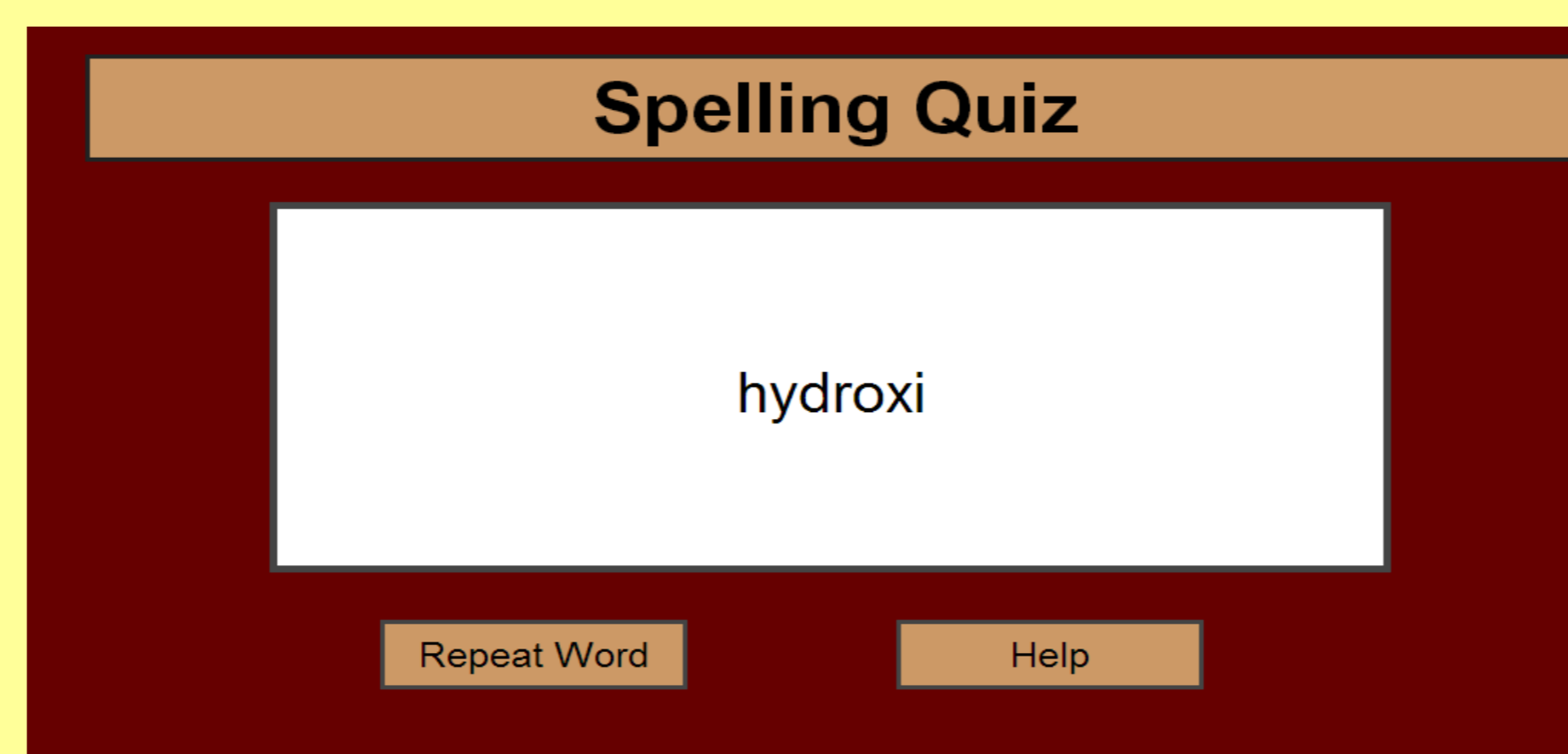


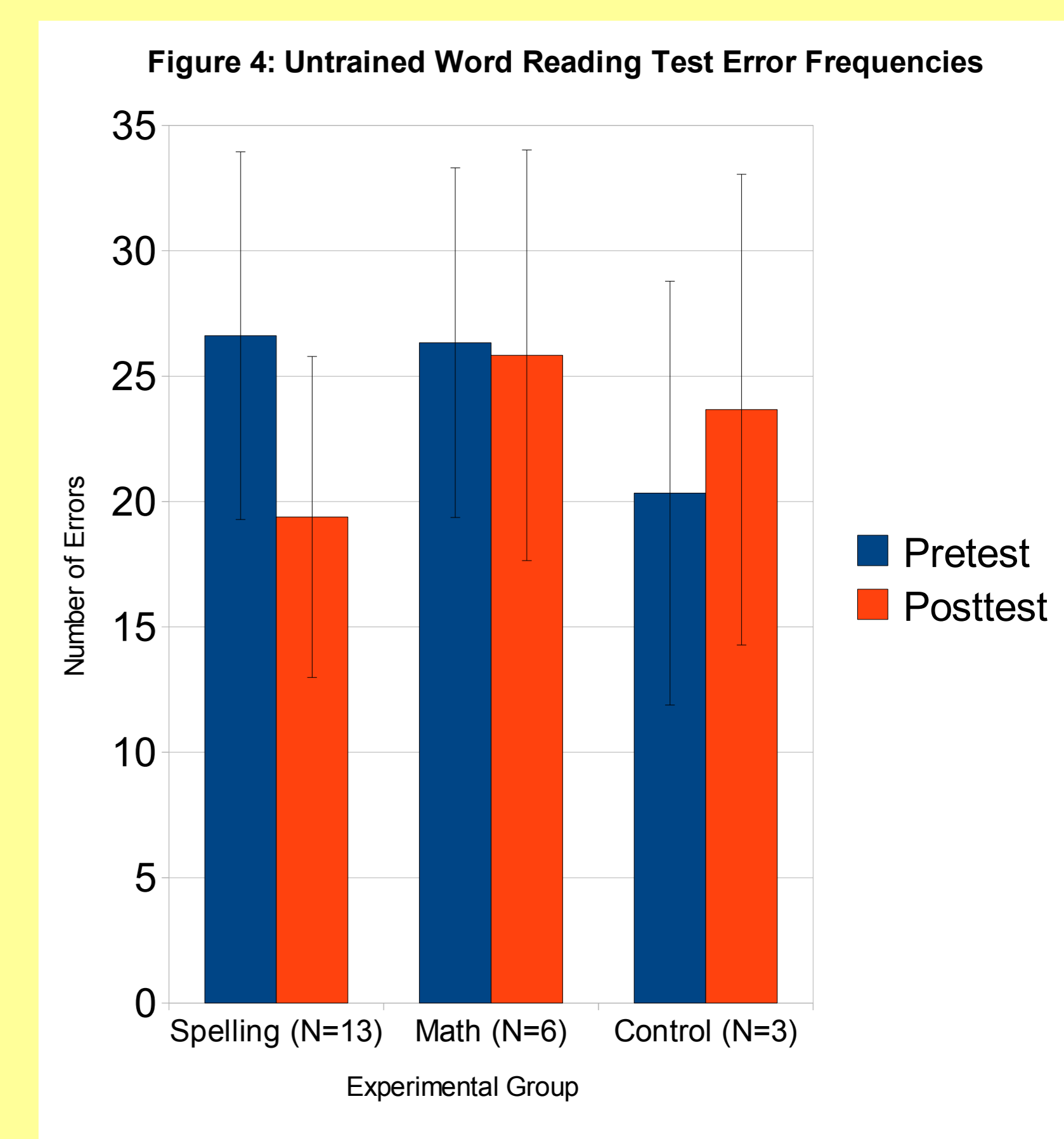
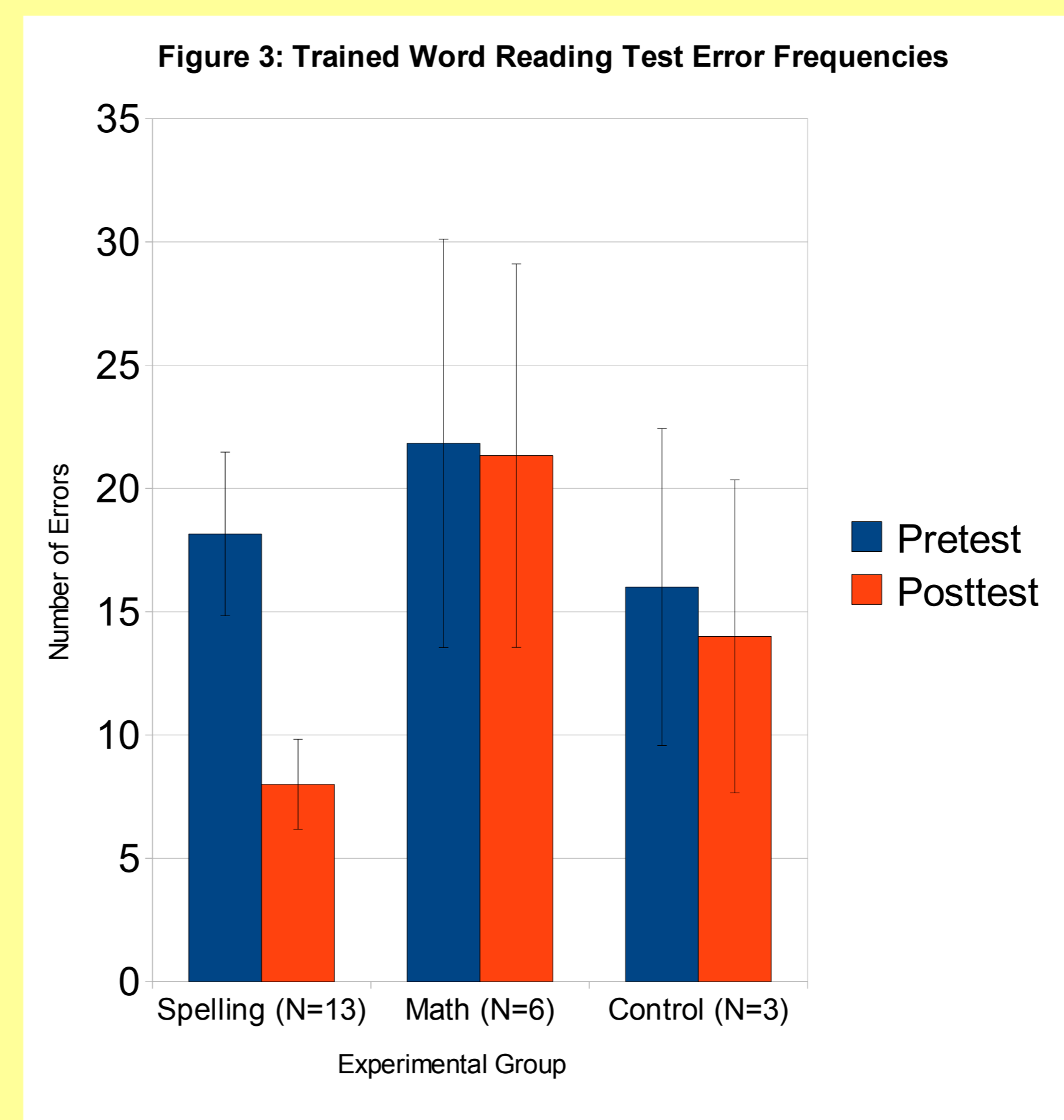
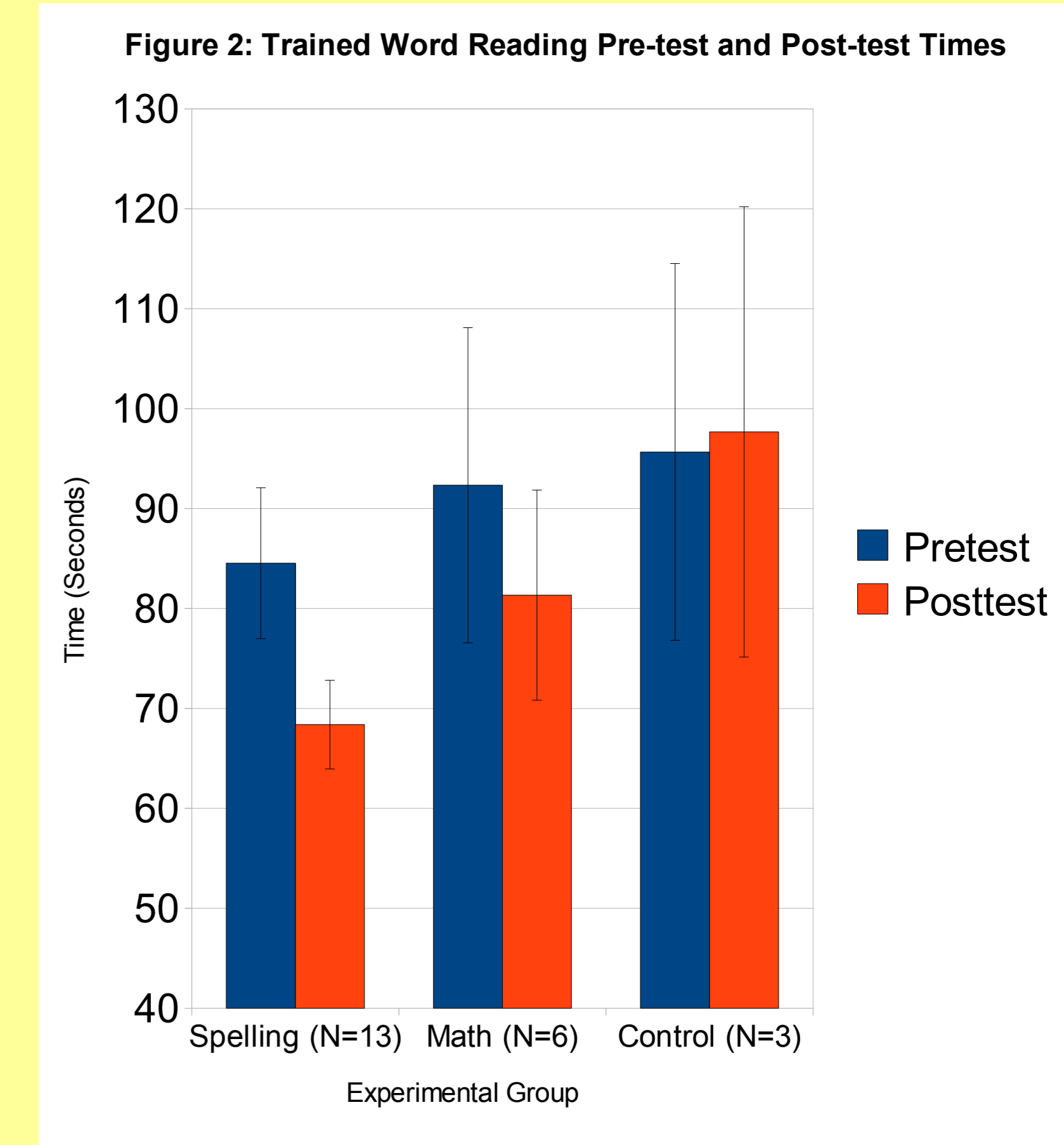
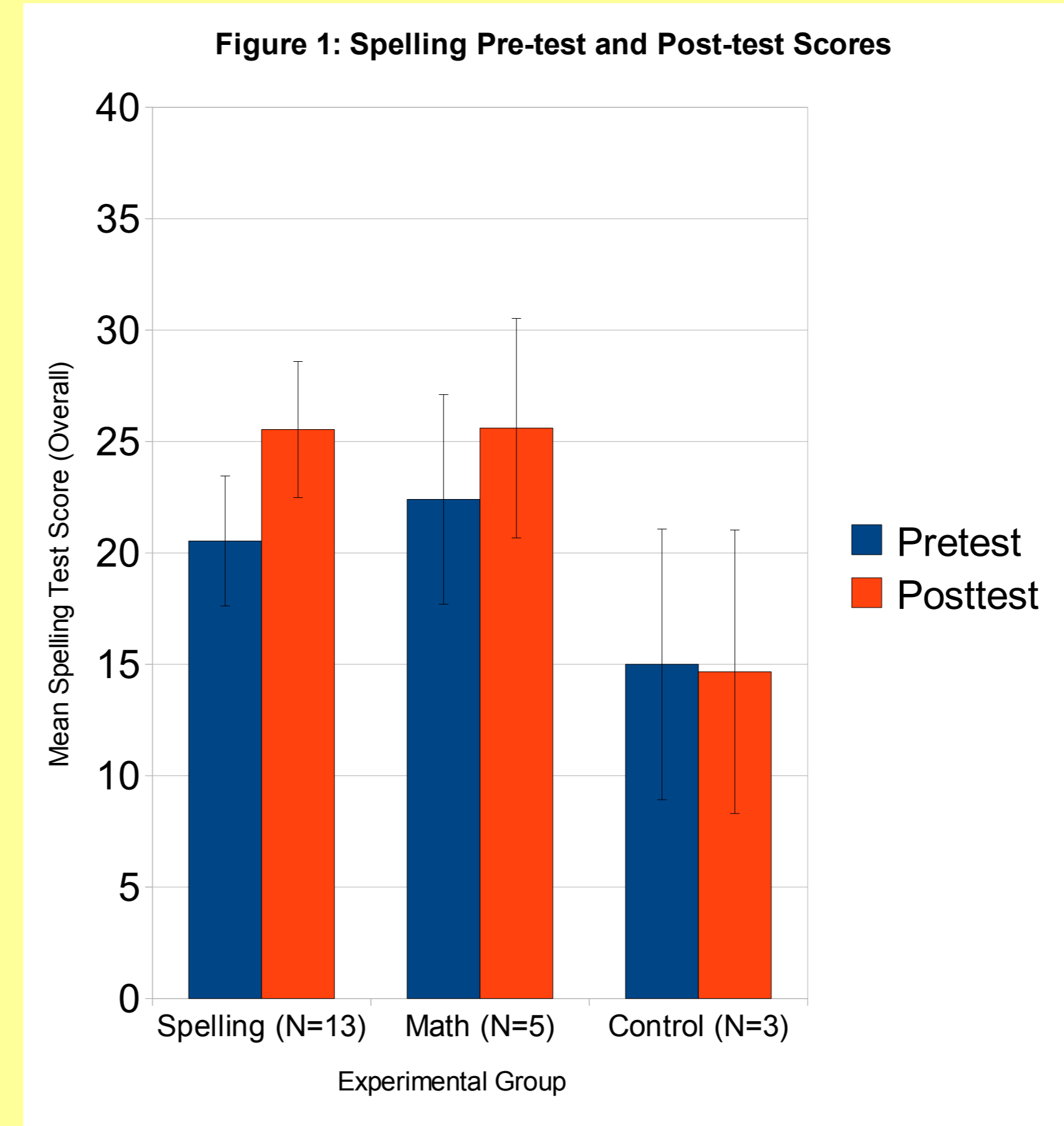
Figure 6. Spelling Training Interface

During spelling training sessions, participants would hear a word read aloud, and would then attempt to spell it. Feedback for errors was given immediately upon input of an incorrect letter, and participants were required to correct the error before proceeding with the rest of the word.

