Invented spelling activities in small groups and early spelling and reading

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Our aim was to assess the impact of an invented spelling programme conducted in small groups on children’s written language acquisition in Portuguese. We expected the experimental group to have better post-test results than the control group in spelling and reading. Participants were 160 preschool-age children who were randomly divided into an experimental and a control group. Their age, cognitive ability, knowledge of letters and phonological abilities were controlled. Children’s spelling and reading were evaluated in a pre- and a post-test. In-between, experimental group participated in an invented spelling programme in small groups and the control group in story readings. The experimental group showed better results in spelling and reading in the post-test than the control one. Different dynamics occurred in the small groups which had different impacts on children’s acquisitions. These results provide empirical support for the proposal that invented spelling should be incorporated into early literacy instruction.

**Keywords:** early literacy; spelling; reading; preschool

**Introduction**

In their early attempts to write, preschool-age children often start by writing scribbles and gradually progress to a more sophisticated representation of the phonological structure of words, even though, sometimes, they still aren’t able to correctly represent all the sounds of the words (Chomsky, 1970; Read, 1971). These early writings or invented spellings can be seen as problem-solving activities and involve word segmentation, analytic procedures and grapheme-phoneme correspondence detection. Invented spelling is not a memorisation procedure in order to write conventionally. It is rather a process that involves exploration of the written code by preschool-age children, who use their previous knowledge about the nature of writing and the letter-sound correspondence in their attempts to represent the sounds in writing (Ferreiro & Teberosky, 1979). This is why children are seen as having an active role during the invented spelling process (Tolchinsky, 2005).

There is strong evidence that invented spelling, phonemic awareness and understanding of the alphabetic principle are highly related. The association between invented spelling and these literacy skills has been established through both correlational (Alvarado, 1998; Ouellette & Sénéchal, 2008a; Vernon, 1998) and experimental studies (Alves Martins & Silva, 2006; Ouellette & Sénéchal, 2008b; Silva & Alves Martins, 2002).
The fact that invented spelling plays an important role in the development of analytical oral skills by promoting analytical oral procedures is supported, for instance, by the correlational studies of Alvarado (1998) and Vernon (1998). These studies showed that children whose invented spellings were less sophisticated used less analytical procedures in word segmentation tasks than children whose spellings were closer to conventional spelling.

Treiman (1998) argued that children’s invented spelling can be an instrument that facilitates the development of an awareness of the oral segments of words and is a good predictor of children’s subsequent success in the alphabetisation process. She also considered that children’s invented spelling may facilitate their acquisition of insights into the alphabetic structure of writing, inasmuch as they mobilise and apply activities involving metalinguistic thinking about speech in their attempts to write words.

Ouellette and Sénéchal (2008a) also found strong correlations between invented spelling, phonemic awareness and letter/sound knowledge. But their findings support the idea that invented spelling is a far more complex literacy skill that goes beyond phonemic awareness. In particular, they found that children’s invented spelling sophistication was related to orthographic awareness (awareness of legal characters and permissible sequences within words), as well as morphologic processing.

The relevance of invented spelling for the development of phonemic awareness was also confirmed by Alves Martins and Silva (2006) in an experimental intervention study that tested the impact of a training programme designed to make Portuguese preschool-age children’s invented spelling evolve on their phonemic awareness. The participants were divided into three experimental and three control groups based on the nature of their invented spelling. The experimental groups achieved greater progress in the phonemic tests than the control groups and the programme’s impact on these tests differed depending on the level of the children’s invented spelling.

While there is a consensus that invented spelling promotes phonological awareness and the understanding of the alphabetic principle, there are several views concerning the relationship between invented spelling and reading. Several correlational studies showed that invented spelling activities are a good predictor of reading acquisition (Levin, Shatil-Carmon, & Asif-Rave, 2006; Mann, 1993; McBride-Chang, 1998; Shatil, Share, & Levin, 2000; Uhry, 1999). Experimental studies have also evaluated the impact of invented spelling programmes on reading acquisition (Alves Martins, Albuquerque, Salvador, & Silva, 2006; Clarke, 1988; Ehri & Wilce, 1987; Ouellette & Sénéchal, 2008b; Ouellette, Sénéchal, & Haley, 2013; Richgels, 1995; Rieben, Ntamakiliro, Gonthier, & Fayol, 2005; Sénéchal, Ouellette, Pagan, & Lever, 2012). These studies have used different intervention methodologies, reflecting the theoretical perspective of the authors in relation to the nature of invented spellings and learning processes.

