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29. Differential Effectiveness of Reading and Non-reading Tasks in Learning to Spell

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Abstract

The effectiveness of a reading and three non-reading tasks (copying, problem naming and oral spelling) in learning to spell was investigated. The results of a spelling test following the training phase, indicated that words practiced in the copying and the problem-naming condition, and that words practiced in the three non-reading tasks were spelled better than words practiced in the reading task.

Introduction

In psycholinguistic research spelling never received the attention reading did and reports of studies on the effectiveness of direct spelling instruction are hard to come by.

The emphasis on reading may have two major causes. One is mainly technical: it is easier to execute experimentally well-controlled studies on reading than on spelling. The second pertains to the assumption that reading and spelling are closely related (Ehri, 1980) and that facts established in reading research also hold for spelling.

A number of observations actually suggest that spelling is not simply the opposite of reading and that it is not the case that what one can read one can spell and vice versa. Classroom experiences tell us that spelling is more difficult to master than reading, and various empirically established facts show the discrepancy between reading and spelling skills. Firstly, the correlation between reading and spelling scores is not perfect, but varies

between .50 and .80 (according to Malmquist, 1958, in Frith, 1980). Secondly, one can easily find children who are good readers but poor spellers, whereas children who are poor readers but good spellers are hardly found (Frith, 1980). Thirdly, experiments by Bosman and de Groot (1991) indicated that beginning readers did not spell words they had read 18 times any better than words they only had read three times.

The conclusion from the above must be that reading and spelling, although closely related are not each other's complement, and that reading might thus not be the best way to learn to spell. There are only a few experimental studies in which reading as a spelling instruction method is compared with other such methods. We will discuss these in the following sections.

A Dutch study by van Doorn-van Eijsden (1984) investigated the effectiveness of writing as compared to reading in a group of subjects from Grade 5. One group was instructed to read the stimuli (words and pseudowords), and a second group had to copy them on paper. The copy-group was significantly better than the reading-group on a post-test that assessed the subjects' spelling skill on both types of stimuli. The reason why the copy-group performed better is not clear. It could be the motor aspect involved (development of an 'integrated movement sequence'; Lashley, 1951; see also Smith, 1973), or it might be that the subjects in the copy-group read with 'full cues' instead of 'partial cues' more often than the subjects in the reading-group did (Frith, 1980).

From the work of Cunningham and Stanovich (1990) with Grade 1 subjects, one would have to conclude that the motor activity involved in the copying task was the critical aspect. They compared the effectiveness of training words using handwriting, letter tiles, or the computer keyboard. The handwriting activity was superior in learning to spell, even when the test situation was congruous with letter and keyboard usage.

However, Sears and Johnson (1986), testing a group of subjects from Grades 4, 5 and 6, did not find superior spelling knowledge in the copying condition as compared to a treatment that involved visualising and the use of a computer. But because their sample consisted of subjects much older than those tested by Cunningham and Stanovich, these results might not be commensurable.

Two studies examined the effect on spelling performances of committing letters or letterstrings to memory. Murphy, Hern, Williams and McLaughlin (1990) compared a daily copy, cover, and compare approach with a traditional one (pre-test on Monday, followed by various activities of dubious relevance to spelling during the week, and a post-test on Friday). In the copy, cover, and compare approach children were instructed to look at a word carefully, copy it, then cover the word and try to write it down (by heart), and finally compare the product with the original word. When an error was made the process had to be repeated until the word was spelled correctly. Subsequently, the procedure was applied to the next word. The copy, cover, and compare approach seemed to lead to higher scores on a spelling test (no tests of significance were performed on the data).

An experiment by Roberts and Ehri (1983) showed that children from Grade 2 who learned the pseudowords, and later had to reproduce the letters by heart, acquired a superior representation for spelling than those just rehearsing or naming the letters while being allowed to look at the words. The authors assumed that the former strategy leads to the formation of an orthographic image. A major problem of both the study of Murphy et al. (1990) and that of Roberts and Ehri (1983) is that it is unclear whether the children in the conditions that led to superior spelling skills had not actually had more training in the words. Therefore their results may not be conclusive.

