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LEARNING, INSTRUCTION, AND COGNITION

The Role of Instruction for Spelling Performance and Spelling Consciousness

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ABSTRACT

This study examined the role of instruction for spelling performance and spelling consciousness in the Dutch language. Spelling consciousness is the ability to reflect on one's spelling and correct errors. A sample of 115 third-grade spellers was assigned to a strategy-instruction, strategic-monitoring, self-monitoring, or control condition representing different types of metacognitive aspects. The results showed that students in all three training conditions made more progress in both spelling performance and spelling consciousness than students in the control condition. With respect to spelling consciousness, only students in the strategy-instruction condition made significant improvement between pretest and posttest. Students made more progress in spelling performance on regular words than on loan words. Students in all four conditions became more accurate at assessing which words they could spell correctly. Students in the control condition more frequently overestimated their spelling ability.

KEYWORDS

Self-monitoring; spelling performance; spelling consciousness; strategy instruction; strategic monitoring

DUTCH CHILDREN WHO are learning to spell are first presented with words that are consistent in their phoneme-to-grapheme correspondences. They are taught to segment the sound of these words into their constituent phonemes and subsequently assign a grapheme to each phoneme. After a while, children learn that some words are sound-spelling inconsistent. The spelling of these words have to be learned by heart or they obey orthographic rules. Words with rule-based spellings require the development of a spelling consciousness—that is, the ability to reflect on one's spelling (Block & Peskowitz, 1990; Bosman, 2004; Deshler, Ferrell, & Kass, 1978; Jansen-Donderwinkel, Bosman, & van Hell, 2002; Willemen, Bosman, & van Hell, 2002). Because spelling consciousness is highly related to spelling performance, the question whether spelling consciousness can be improved by enhancing spelling performance is justified.

Metacognition

Stimulating the development of metacognition may improve not just spelling performance but also spelling consciousness. Metacognition refers to the awareness, knowledge, and thinking about one's cognitive processes and strategies (Flavell, 1979; Harris, Graham, Brindle, & Sandmel, 2009). Cognitive awareness is needed to understand and monitor cognition. Metacognitive knowledge includes declarative, procedural, and conditional knowledge (Jacobs & Paris, 1987; McCormick, 2003). Declarative knowledge is knowledge about oneself as a learner; knowledge, skills, and strategies are needed to

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accomplish a task. Procedural knowledge is knowledge about how the task has to be performed or how strategies could be applied. Conditional knowledge refers to knowing in what kind of situations knowledge can be applied.

Metacognitive skills mature with age and experience (Flavell, Green, Flavell, Harris, & Wilde Astington, 1995). Between 4 and 8 years old, children make a significant development in becoming aware of their own thinking and learning. Although young children often overestimate the capacity of their memory and they use less useful strategies (Flavell, Friedrichs, & Hoyt, 1970; Sternberg, 1985), with the help of their teachers encouraging them to reflect on their way of thinking, even young children are able to develop metacognitive strategies (Flavell et al., 1995). Some studies indicate that the acquisition of metacognitive skills requires explicit teaching (Fisher, 1998; Slife, Weiss, & Bell, 1985), whereas others suggest that these skills may also develop as a result of experience with and the use of cognitive strategies, particularly in older students (Brown & Barclay, 1976; Brown, Campione, & Murphy, 1977).

Spelling performance and spelling consciousness

Metacognitive skills become increasingly important during spelling development. Initially, students are only taught to spell words that are consistent in their phoneme-to-grapheme correspondences (e.g., *stop* and *star* in English, "*kus*" [kiss] and "*ster*" [star] in Dutch). These words can be spelled by segmenting the word into its phonemes and writing down the graphemes that correspond with these phonemes (Ehri & Wilce, 1987; Morris & Perney, 1984). An example is the word *stop*, which consists of the phonemes /s/, /t/, /ɒ/, and /p/ that are one-to-one related to the graphemes *S, T, O*, and *P*. However, the majority of words do not obey prototypical phoneme-grapheme relations (*dream* and *hope* in English, "*kikker*" [frog] and "*bomen*" [trees] in Dutch). Learning to spell these words requires metacognitive skills—namely the application of phonological, morphological, and/or orthographic spelling rules.

A phonological spelling rule explicates which phonemes map onto which graphemes (Steffler, 2001). In English, whether the phoneme /k/ can be represented by *K, C, CK*, or *CH* depends on where it occurs in the word. In Dutch, both nouns and verbs with the morpheme /ew/ or /iw/ are spelled *EEUW* or *IEUW*, despite the fact that *U* before the *W* is silent (e.g., "*meeuw*" [gull] and "*nieuw*" [new]).

To write words with a morphological spelling rule, a speller needs to know its meaning and its derivatives (Steffler, 2001). Although the *G* in *sign* is silent, it has to be written with a *G*, because it is related to *signature*. Dutch words with a final /p/ sound may be written with a *P* or a *B*, depending on the plural form of the word. The singular form "*lamp*" [lamp] is written with a *P*, because the plural of /lɑmp/ [lamp] is /lɑmpən/. The plural form of /wɛp/ [web] is /wɛbən/, therefore the singular form is *web* with final *B*. Phonological and morphological rules may be relatively easy to learn, because they are based on the phonology of the language.

To apply orthographic rules, the speller needs to know how graphemes go together according to the typical structure of a particular language (Steffler, 2001). In English, an *E* at the end of a one-syllable word makes the preceding vowel long; the *E* in *hope* makes the *O* long. In Dutch, a consonant after a short vowel has to be doubled in case of a closed syllable. In the plural form "*latten*" [shelves], the *T* has to be doubled to keep the short vowel *A* short.

With respect to spelling, metacognition involves thinking about and reflecting on how to spell words, knowing which strategy can be used in a particular situation and subsequently applying these strategies correctly. Students who are conscious of their spelling process and who are able to evaluate the correctness of their spelling accurately have a higher spelling-performance level than students who are not (Block & Peskowitz, 1990; Snow, 1989). They are also better at choosing the most appropriate spelling strategies (Kreiner & Green, 2000).

Nevertheless, adequate spelling consciousness is not just lacking in children in primary school who have spelling difficulties (Koning, 1985), but also in college students (Hendrickson & Pechstein, 1926; Ormrod & Jenkins, 1989). Koning showed that 91% of children with spelling difficulties in grades 2–5 are not aware of the kinds of problems they had with spelling. Other studies showed that primary school students (grades 3–6) seem to have an adequate level of spelling consciousness, because they mainly used words in their free-writing assignments that they knew how to spell (Jansen-

Donderwinkel et al., 2002) or because they asked the help of others when they did not know how to spell a particular word (i.e., grade 2; Gunderson, 1943). The college students of Hendrickson and Pechstein could accurately indicate when they had spelled a word correctly, but had problems indicating when they had spelled words incorrectly.