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Results

At the end of the intervention period, only 13 experimental group and six control participants had completed the minimum requirement of 15 training sessions. A second control group was created using three participants who had not completed a single session. Figure 1 shows that, despite expectations, no interaction between group and test-stage was identified in terms of spelling test score, though the interaction did approach significance ($p=.098$), and the effect size was quite large ($\eta^2=.228$). Figure 2 depicts that, contrary to hypotheses, no significant interaction between group and test-stage was identified for reading speeds, though a large effect size was observed ($\eta^2=.174$). Consistent with hypotheses, overall error rate on both trained and untrained word reading tests was found to decline for participants receiving spelling intervention, but not for those in either control group (Figure 3, 4). No group-dependent effect of spelling training on the frequency of good responses was detected.



Conclusions

Collectively, results offer support for the notion that the effects of spelling training can generalize to reading skill, and that these effects persist beyond monosyllabic words. They also offer support for the idea that spelling training might actually be more effective than reading practice for developing reading skill, given that effects were found to generalize to unpracticed words with practiced units, while reading practice has previously been shown to offer little generalization to new words (Levy, 2001). Significant improvements in reading ability were identified before improvements in spelling ability were observed, offering support for the idea that spelling and reading share cognitive resources, with spelling being the more demanding skill.

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