Research investigating which spelling strategies are spontaneously used by having the subjects 'think aloud', indicates that neither children nor adults apply very effective means to remember the correct spelling of a word. Ormrod and Jenkins (1989) found that subjects (undergraduates, subjects of Grade 3/4 and 7/8) mainly used word pronunciation and letter rehearsal, but these turned out not to be very effective as they did not significantly correlate with post-test spelling scores. The only effective strategy, used by a small minority of 14 percent in the group of undergraduates, was overpronunciation, that is, pronouncing the word such that it reflects the actual spelling more closely (/ai /s/ /le/ for 'aisle', or /ser/ /ge/ /ant/ for 'sergeant').

The results of the above studies are inconclusive with respect to the role of the motor aspect in spelling and the effectiveness of earlier reading on subsequent spelling of the words. It is also not clear whether letter rehearsal like in the study of Roberts and Ehri (1983) is a better way to teach spelling than copying is. Moreover, it is still an open question whether it simply is the sheer amount of time invested in the task that causes superior spelling skills.

The present experiment aimed at clarifying these issues. Young beginning readers and spellers were confronted with words they had never seen prior to the experiment and that were likely to cause spelling mistakes because the correct spelling is contingent and can therefore not be derived. To assess the effectiveness of copying and reading, these spelling instruction methods were included in the experiment, together with two methods that emphasized the rehearsal of letters or letterclusters. By comparing scores on a spelling test following the training session with the time it took to complete the session, it is possible to ascertain whether it is merely the amount of time that is responsible for the improvement in spelling skill, or whether it is the quality of processing that causes this instead. Testing the subjects' spelling skills after training both with a dictation and a forced choice task allowed the assessment of differential ease of spelling-production and spelling-recognition.

An additional goal, of practical importance, was to develop spelling instruction methods that are not only theoretically interesting but are also of relevance to the classroom and are easily applicable.

Method

Materials. Twelve Dutch words (five nouns, five adverbs and two verbs) were chosen from a list by Kohnstamm, Schaerlaekens, de Vries, Akkerhuis and Froonincksx (1981) to serve as the experimental material. The selected words were regarded as very familiar to six-year-old children. The mean length in letters was 6.8, with the shortest word having five letters and the longest nine (SD 1.36).

The training material consisted of four different lists. In every list six words made up the reading condition and six the non-reading condition. Three words of both the reading and the non-reading condition were trained twice (Frequency 2) and three words six times (Frequency 6). All four lists thus contained 24 words in the reading and 24 in the non-reading condition. In every list a training word only appeared in either the reading or the non-reading condition. In constructing four lists this way, every word appeared in every frequency and in both conditions.

All words were printed in font Helvetica, size 14 (the font the children are familiar with) on an A4-size piece of paper with one word per line, one side containing the reading stimuli and the other the non-reading stimuli.

Procedure. A child was assigned to one of the three non-reading conditions, namely: copying (CP), problem naming (PN) or oral spelling (OS). Every child read all 24 words of one of the lists and practiced 24 words according to one of the non-reading conditions.

In the CP-condition a child simply had to copy the 24 words from one of the lists onto a notebook, using a new piece of paper for every new word. In the PN-condition a child was instructed to explicate the spelling ambiguities in every word, indicated by underlining of the ambiguous parts. In the Dutch language there are four clear cases of ambiguous phonemes. The /e/ (schwa) can be written by an 'e', 'u' and 'o', /ou/ by 'ou(w)' and 'au(w)', /g/ by 'g' and 'ch', and a final /t/ by 't' or 'd'. In the OS-condition the subject was asked to read the word aloud and then spell it aloud by heart. Because children in Grade 1 tend to analyse a word by naming the phonemes instead of the actual letters, the experimenter had to make sure that every ambiguous phoneme was clarified by the subject.