Only few studies have focused on ways to improve spelling consciousness (e.g., Block & Peskowitz, 1990; Paffen & Bosman, 2005). Spelling consciousness can be improved by a short training. It is, however, unclear whether spelling consciousness requires explicit teaching (i.e., by suggesting ways to think about one's spelling) or whether it could also be stimulated more implicitly (i.e., by having them perform a particular task without explicitly influencing their ways of thinking). Block and Peskowitz (1990) used an implicit means of stimulating students' spelling consciousness. They showed that fourth-grade students who visually inspected their spelling after writing became better at accurately estimating the correctness of their spelling. Visual inspection of the word was even more effective when it went along with pronunciation of the word. Paffen and Bosman (2005) developed an explicit spelling-consciousness intervention. In five sessions, third-grade students were made aware of their spelling and spelling difficulties and were taught metacognitive strategies. Students were stimulated to think about their spelling process by considering their difficult words, the ways to spell difficult words, and the correctness of their spellings by asking them questions and teaching them strategies to spell correctly. After the intervention, students in the training condition were better able to indicate accurately which words they had spelled correctly and which words they had spelled incorrectly. Students who received no training but did have to estimate the correctness of their spelling during pretest and posttest also became better at indicating which words they could spell correctly, but their judgment of wrongly spelled words remained the same. A word-study strategy of Harris, Graham, and Freeman (1988) required students to (a) say the word, (b) write and say the word, (c) check the word, (d) trace and say the word, and (e) write the word from memory and check it. This intervention, which aimed at memorizing the spelling of words without explicit metacognitive-skill training, caused an improvement in the spelling consciousness of fourth-grade learning disabled students.

Intervention type

In the past decades, research has revealed that adequate spelling performance requires formal spelling instruction (e.g., Bosman, 2004; Butyniec-Thomas & Woloshyn, 1997; Devonshire & Fluck, 2010; Faber, 2006; Gettinger, Bryant, & Fayne, 1982; Graham, 1999, 2000). Numerous studies focused on the best ways to memorize a word's spelling (e.g., Bosman, van Hell, & Verhoeven, 2006; Hilte & Reitsma, 2006; Hubbert, Weber, & McLaughlin, 2000); ways to learn a spelling rule (e.g., Darch, Eaves, Crowe, Simmons, & Conniff, 2006; Hilte & Reitsma, 2011; Kemper, Verhoeven, & Bosman, 2012); and how to encourage students to apply spelling rules in a structured way (e.g., Butyniec-Thomas & Woloshyn, 1997; Paffen & Bosman, 2005).[1]

An important insight is that spelling regularities have to be made explicit, spelling rules need to be explained, and the application of spelling rules has to be practiced until mastery (Berninger et al., 1998; Henry, 1989). Mastery involves not only the correct spelling of words that have been practiced, but also the application of the spelling rule to new words. Stated differently, students should be able to transfer their acquired knowledge to new materials (e.g., Butyniec-Thomas & Woloshyn, 1997). Although teaching a spelling strategy is regarded as effective for a large number of different words, the effect on spelling consciousness is still unknown. The focus of this study, therefore, is the improvement of both spelling performance and spelling consciousness. Three different strategies will be compared to assess effectiveness.

Strategy instruction

Primary school children with and without learning disabilities often fail to use efficient learning strategies unless they receive explicit instruction in these spelling strategies (Graham, 1983; Graham & Freeman, 1985). Some studies suggest that teaching students a strategy may improve their

metacognitive skills (Brown & Barclay, 1976; Brown et al., 1977). Merely thinking about how to handle a particular task can stimulate metacognitive skills. Various studies have shown the effectiveness of teaching a strategy that involves the segmentation of a word into phonemes or syllables (Butyniec-Thomas & Woloshyn, 1997; Cordewener, Verhoeven, & Bosman, 2015) and teaching a rule (i.e., first- to fourth-grade students with and without learning disabilities; Butyniec-Thomas & Woloshyn, 1997; Cordewener et al., 2015; Darch et al., 2006; Hilte & Reitsma, 2011; Kemper et al., 2012). The intervention of Kernaghan and Woloshyn (1995) contained a metacognitive part in which students were taught when and how to use a strategy. They found that even first-grade students were able to learn spelling strategies. An example of an effective metacognitive strategy that was taught by Paffen and Bosman (2005) is to have students listen carefully to the word, segment it into syllables, and deduce the spelling rule(s) that could be applied to each syllable. Offering spellers a structured way to think about each part of the word may stimulate them to think actively about their spelling without explicit metacognitive instruction.

Strategic monitoring

A large number of studies have established that primary school students are stimulated to think about their own learning processes when metacognitive questions are asked (Fisher, 2007; Jacobs, 2004; Olson & Astington, 1993). Jacobs (2004) even showed that asking metacognitive questions after writing activities causes kindergarten students to become more aware of the strategies they were using. Thus, when students are encouraged to think about why they perform tasks in a particular way, their metacognition and their performance on these tasks may improve.

Self-monitoring

Another way to improve spelling performance is to have students self-correct their work by asking them to compare their spelling with the one on the correction sheet (McGuffin, Martz, & Heron, 1997; McNeish, Heron, & Okyere, 1992; Morton, Heward, & Alber, 1998; Willemen, Bosman, & van Hell, 2000, 2002). Gettinger (1985) found that poor spellers from third to eight grade profit more when they have to self-correct than when a teacher corrects their spelling. Self-correction may also be effective in improving spelling consciousness of students (i.e., third- and fourth-grade students and students from special primary education; Block & Peskowitz, 1990; Willemen et al., 2002). When students are able to correct their own work, they are able to detect their own errors. Metacognitive skills can thus be triggered by having spellers compare their own spelling with the correct spelling. Willemen et al. (2002) showed that third-grade students and students from special primary education in a self-correction condition were not only able to detect their spelling errors during the correction phase, but also made fewer errors during the writing phase of their text. Thus, not only did they become better at detecting their spelling errors, they also started thinking more about their spelling during the writing process. Cordewener et al. (2015) found no effect of the self-correction procedure on the spelling consciousness of third-grade students. Note, however, that students were not allowed to correct their work immediately after dictation. Thus, it is not yet clear whether spelling consciousness of students may improve by just having them correct their own work without further explicit metacognitive instruction.

Word type

The Dutch language contains indigenous or native Dutch words and loan words or borrowings from other languages. Because indigenous words are much more consistent in their spelling than loan words, students need to become aware of the distinction between the two types of words (Bosman, 2004). The intervention in the present study was aimed only at Dutch, regularly spelled words that could be spelled correctly by applying the rules students had learned thus far. However, we also investigated whether the acquired strategy generalized to the spelling of loan words, because the major parts of loan words can be spelled using the rules that were taught.

The present study

In the present study, we compared the effects of different interventions on the spelling performance and spelling consciousness of third-grade students. Third graders' spelling level and cognitive ability is such that they can apply spelling rules and are able to make use of metacognitive strategies. Because they still make plenty of spelling errors, students may still benefit from a strategy training (e.g., Cordewener et al., 2015; Paffen & Bosman, 2005). Spelling performance was examined by having students spell both regular words and loan words. To measure spelling consciousness, students had to assess whether they thought they were able to spell these words correctly before they wrote the word down. We not only took into account the number of correct judgments, but also looked at whether there is a difference in correct judgments between correctly spelled words and incorrectly spelled words. The effect of three training conditions in which three different metacognitive aspects were implemented were compared with a control condition. In the strategy-instruction condition, students were taught a strategy they had to apply before they had to write down each word. The strategy involved segmenting the word into syllables and expounding the spelling rule or rules that should be applied to each syllable (Cordewener et al., 2015). Only highly generalizable spelling rules were used. We encouraged students to think about their spelling while spelling rather than afterwards. In the strategic-monitoring condition, students were taught the same strategy, but they were asked to use the strategy concerning incorrectly written words. In the self-monitoring condition, the students had the opportunity to immediately correct their own work after dictation.

Method[2]

Participants

In the present study, 115 third-grade students (58 girls, 57 boys) between the ages of 7 years, 4 months, and 10 years, 1 month, (M = 8 years, 6 months; SD = 0;64) participated. Dutch was the native language of all but six students. One student spoke Moroccan at home, and five students used a combination of Dutch and another language (i.e., English, Moroccan, Papiamentu, Lebanese, and Turkish). All students used Dutch at school. The students in the training conditions were recruited from three classes of three different schools for primary education in the Netherlands. All three schools used the same spelling-instruction method Taal Actief [Active Language] (Fuchs, de Goei, van den Heuvel, & de Geus, 2002), which guaranteed similar instruction of spelling rules for all students. The students in the control condition were from two classes of two different schools for primary education in the Netherlands; these schools both used the spelling-education method Taaljournaal [Language News] (Horst, 1993).[3]

The students in the experimental condition were assigned to one of three training conditions. The matching procedure used revealed that the students did not differ on general word spelling, spelling performance, and spelling consciousness on either pretest, age, and sex (all Fs < 1). The strategy-instruction condition comprised 13 girls and 15 boys (age: M = 8 years, 5 months; SD = 0;62), the strategic-monitoring condition had 16 girls and 14 boys (age: M = 8 years, 5 months; SD = 0;59), the self-monitoring condition consisted of 16 girls and 14 boys (age: M = 8 years, 5 months; SD = 0;41), and the control condition consisted of 13 girls and 14 boys (age: M = 8 years, 11 months; SD = 0;6). All students participated in the pretest, posttest, and all four training sessions.

Materials

Standardized-word spelling test

General word spelling was measured by the standardized Dutch spelling-to-dictation test Schaal Vorderingen in Spellingvaardigheid [Scale Progression in Spelling Abilities] (van den Bosch, Gillijns, Krom, & Moelands, 1991). This test contained 36 disyllabic or trisyllabic words at the level of grade 3. Students had to write down words that were orally presented to them. The lowest possible score was zero and the highest possible score was 36.

Word spelling on the pretest and posttest

Both the pretest and posttest contained 50 regularly spelled and 50 loan words. The same words, albeit in a different order, were used in the pretest and in the posttest, to ensure identical difficulty of words and spelling rules. Since we used other words in the training sessions, we did not expect large practice effects between pretest and posttest. Moreover, practice effects would not be a problem because they should have similar effects on each training condition. Each test was administered in three sessions of 34, 33, and 33 words, respectively.

Regularly spelled words. The spelling of regularly spelled native Dutch words was measured by a spelling-to-dictation test based on words used in the standardized Schaal Vorderingen in Spellingvaardigheid test [Scale Progression in Spelling Abilities] (van den Bosch et al., 1991) and the PI-dictee [PI-dictation] (Geelhoed & Reitsma, 2004). None of the words of the standardized test were used in the experiment. All words could be spelled correctly when spelling rules are used properly. The words contained no other spelling difficulties. These words are presented in Appendix A. The lowest possible score was zero and the highest was 50.

Loan words. Loan words cannot be spelled correctly by applying Dutch spelling rules. These words have to be known by heart or spelled by analogy to other words. The loan words were derived from the ones used in the study of Paffen and Bosman (2005) and are presented in Appendix A. The lowest possible score was zero and the highest possible score was 50.

Spelling consciousness. Spelling consciousness was measured by having students indicate whether they thought they were able to spell each of the presented words correctly or not. During the pretest and posttest, words were orally presented to the students. After a word was pronounced by the experimenter, the students first had to indicate whether the student thought he or she was able to write the word correctly by circling *yes* or *no*. Thereafter, the student was allowed to write the word down. The level of spelling consciousness was computed by counting the number of correct judgments. A judgment was correct when the student had circled *yes* and also had written the word correctly or when the student had circled *no* and indeed wrote the word incorrectly. The lowest possible score was zero and the highest possible score was 50 both for regularly spelled words and for loan words.

Word spelling on the training sessions

The intervention consisted of four training sessions of 30 regular words each. Loan words were not trained. These words were based on the practice dictations of the Schaal Vorderingen in Spellingvaardigheid [Scale Progression in Spelling Abilities] (van den Bosch et al., 1991) and the PI-dictee [PI-dictation] (Geelhoed & Reitsma, 2004). None of the words used in the intervention were used in the pretest and posttest. All words could be spelled correctly when spelling rules that students had learned so far were used. The words contained no other spelling difficulties. All trained words are presented in Appendix B. For each session, the lowest possible score was zero and the highest possible score was 30.

Procedure

The test and training sessions were conducted by five masters students with the help of the first author of this paper. Each masters student tested and trained the students at one school. The masters students received thorough training and a manual in which the test and training procedures were described in detail. Prior to the first training session, the standardized-word spelling test and the pretest for spelling were administered. For the students who participated in the intervention, 3 weeks after the pretest the training sessions started. For the students in the control condition, the sessions started 2 weeks after the pretest.[4] Students received one training session every week. The week after the fourth training session the posttest was performed. The pretest, posttest, and all training sessions were administered groupwise except for the training sessions of the strategy-instruction condition; these were administered individually. Table 1

presents the scores on the pretest and the posttest. As said, the students in the control condition were a few months older and scored approximately one standard deviation higher on the initial spelling tests than students in the training conditions (the difference was a bit smaller for the spelling consciousness scores on loan words). Since the scores of students in the control condition did not reach a ceiling effect, not even on the posttest, we did not expect this difference to have any influence on our results. Nevertheless, we did control for these differences in our analyses.