Half of the subjects participated in the reading condition first. The other half performed the non-reading task first. The time it took the subjects to complete both the reading and the non-reading task was measured separately with a stopwatch.

The training stage was followed by a spelling test. The experimenter read all twelve trained words one by one and the child was asked to write them down. The final part of the experiment consisted of a forced choice task presented on the screen of a Macintosh Classic personal computer. The child was confronted with two spellings of a word, one was the correct spelling and the other contained a phonologically correct spelling error (an example: 'blauw' and 'blouw'; the first one is the correct spelling for the Dutch word 'blue'). By using the mouse the child could indicate (by clicking on the appropriate place) which of the two she or he thought was the correct spelling. The responses were registered by the computer. A complete experimental session took between 15 and 40 minutes.

Subjects. From a population of 246 children of Grade 1 a sample of 57 children (mean age 7.1) was drawn with an average score on a reading-decoding pre-test (Caesar, 1970). The scores on the reading test served as the criterion for selection rather than those on a spelling pre-test (Mommers and van Dongen, 1986), because the variance of the latter was somewhat small. The mean score on the reading pre-test for the total population was 29.7 (SD 10.9; min 10; max 83), and for the sample 27.3 (SD 4.8; min 19; max 36). The means on the spelling pre-test were 27.2 (SD 3.9; min 2; max 30) and 27.9 (SD 2.3; min 18; max 30) for the population and the sample respectively. Scores on a nonverbal (Standard Progressive Matrices; Raven, 1958) and verbal intelligence test (RAKIT-Vocabulary; Bleichrodt, Drenth, Zaal and Resing, 1984) were also known.

The three experimental groups were made up such that they did not differ significantly on any of the four tests. The mean scores on the reading-decoding pre-test were 26.8 (SD 5.2) in the CP-group, 27.4 (SD 5.2) in the PN-group and 27.5 (SD 4.3) in the OS-group, $F_{(2,54)} = .11$, $p = .90$. The results of the spelling pre-test were 28.0 (SD 2.5) in the CP-group, 27.6(SD 2.8) in the PN-group and 28.1 (SD 1.5) in the OS-group, $F_{(2,54)} = .22$, $p = .80$.

A group of 26 children (from one classroom) served as the control group. These children simply took the spelling test without being trained in the selected material. The mean scores on the spelling pre-test and on both the verbal and nonverbal intelligence tests of this group did not differ significantly from those of the experimental groups ($p = .28$, .94 and .62, respectively). The mean score on the reading pre-test of the control group was significantly higher than the one of the experimental group (32.9 and 27.3 respectively, $F_{(1,76)} = 6.23$, $p < .05$).

Results

In discussing the results of the present experiment we will start with the data gathered during the training stage, followed by the results of the spelling test, and finally the results of the forced choice test.

Training stage. In both the CP- and the OS-condition it was possible to register the total number and the diversity of errors (that is, the number of different words in which an error was made) occurring during training. The mean total number of errors was 4.16(SD 2.3) in the OS-condition and 2.63(SD 4.5) in the CP-condition, but this difference was not statistically significant ($F_{(1,36)} = 1.72$, $p > .10$). The diversity score in the OS-condition (mean: 2.63; SD 1.1) was significantly higher than in the CP-condition (mean: 1.10; SD 1.3), $F_{(1,36)} = 14.70$, $p < .001$. Correlations between scores on the spelling pre-test and number of errors ($r = -.15$) or diversity of errors ($r = -.16$) were both low and nonsignificant.

A 3 (non-reading condition: CP vs PN vs OS) by 2 (task: reading vs non-reading) ANOVA of the time-on-task data showed significant main and in-

[illegible] effect of the non-reading condition ($F_{(2,54)} = 30.85$, $p < .001$) revealed that the PN-condition (5.43 min.) took significantly shorter (Newman-Keuls, $p < .01$) to complete than the CP (13.03 min.) and OS (11.19 min.) conditions. The time to complete the reading task (1.21 min.) was significantly shorter than that required to complete the non-reading task (8.41 min.); ($F_{(1,54)} = 538.31$, $p < .001$). The significant interaction effect ($F_{(2,54)} = 53.92$, $p < .001$) between non-reading condition and task indicated no differences in the time to complete the reading task for the different non-reading conditions, but a highly significant difference between the non-reading conditions themselves, with the PN-task taking less time than the CP- and OS-task ($F_{(2,54)} = 42.94$, $p < .001$).