Strategy-instruction condition

Students received strategy instruction in an individual setting. Each student was taken to a separate room in the school building. First, the experimenter explained that a spelling strategy would be taught, which would make it easier to spell words correctly. After that, the experimenter explained the strategy and had the student practice with a particular word. The student was asked to divide each word into syllables and to name the rule or rules that could be applied to each particular syllable before writing the word. When a student did not divide the words correctly, did not apply all rules correctly, or did not write the words correctly, the experimenter helped the student to divide the word and apply the rules again, such that each word was written correctly. This was done for all 30 words.[5]

Strategic-monitoring condition

The dictation task for each session was administered in groups of 9 to 11 students. After each dictation, each student was taken to a separate room in the school building. In the first session, the experimenter first explained that a spelling strategy would be taught, which would make it easier to spell words correctly. After that, the student received his or her work together with a sheet containing the correctly spelled words. If the student had written the word correctly, the student was allowed to put a correct sign next to the word. In case the word was written incorrectly, the student had to apply the same strategy as in the strategy-instruction condition. The strategy was used during the correction phase rather than during the writing phase. This strategy was introduced with a practice word, just as in the strategy-instruction condition. After the student had corrected all words, the metacognitive questioning phase started, in which the experimenter asked a couple of questions to stimulate the student to think about his or her spelling (see Appendix C). In the second, third, and fourth sessions, the procedure was the same, apart from the fact that a couple of metacognitive questions were asked before the students started to correct their dictation.

Self-monitoring condition

The dictation session and the correction procedure were administered in groups of 9 to 11 students. Students were taken to a separate room in the school building and had to accomplish a dictation task after which they received a sheet with all correctly spelled words and were instructed to correct their own work. Students had to perform the self-correction procedure by themselves without the help of the teacher. It was, therefore, not necessary to use individual sessions for this condition. The experimenter did not check whether or not the students properly corrected all words because this condition attempted to mimic a classroom situation. Teachers are most often unable to check whether or not each student applied the proper correction to each word.

Table 1. Means and standard deviations of the different tests in the four conditions.

Condition	General word spelling *M* (*SD*)	Pretest spelling performance *M* (*SD*)	Pretest spelling consciousness *M* (*SD*)
Strategy-instruction ($N = 28$)	22.86 (8.71)	34.61 (18.26)	54.93 (17.40)
Strategic-monitoring ($N = 30$)	24.20 (8.56)	36.73 (18.81)	56.07 (16.62)
Self-monitoring ($N = 30$)	24.50 (7.79)	36.67 (17.71)	57.07 (15.60)
Control group ($N = 27$)	28.52 (5.75)	52.37 (18.52)	66.00 (13.97)

Control condition

In this condition, the dictation sessions were administered in groups of 11 to 16 students. Students were taken to a separate room in the school building and had to accomplish a dictation task.[6] They received no feedback on their dictation.

Results

First, mixed-model regression analyses were conducted to investigate the effect of the training conditions with respect to spelling performance. Second, the same mixed-model regression analyses were conducted to investigate the effect of the training conditions on spelling consciousness.[7] Third, we not only took into account the global measure of spelling consciousness (i.e., percentage of correct judgments) but also looked at the distribution of the judgments into the categories into more detail (i.e., yes-correct, yes-incorrect, no-correct, and no-incorrect) with a GLM for repeated measures.

Effects of the training conditions on spelling performance

To examine the effects of the training conditions on spelling performance, a model was fitted with spelling-performance scores on both regular words and loan words as the dependent variable. The age of the students was entered as a covariate. The models were estimated using package "lme4" (Bates, Maechler, Bolker, & Walker, 2015) in R version 3.2.4 (R Core Team, 2016). The mean scores of the students in the four conditions are presented in Table 2.

With respect to spelling performance, first, an empty model with Subjects as a random factor was estimated (Model 0). This model can be compared to the more complex pretest-posttest model in which measurement occasions are regarded as nested within Subjects. This is a random intercepts and random slopes model (Model 1) in which the intercept (spelling performance score at pretest) and the slope (change in spelling performance from pretest to posttest) of a subject are allowed to randomly deviate from the pretest grand mean and the overall slope in the data set respectively. To serve as a baseline model for estimating the effect of *Training Condition* on Spelling Performance, *Age* (at pretest in months, grand mean centered) and *Test* (Pretest versus Posttest) were also entered into Model 1. In Model 2 the within subject variable *Word Type* (Regular Words versus Loan Words) was added to the model and in Model 3 between subject variable *Training Condition* (Control, Strategy-Instruction, Strategic-Monitoring versus Self-Monitoring) was added to the model. Finally, Model 4 examined the within-subject interaction between *Test* and *Word Type* and the cross-level interaction between *Test* and *Training Condition*. Using a deviance test, each model was compared to the previous one in order to determine the added value of subsequent predictors to the overall fit to the data.

Table 3 presents the results of the mixed models for spelling performance. It reveals that differences between students can be attributed to *Age* and *Test*, since allowing random intercept and slope variance for levels of *Test* within subjects resulted in a significant deviance drop (Model 0 versus

Table 2. Spelling performance scores on the different words in the four conditions.

	Strategy-instruction *M* (*SD*)	Strategic-monitoring *M* (*SD*)	Self-monitoring *M* (*SD*)	Control group *M* (*SD*)
Pretest				
All	34.61 (18.26)	36.73 (18.81)	36.67 (17.71)	52.37 (18.52)
Regular	27.14 (11.53)	28.47 (12.63)	28.00 (11.40)	37.30 (9.98)
Loan	7.46 (7.60)	8.27 (7.26)	8.67 (7.52)	15.07 (9.71)
Posttest				
All	43.14 (19.10)	44.27 (17.76)	45.67 (19.34)	55.07 (16.11)
Regular	33.25 (10.94)	33.30 (10.40)	32.77 (10.80)	39.00 (7.41)
Loan	9.89 (9.21)	10.97 (8.78)	12.90 (9.38)	16.02 (10.07)

Model 1). This was expected: There are known age differences in the data set that need to be accounted for and the spelling performance of students was measured on two occasions, which is not accounted for in Model 0. The addition of *Word Type* resulted in a significant deviance drop (Model 1 versus Model 2), indicating that distinguishing between levels of *Word Type* within subjects explains variation in the observed spelling performances. In Model 3, the addition of *Condition* also resulted in a significant deviance drop (Model 2 versus Model 3), indicating that distinguishing between subjects based on the four levels of *Condition* provides an additional reduction in unexplained variation in spelling performance. Adding the within-subject interactions *Test* X *Word Type* and between-subject interactions *Test* X *Condition* resulted in the best fitting model of all models considered to predict spelling performance of students (Model 4). The results of Model 4 show that the interaction between *Test* and *Condition* was significant for all three conditions relative to the intercept, indicating that the students in the training conditions made more progress in spelling performance between pretest and posttest than students in the control condition. Additional analyses (Bonferroni corrected) showed that the progress of students in all three training conditions was significant ($ps < .0001$), whereas students in the control condition made no progress between pretest and posttest ($p = .06$). There were no differences between the three training conditions. Moreover, the interaction between *Test* and *Word Type* was significant, indicating that students made more progress between pretest and posttest on regular words than on loan words. The main effect of the control variable *Age* was also significant, indicating that, on average, older students (i.e., our control condition) had higher spelling-performance scores than younger students. The pretest-posttest slope for the control group was, however, close to zero.

Effects of the training conditions on spelling consciousness

The same five models were used to test for the effect of training on spelling consciousness of both regular words and loan words. Again, the age of the students was entered as a covariate. Mean scores are presented in Table 4.

Table 3. Mixed-model regression strategy for spelling performance.

	Model 0		Model 1		Model 2		Model 3		Model 4	
	β	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*
Fixed Part										
Intercept[a]	21.688***	0.873	19.935***	1.073	30.538***	0.942	37.698***	1.821	38.615***	1.886
Age			−0.202	0.146	−0.218	0.145	−0.475**	0.149	−0.492***	0.149
Test: Post			3.849**	1.243	3.876***	0.488	4.310***	0.490	2.947**	0.975
Word Type: Loan					−21.207***	0.419	−21.207***	0.420	−20.322***	0.585
Condition: Strategy-instruction							−10.029***	2.492	−11.858***	2.589
Condition: Strategic-monitoring							−9.136***	2.444	−10.678***	2.539
Condition: Self-monitoring							−8.951***	2.465	−10.913***	2.561
Test * Word Type: Loan									−1.770*	0.828
Test * Condition: Strategy-instruction									3.067*	1.198
Test * Condition: Strategic-monitoring									2.566*	1.179
Test * Condition: Self-monitoring									3.299**	1.179
Random Part										
Intercept variance: Subject	44.127		47.104		87.016		71.039		71.119	
Slope variance: Test within Subject			0.162		0.308		0.024		0.022	
Intercept-Slope covariance			−2.764		−5.176		−1.313		−1.256	
Residual variance	174.138		170.449		20.165		20.285		19.697	
Deviance	3756.9		3746.5*		3011.1***		2983.1***		2961.7**	
Deviance difference (χ^2)			10.4		735.4		28		21.4	
Degrees of freedom			$df = 4$		$df = 1$		$df = 3$		$df = 4$	

*$p < .05$, **$p < .01$, ***$p < .001$.
[a]The intercept represents: Test = Pre; Word Type = Regular Words; Condition = Control Group.

Table 4. Spelling consciousness scores on the different words in the four conditions.

	Strategy-instruction *M* (*SD*)	Strategic-monitoring *M* (*SD*)	Self-monitoring *M* (*SD*)	Control group *M* (*SD*)
Pretest				
All	54.93 (17.40)	56.07 (16.62)	57.07 (15.60)	66.00 (13.97)
Regular	29.68 (9.43)	31.77 (9.38)	30.67 (8.80)	37.07 (8.75)
Loan	25.25 (11.52)	24.30 (10.50)	26.40 (9.79)	28.93 (9.46)
Posttest				
All	62.71 (16.20)	61.03 (13.62)	61.33 (13.57)	62.26 (15.69)
Regular	34.18 (9.10)	34.23 (8.23)	34.03 (9.02)	38.04 (8.27)
Loan	28.54 (10.17)	26.80 (9.01)	27.30 (7.39)	24.22 (9.93)

Table 5 presents the results of the mixed models for spelling consciousness. Here also, differences between students cannot be attributed to *Age* and *Test*, since allowing random intercept and slope variance for levels of *Test* within subjects did not result in a better fit (Model 0 versus Model 1). However, the addition of *Word Type* did result in a better fit (Model 1 versus Model 2), indicating that distinguishing between levels of *Word Type* within subjects explains variation in the observed spelling consciousness. In Model 3, the addition of *Condition* did not result in a better fit (Model 2 versus Model 3), but the addition of the within-subject interactions between *Test* X *Word Type* and between-subject interactions *Test* X *Condition* did (Model 4). Model 4 shows that the interaction between *Test* and *Condition* was significant for all three conditions relative to the intercept, indicating that the students in the training conditions made more progress in spelling consciousness between pretest and posttest than students in the control condition. Additional analyses (Bonferroni corrected), however, showed that students in the strategy-instruction condition made significant improvement between pretest and posttest ($p < .01$), whereas students in the other conditions did not make significant improvement

Table 5. Mixed-model regression strategy for spelling consciousness.

	Model 0		Model 1		Model 2		Model 3		Model 4	
	β	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*	*β*	*SE*
Fixed Part										
Intercept[a]	30.048***	0.680	29.191***	0.810	32.783***	0.853	35.046***	1.588	36.632***	1.755
Age			−0.037	0.114	−0.039	0.114	−0.123	0.125	−0.131	0.125
Test: Post			1.776*	0.779	1.779**	0.677	1.921**	0.681	−0.543	1.474
Word Type: Loan					−7.183***	0.643	−7.183***	0.645	−6.052***	0.899
Condition: Strategy-instruction							−2.886	2.096	−6.330**	2.361
Condition: Strategic-monitoring							−3.114	2.055	−5.730*	2.316
Condition: Self-monitoring							−2.869	2.073	−5.284*	2.333
Test * Word Type: Loan									−2.261	1.271
Test * Condition: Strategy-instruction									5.796**	1.845
Test * Condition: Strategic-monitoring									4.387*	1.815
Test * Condition: Self-monitoring									4.037*	1.815
Random Part										
Intercept variance: Subject	36.667		43.122		48.029		45.501		45.493	
Slope variance: Test within Subject			0.808		0.901		0.416		0.355	
Intercept-Slope covariance			−5.901		−6.579		−4.348		−4.019	
Residual variance	65.823		64.703		47.594		47.788		46.442	
Deviance	3364.1		3358.9		3251.3***		3239.7		3215.2**	
Deviance difference (χ^2)			5.2		107.6		11.6		24.5	
Degrees of freedom			$df = 4$		$df = 1$		$df = 3$		$df = 4$	

*$p < .05$, **$p < .01$, ***$p < .001$.
[a]The intercept represents: Test = Pre; Word Type = Regular words; Condition = Control Group.