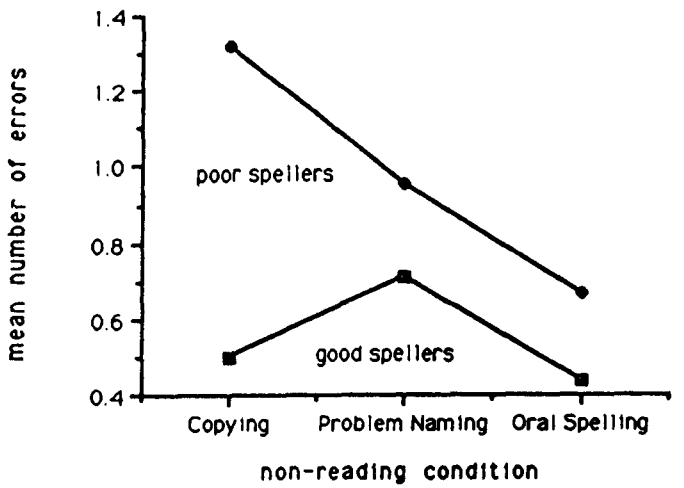

Figure 1
Number of errors for good and poor spellers in all three non-reading conditions

Spelling test. The responses of the subjects were evaluated on the basis of correctness of target-letter(s) or target-clusters in the word. The mean total error (see below) indicates mean error per word.

A 3 (non-reading condition: CP vs PN vs OS) by 2 (spelling level, based on the subjects' scores on the spelling pre-test: good vs poor) by 2 (task: reading vs non-reading) by 2 (frequency: 2 vs 6) ANOVA was performed on the target errors. All four main effects were significant. The effect of spelling level revealed that good spellers made less errors (.55) than poor spellers (.98), $F_{(1,51)} = 24.5$, $p. < .001$. The effect of the non-reading condition ($F_{(2,51)} = 6.12$, $p < .01$) showed that subjects in the OS-condition (.56) made the least errors. A Newman-Keuls analysis indicated that the mean error score of the OS-group differed significantly from those of the PN- (.83, $p < .05$) and the CP- (.91, $p < .01$) group. The mean error score on the reading task (.96) was significantly higher (main effect of task, $F_{(1,51)} = 51.23$,

$p < .001$) than in the non-reading task (.57). The main effect of frequency indicated that subjects made more errors in words of Frequency 2 (.82) than in words of Frequency 6 (.71), $F_{(1,51)} = 4.07$, $p < .05$.

Only one interaction effect was significant and one marginally so. The one between non-reading condition and spelling level was significant ($F_{(2,51)} = 5.15$, $p < .01$). This was mainly due to the fact that the poor spellers in the CP-condition made significantly more errors (1.32) than those in any of the other conditions (Newman-Keuls, $p < .05$). The poor spellers in the PN-condition had also made significantly more errors than the good spellers in the CP- and the OS- conditions (Newman-Keuls, $p < .05$). Figure 1 summarizes the results of this analysis. The interaction between task and frequency ($F_{(1,51)} = 3.81$ $p < .06$), although only marginally significant, indicated that all means differed from each other significantly (Newman-Keuls, $p < .01$) except those of the two reading conditions (see Figure 2).

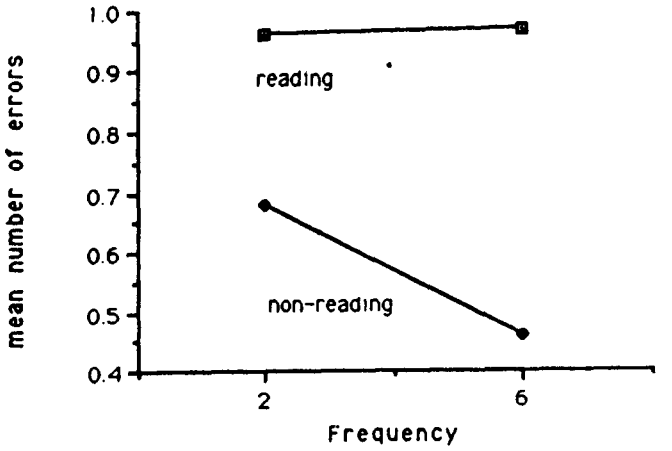

Figure 2
Number of errors for all spellers in the reading and non-reading condition

A comparison of the mean error scores on the spelling test (of the stimuli in the reading condition only) of the subjects of the experimental group (N=57) with those of the control (N=26) showed a statistically significant result ($F_{(1,81)} = 6.48$, $p < .05$). The mean error score of the control group was higher (1.24) than that of the experimental group (.96).

Forced choice test. The responses of the subjects were judged to be either correct or wrong. The same analysis as on the results of the spelling test were performed on the data of the forced choice test. Only two effects reached significance. The effect of spelling level ($F_{(1,51)} = 11.03$, $p < .01$) showed again that good spellers made less errors (.13) than poor spellers (.24), and the effect of task indicated (cf: results on the spelling test) that

the mean error score in the reading condition (.23) was significantly higher ($F_{(1,51)} = 51.23$, $p < .001$) than that in the non-reading condition (.13).

A final analysis was done on the mean error scores per subject on the forced choice test and on the spelling test. The means of the subjects in the forced choice test were adjusted by adding .50 to their means. It would be trivial to compare the actual means, because of the fact that a subject in the forced task already has a chance of being 50 percent correct on the basis of guessing.

A 3 (non-reading condition: CP vs PN vs OS) by 2 (spelling level: good vs poor) by 2 (type of test: forced choice vs spelling) analysis of variance revealed that two main effects and all first- and second-order interactions were significant. The significant effects were, again, those of non-reading condition and of spelling level (already discussed above). The main effect of type of test was marginally significant, $F_{(1,51)} = 3.84$, $p = .06$, with the mean error score on the forced choice test (.69) being smaller than the one on the spelling test (.76). Two relevant interaction effects will be discussed here. One of them was the interaction between non-reading condition and type of test, $F_{(2,51)} = 4.90$, $p < .05$). This interaction was caused by the fact that the numbers of errors of the three non-reading conditions on the forced choice test did not differ significantly, but on the spelling test they did ($F_{(2,51)} = 6.25$, $p < .01$; Figure 3 represents the result). The second relevant interaction was the one between spelling level and type of test, $F_{(1,51)} = 15.\angle 8$ $p < .001$. It showed that the poor spellers made more errors on the spelling test than on the forced choice test, $F_{(1,51)} = 19.89$, $p < .001$, whereas good spellers did not differ on the type of test variable.

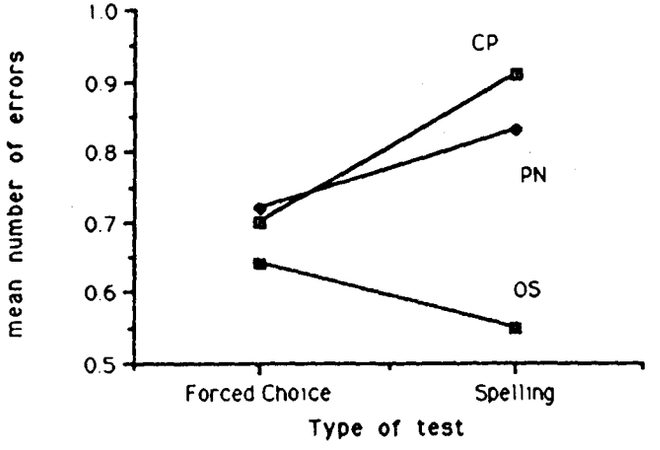

Figure 3
Number of errors on the forced choice and spelling test for all three non-reading conditions

Discussion

The main purpose of this study was to gain insight into the effectiveness of four spelling instruction methods. Before attending to this matter the results of the training stage will be discussed.