(strategic-monitoring condition, $p = .13$; self-monitoring condition, $p = .25$; control condition, $p = .88$). The main effect of *Word Type* was significant, indicating that, on average, students had higher spelling consciousness scores on regular words than on loan words.

More-specific measure of spelling consciousness

In the previous analysis, a global measure of spelling consciousness was used: the number of correct judgments (i.e., yes-correct and no-incorrect). To obtain a more detailed insight into the development in spelling consciousness, the effects of the four conditions on the exact judgments of the students were also examined. All four categories (i.e., yes-correct, yes-incorrect, no-correct, and no-incorrect) were taken into account. A 4 (*Condition*: Control, Strategy-Instruction, Strategic-Monitoring versus Self-Monitoring) × 2 (*Test*: Pretest versus Posttest) GLM was performed on the number of judgments in each category for regular words and loan words separately. *Condition* was treated as a between-subjects variable and *Test* as a within-subjects variable. The percentages of judgments in each category are presented in Table 6.

The results of these analyses are presented in Table 7. The number of judgments concerning the category yes-correct of regular words was higher on the posttest than on the pretest. Regarding the category yes-incorrect of regular words, a GLM was performed with *Condition* as a between-subjects variable and the difference between pretest and posttest as a within-subjects variable. The difference between the strategy-instruction and control condition was significant ($p < .01$), indicating that the number of yes-incorrect judgments of students in the strategy-instruction condition was lower on the posttest than on the pretest, whereas no difference emerged in the control condition. The number of judgments concerning the category no-incorrect of regular words was lower on the posttest than on the pretest.

The number of judgments concerning the category yes-correct of loan words was higher on the posttest than on the pretest. Post hoc comparisons showed no differences between the four conditions. Regarding the category yes-incorrect of loan words a GLM was performed with *Condition* as a between-subjects variable and the difference between pretest and posttest as a within-subjects variable. The differences between the control condition and all training conditions were significant ($ps < .01$ or $.05$), indicating that the number of judgments in the category yes-incorrect of students in the control condition increased between pretest and posttest ($p < .05$), whereas the number of judgments in the category yes-incorrect of students in the strategic-monitoring condition decreased ($p < .05$) and the number of yes-incorrect judgments of students in the strategy-instruction and self-monitoring conditions remained stable. A GLM was also performed on the category no-incorrect of loan words with *Condition* as a between-subjects variable and the difference between pretest and posttest as a within-subjects variable. Differences between the control condition and the strategy-instruction and strategic-monitoring conditions were significant ($ps < .05$), indicating that the number of no-incorrect judgments remained stable between pretest and posttest for the training conditions and decreased for the control condition ($p < .01$). Finally, a GLM was performed on the category no-correct of loan words with *Condition* as a between-subjects variable and the difference between pretest and posttest as a within-subjects variable. Differences between the self-monitoring condition and the strategy-instruction and control conditions were significant ($p < .05$ and $p < .01$), indicating that the number of no-correct judgments increased between pretest and posttest for students in the self-monitoring condition ($p < .05$), whereas it remained stable for students in the strategy-instruction and the control conditions.

Table 6. Percentages of judgments in each category (i.e., yes-correct, yes-incorrect, no-correct, and no-incorrect).

		Yes *M* (*SD*)		No *M* (*SD*)	
		Regular	Loan	Regular	Loan
Correct	Pretest	55.5 (25.8)	16.5 (16.0)	4.8 (7.8)	3.1 (4.7)
	Posttest	64.6 (22.8)	21.5 (18.4)	4.4 (8.0)	3.3 (4.5)
Incorrect	Pretest	30.4 (19.4)	44.4 (23.0)	9.3 (13.0)	36.0 (25.2)
	Posttest	24.9 (17.1)	42.8 (20.3)	6.1 (10.7)	32.4 (24.1)

Table 7. Results of the specific analyses for spelling consciousness.

	Interaction Condition × Test	Main effect Condition	Main effect Test
Regular words			
yes-correct	$F(3,111) = 1.14$, $p = .34$	$F(3,111) = 2.59$, $p = .06$	$F(1,111) = 72.96^{***}$, *partial* $\eta^2 = .40$
yes-incorrect	$F(3,111) = 4.24^{**}$, *partial* $\eta^2 = .10$	$F(3,111) = 3.08^{*}$, *partial* $\eta^2 = .08$	$F(1,111) = 32.49^{***}$, *partial* $\eta^2 = .23$
no-incorrect	$F < 1$	$F < 1$	$F(1,111) = 18.95^{***}$, *partial* $\eta^2 = .15$
no-correct	$F(3,111) = 1.57$, $p = .20$	$F < 1$	$F < 1$
Loan words			
yes-correct	$F(3,111) = 1.38$, $p = .25$	$F(3,111) = 2.78^{*}$, *partial* $\eta^2 = .07$	$F(1,111) = 69.08^{***}$, *partial* $\eta^2 = .38$
yes-incorrect	$F(3,111) = 4.95^{**}$, *partial* $\eta^2 = .12$	$F < 1$	$F < 1$
no-incorrect	$F(3,111) = 3.91^{*}$, *partial* $\eta^2 = .10$	$F(3,111) = 1.48$, $p = .22$	$F(1,111) = 6.14^{*}$, *partial* $\eta^2 = .05$
no-correct	$F(3,111) = 4.69^{**}$, *partial* $\eta^2 = .11$	$F(3,111) = 1.36$, $p = .26$	$F < 1$

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .0001$.

Discussion

The focus of this study was the role of instruction for both spelling performance and spelling consciousness in grade 3. The effects of three instruction conditions with different levels of metacognitive aspects were compared with a control condition. In the strategy-instruction condition, metacognition was stimulated implicitly by offering students a structured way to think about their spelling before writing a word. In the strategic-monitoring condition, metacognition was stimulated more explicitly by having students apply the same strategy during the correction phase of their dictation and asking them metacognitive questions. In the self-monitoring condition, metacognition was supposed to be stimulated implicitly by asking students to think about the correctness of their spellings directly after dictation. Spelling consciousness was measured by asking students to assess whether they thought they were able to write a word correctly before they had to write it.

The results showed the benefits of implicit and explicit metacognitive practice on spelling performance. All three experimental groups outperformed the control group after training. The positive effects of the strategy-instruction and self-monitoring conditions in the present study were in line with results obtained by Cordewener et al. (2015). The stronger effects in the present study might be explained by the fact that applying the strategy before writing the word might be more effective than applying it afterwards. Moreover, self-correction immediately after dictation appears to be more effective than postponed self-correction. Because the strategic-monitoring condition is actually a combination of self-correction and applying a strategy, it is perhaps not surprising that this condition was also effective. Moreover, previous research confirmed the effects of strategy instruction that includes syllable segmentation (Butyniec-Thomas & Woloshyn, 1997; Kernaghan & Woloshyn, 1995; Paffen & Bosman, 2005) and the application of spelling rules (Butyniec-Thomas & Woloshyn, 1997; Darch et al., 2006; Hilte & Reitsma, 2011; Kemper et al., 2012; Paffen & Bosman, 2005). The positive effects of self-monitoring were also in line with previous research (Grskovic & Belfoire, 1996; McGuffin et al., 1997; McNeish et al., 1992; Morton et al., 1998; Willemen et al., 2000, 2002; Wirtz, Gardner, Weber, & Bullara, 1996). In the strategic-monitoring condition, these aspects were combined with metacognitive questioning of which the positive effect on spelling performance was already demonstrated by Jacobs (2004). Students made more progress in spelling performance on regular words than on loan words, perhaps because during training only regular words were used. Moreover, the strategy that was used in the strategy-instruction and strategic-monitoring condition could only be applied to regular words, because part of the strategy was to apply the previously learned Dutch spelling rules and these could not be applied to loan words.

With respect to spelling consciousness, only students in the strategy-instruction condition made progress between pretest and posttest. This indicates that applying a strategy before writing each word leads to an improvement in spelling consciousness. This is in line with the previous study of Cordewener et al. (2015), in which strategy instruction during the correction phase and self-

monitoring were not effective with respect to the improvement of spelling consciousness. The positive effect of applying a strategy before writing each word was also established by Paffen and Bosman (2005). However, a more detailed look at the spelling consciousness of students suggests that training also affects the way in which spelling consciousness changed between pretest and posttest. Students in all four conditions became more accurate at assessing which words they could spell correctly between pretest and posttest, but they became less accurate at assessing regular words they could not spell correctly. Note that this might be related to the fact that students also spelled fewer regular words incorrectly on the posttest than on the pretest.

Students in the control condition, however, less often correctly indicated misspelled loan words on the posttest than on the pretest, whereas students in the strategy-instruction and strategic-monitoring conditions performed similarly at both test moments. Moreover, students in the control and strategy-instruction conditions had the same number of errors in which correctly spelled loan words are indicated as incorrect at both the pretest and the posttest, whereas students in the self-monitoring condition had an increase in this type of error. Students in the control condition showed stable performance identifying incorrectly spelled regular words (yes-incorrect) between pretest and posttest, whereas for students in the strategy-instruction condition the number of errors decreased. Note that students in the control condition showed an increase in how often they indicated incorrectly spelled loan words as correct, whereas this remained stable for students in the strategy-instruction and self-monitoring conditions and even decreased for students in the strategic-monitoring condition. Thus, in line with the results of Paffen and Bosman (2005), training metacognitive aspects is needed for students to indicate more accurately which words they could not spell correctly. The intervention conditions in which metacognition was stimulated more explicitly (i.e., the strategic-monitoring and strategy-instruction conditions) were most useful for having students identifying words they could not spell correctly.

In line with previous research, this study showed that spelling consciousness and spelling performance are highly related. One possible explanation is that poor spellers think less about their spelling before writing a word. In contrast, good spellers think more about how to spell a word before writing it. Consequently, for good spellers it might be easier to notice the difficulties of a particular word and their spelling consciousness might be better. However, only half of the variance in spelling consciousness could be explained by spelling performance (between 40% and 44%), which means that spelling consciousness and spelling performance are distinct skills. Research on judgments of learning also showed that it is hard for students to report accurately about their cognitive processes (e.g., Nisbett & Wilson, 1977). However, our results showed that judgments of learning can be improved by improving spelling performance.

Practical implications

The present study supports other research that showed that a short intervention can improve both spelling performance and spelling consciousness. For spelling performance, both direct self-correction and having students apply a strategy that requires them to segment each word into syllables and name and apply the corresponding spelling rules, appears to be effective. This strategy can be used during the correction phase in combination with asking students metacognitive questions. We suggest, however, to encourage students to apply this strategy before writing down each word, because applying this strategy also increases spelling consciousness. A strong recommendation to teachers is to make sure that students apply this strategy right from the start of formal spelling instruction. Internalizing an effective strategy most likely enhances spelling consciousness and spelling performance. Finally, teachers are advised to always have students inspect their spellings directly after dictation to improve both spelling performance and the ability to correctly identify words that they could spell correctly.

Notes

1. In our literature review, we also included spelling research on students with learning difficulties. However, these results are highly generalizable to students without learning difficulties, since the spelling process is similar for various groups of spellers (e.g., Bosman & Van Orden, 1997; Cordewener, Bosman, & Verhoeven, 2012). All kinds of

spellers (e.g., typically beginning spellers, students with spelling (and reading) difficulties, deaf students, language-disordered students) make the same types of, phonetically acceptable, spelling errors (e.g., Bosman & van Leerdam, 1993; Brown & Ellis, 1994; Bruck, 1988; Campbell, 1994; Cromer, 1980).

2. This study was based on a previous study we performed, so parts of the Method section are similar to those in the previous study (Cordewener, Verhoeven, & Bosman, 2015).
3. To be able to compare the improvement of the students in the training conditions with students who received no training, we used a control condition of students that was included in a previous study (Cordewener et al., 2015). Therefore, these students were a few months older and already had higher scores on the spelling tests than the students in the training conditions. However, we controlled for these age and test-score differences in our analyses.
4. In our analyses, we controlled for this difference.
5. In the strategy-instruction and strategic-monitoring conditions, at the end of each session, the experimenter asked the student how he or she thought about the session. The experimenter just asked this question, but nothing was done with the answer of the student.
6. Students in the control condition had to indicate for each word in the training sessions whether they thought they were able to write the word correctly by circling 'yes' or 'no' before they wrote the word down.
7. In our data, the correlation between spelling consciousness and spelling performance is .63 ($p < .001$) at the pretest and .66 ($p < .001$) at the posttest.