It does not appear to be more difficult to perform the oral spelling task than the copying task, because the number of errors the children made during training was the same in both tasks. However, copying does lead to a lower diversity score than oral spelling does. That is, when an error is made on a particular word the subjects in the copying condition tend to make this same error again when copying this word the next time, while in the oral spelling condition subjects made as many errors as in the copying condition, but these errors concerned a larger variety of words.

From the results of the time-on-task variable it is clear that reading is the fastest way to process words. The data also showed that the oral spelling and copying tasks take considerably more time than the problem-naming task. This result in itself is not interesting, but is of major importance when the results of the spelling test are also taken into account.

Subjects in the oral spelling condition showed superior spelling skills after training. The performance of the children in the copying and problem-naming conditions did not differ from one another. If we take into account the time-on-task variable, then copying, particularly in the case of poor spellers, appears to be the least efficient method: It takes more time to finish the copying than the problem-naming task, whereas they are equally effective when considering the scores on the spelling test.

This result is in accordance with that of Roberts and Ehri (1983). They found superior spelling knowledge (for pseudowords) for children who trained by committing letters to memory. Our findings also clearly indicate that learning the spelling without being able to see the correct spelling (oral spelling) is more effective than just explicating the ambiguous letters or letterclusters (problem-naming).

Our experiment permitted us to answer the question as to the role of the motor aspect in spelling (e.g., van Doorn-van Eijsden, 1984). It is evident from our study that the actual writing component is not essential in the process of learning to spell, because copying was less effective than oral spelling, and it was not more effective than problem-naming. This fact sheds a different light on the results of Cunningham and Stanovich (1990). From their finding that writing (that is, copying) beat the use of letter tiles or the computer keyboard they concluded that its motor aspect caused the superior spelling performance. An explanation more in agreement with our results is that the handwriting condition led to superior performance because the focus of attention was directed more on processing the word itself than in the conditions with letter tiles and keyboard. These last two conditions both involve a search for the right letter among a large number of distracting ones. The focus was probably not on the structure of the word, but on each individual letter. To look for every single letter might have become a goal in itself, while the overall goal (easier to retain with handwriting) received less attention. It may thus be that it was not the dif-

ferential motor aspect involved in their tasks which caused their result, but the fact that copying resembles the essential aspect of the spelling process more than choosing the correct sequence of letters does.

The analysis of the data of the spelling and the forced choice tests showed that good spellers performed equally well on both tests, whereas the poor spellers performed better on the forced choice than on the spelling test. That is, after training, poor spellers seem to be better at recognizing than at producing the proper spelling.

Reading as a means to learn the spelling of words is the least effective method. The spelling performance of the experimental group after reading the stimuli was better than that of the control group, who had not seen the stimuli before. But the effect of reading on spelling is not very large, because words that were read six times were not spelled any better than words that were read only twice. Practicing the words six times in the three non-reading conditions however *was* more beneficial for the spelling results than practicing the words only twice.

A final result, also reported by Roberts and Ehri (1983), was that pre-experimental spelling skill is an independent and powerful factor that accounts for differences on the spelling test, which indicates that both good and poor spellers gain to the same extent from proper spelling instruction.

In sum, oral spelling for a group of beginning literates with average reading and spelling scores is the most effective instruction method (out of those studied here) to learn to spell, whereas reading is the least effective. Although copying, the most common practice at school, leads to better spelling than reading does, it is actually a very inefficient means (especially for poor spellers) to learn to spell, because it takes up quite a lot of time. When the time aspect is taken into account, problem-naming is preferable to copying.

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