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Appendix A. Words used in the pretest and posttest

Regularly spelled words	*Loan words*
brandnetels [nettles]	ruïne [ruins]
smokkelaars [smugglers]	explosie [explosion]
voetballer [soccer player]	theater [theater]
stromen [streams]	lucifer [match]
schaduw [shadow]	fantastisch [fantastic]
sneeuwmannen [snowmen]	exotisch [exotic]
bericht [message]	orthodontist [orthodontist]
kastdeur [door of a closet]	bureau [desk]
beloning [reward]	chirurg [surgeon]
broodtrommel [bread box]	bibliotheek [library]
vogeltjes [little birds]	computer [computer]
verlegen [shy]	champignons [mushrooms]
koffertje [little suitcase]	plafond [ceiling]
vleesgerecht [meat course]	maximum [maximum]
tomaten [tomatoes]	charmant [charming]
hoofdletter [capital]	ambulance [ambulance]
boterhammen [slices of bread]	spaghetti [spaghetti]
meeuwen [gulls]	illustratie [illustration]
krokodillen [crocodiles]	politie [police]
hardloper [runner]	cadeau [gift]
fluitketel [singing teakettle]	machinist [train driver]
getallen [numbers]	hobby [hobby]
oppassen [taking care]	centrum [center]
brutaal [rude]	taxi [taxi]
schreeuw [scream]	hallucinatie [hallucination]
ongeveer [approximately]	cheque [cheque]
slaapzalen [dormitories]	liniaal [ruler]
fakkeloptocht [torch ceremony]	etalagepop [window dummy]
stoppelbaard [stubbly beard]	garagepoort [garage gate]
schommel [swing]	cirkel [circle]
vriendschap [friendship]	echo [echo]
verzameling [collection]	benzine [gasoline]
roeiers [rowers]	marathon [marathon]
zweefmolen [giant's stride]	apotheek [pharmacy]
kieuwen [gills]	punaise [thumbtack]
voorzitter [chairman]	romantisch [romantic]
toestemming [permission]	bioscoop [cinema]
weerverswachting [weather forecast]	meubilair [furniture]
bedankt [thanks]	centrifuge [centrifuge]
zelfbeheersing [self-control]	niveau [level]
bekeuring [penalty]	accommodatie [accommodation]
enkel [ankle]	architect [architect]
lawaai [noise]	journalist [journalist]
waterdruppels [drops of water]	uniform [uniform]
volwassenen [adults]	typen [to type]
oorverdovend [deafening]	export [export]
ademhaling [breath]	asperges [asparagus]
mooiste [prettiest]	expositie [exposition]
verfkwast [paintbrush]	emigratie [emigration]
gastspreker [guest speaker]	horloge [watch]

Appendix B. Words used in the training sessions

Session 1	*Session 2*
regen [rain]	bakker [baker]
schatkist [treasure chest]	tevreden [satisfied]
kralen [beads]	zwaai [sway]
kreeft [lobster]	strandhut [beach cabin]
avonturen [adventures]	middelen [means]
angst [fear]	opnieuw [again]
kassa [pay desk]	rugzakken [backpacks]
woord [word]	luchtballon [balloon]
vlokken [flakes]	bedlampje [bed lamp]
tovenaar [wizard]	kastelen [castles]
mond [mouth]	koektrommel [cookies box]
opener [opener]	kamerplanten [indoor plants]
pennen [pens]	broodplank [bread board]
schepen [ships]	bedden [beds]
handbal [handball]	verhalen [stories]
geweer [gun]	teleurstelling [disappointment]
paraplu [umbrella]	rondvaart [circular cruise]
oplichters [swindlers]	petten [caps]
appelstroop [apple treacle]	personen [people]
boerinnen [farmers' wives]	spannend [exciting]
vuist [fist]	ondeugend [naughty]
verschillen [differences]	kantoortje [small office]
stekelvarken [porcupine]	kannetje [cannikin]
spelletje [game]	beweging [movement]
sneeuwstorm [blizzard]	brillen [pairs of glasses]
broodkorst [bread crust]	garnalen [shrimps]
fietszadel [bike saddle]	geschreeuw [yelling]
geeuw [yawn]	gespetter [splash]
komkommer [cucumber]	vertrokken [departed]
vanzelfsprekend [obviously]	soeplepel [soup ladle]
Session 3	*Session 4*
spuit [injection needle]	sprinkhanen [grasshoppers]
verkeerslicht [traffic light]	veldmuis [field mouse]
ballonnen [balloons]	samenkomst [meeting]
hagelslag [chocolate sprinkles]	gehaktballen [meatballs]
kippenhok [hennery]	kantoren [offices]
brandstichter [arsonist]	kroketten [croquettes]
hobbelpaard [rocking horse]	schelpen [shells]
mededeling [announcement]	evenwicht [balance]
oktober [October]	geschrokken [frightened]
oppervlakte [surface]	bestemming [destination]
samen [together]	angstdromen [nightmares]
schatkamer [treasury chamber]	kennissen [acquaintances]
slaapkamer [bedroom]	slangen [snakes]
vergissing [mistake]	opvallend [remarkable]
aardbeving [earthquake]	tekeningen [drawings]
drinkwater [drinking water]	zangvogel [singing bird]
gebaren [gestures]	voorstellingen [exhibitions]
kammetje [little brush]	voetstappen [footsteps]
melktand [primary tooth]	verkeerd [wrong]
nieuwsbrief [news letter]	brand [fire]
overdag [by day]	leeuwinnen [lionesses]
prinsessen [princesses]	ogenblikje [moment]
middelpunt [center]	belangstelling [interest]
optocht [procession]	onverstoorbaar [imperturbable]
soldaten [soldiers]	ongelukken [accidents]
spoorloos [trackless]	verpleger [nurse]
spreeuwen [starlings]	uitstekend [excellent]
springstoffen [explosives]	vloeistoffen [fluids]
pudding [pudding]	woning [home]
toernooi [tournament]	vliegveld [airport]

Appendix C. Metacognitive questions

Questions before correcting the spelling-to-dictation task

1. Do you remember the things you had to think about while doing a spelling-to-dictation task?
2. Do you remember the steps you had to use to spell a word correctly?
3. How did it go this time?
4. Did you find difficult words?
   a. What did you do to spell them?
   b. What was easy and what was difficult?
   c. Can you point to some words that were difficult for you?

Questions after correcting the spelling-to-dictation task

1. How do you think your spelling-to-dictation task went?
2. How do you think you can do it better next time?
3. What are the most difficult spelling rules for you?
4. How can you take care of applying these rules better next time?
5. Which steps can you take by spelling a word?
6. Do you think you are going to apply those steps when you are doing a dictation task next time?
7. What are you going to try next time to use those steps? After the next spelling-to-dictation task, we will together correct your work again.