In one of the first experimental studies in this field, Ehri and Wilce (1987) found that kindergarten children trained to spell phonetically simplified words (for example, SEAT spelled as SET) learned to read similarly simplified words in fewer trials than did a control group. In this study, however, teaching was not tailored to the individual child’s developmental level, nor did training involve spontaneous spelling attempts, which are fundamental to the definition of invented spelling.

A naturalistic study by Clarke (1988) compared two first-grade classroom programmes, one including invented spelling and the other conventional spelling. The
classrooms in which invented spelling was encouraged showed the greatest improvements in both decoding and irregular word recognition. However, phonological awareness was not measured and thus, whether group differences were due to any pre-existing differences in this skill was not ascertained.

Further confirmation about the relationships between invented spelling and word reading comes from a word-learning study conducted by Richgels (1995). In this experiment, kindergarten children with strong alphabetic knowledge, but who were still nonreaders, were classified as good or poor invented spellers. These children were then taught to read phonetically simplified words through a paired-associate learning task. The good invented-spelling group significantly outperformed the poor invented-spelling group in terms of the number of words learned over a two-day period. The author concluded that there is a strong relation between invented spelling and learning to read at the start of schooling.

More recently, Rieben et al. (2005) developed a multiple-group intervention study with five-year-old French-speaking children. They compared different word-spelling-practice conditions in kindergarten and assessed their effects on letter knowledge, phonological awareness, reading and spelling. Three different experimental treatments were designed: invented spelling, copied spelling and invented spelling with feedback on correct spelling; a fourth group, serving as a control group, only made drawings. The invented-spelling group with feedback scored significantly higher than the other three groups in reading practiced words. However, no between-group differences were evident for reading words not used in the training programme, and no group differences were reported in measures of phonological awareness and invented spelling complexity. The authors concluded that children might not learn enough from invented spelling where reading is concerned. They also note that, in their study, inter-individual variability was very high for all the variables and for all the treatment groups. In general, the authors were quite sceptical about the impact of invented spelling on reading.

Several factors might explain the limited results found by Rieben et al. (2005). First, the initial level of children’s writing was quite primitive since children knew very few letters. The intervention procedure didn’t stimulate metalinguistic reflection on the relations between oral and written language as the focus of the training procedure was spelling out words. On the other hand, the intervention was delivered infrequently at a rate of only three times per month. Finally, the reading test that was used was rather complex.

Ouellette and Sénéchal (2008b) conducted another intervention study that tested whether invented spelling plays a causal role in learning to read. Three groups of five-year-old English-speaking children participated in a four-week intervention (nine sessions). Children in the invented-spelling group spelled words as best as they could and received developmentally appropriate feedback: each child was shown a spelling containing one or more letters than those he/she was able to produce. Children in the two comparison groups were trained in phonological awareness or drew pictures. The invented-spelling group demonstrated more advanced invented spellings, higher orthographic awareness and better scores in reading the words used during training than did the other groups, and both the invented-spelling group and the phonological-awareness group demonstrated superior phonological awareness. Importantly, the invented-spelling group learned to read more words in a learn-to-read task than the other groups. These results are in accordance with the view that invented spelling coupled with feedback encourages an analytical approach and
facilitates the integration of phonological and orthographic knowledge, hence facilitating the acquisition of reading. The same results were obtained in another study with kindergarten children with low phonological skills, which suggest that these training programmes are effective in preventing future reading difficulties (Sénéchal et al., 2012).

These findings were confirmed and extended to diverse learners in mixed groups in a recent study by Ouellette et al. (2013). Using the same methodology of Ouellette and Sénéchal study (2008b) but expanding the programme in duration – 16 sessions over an eight-week period – the authors demonstrated the efficiency of a teaching programme that guided children’s invented spelling within a Vygotskian framework for the evolution of children’s early reading skills. They also showed that these benefits go beyond the expansion of alphabetic knowledge and phonological awareness and confirmed the lasting benefits of intervention until the beginning of grade 1.

In a recent study with Portuguese preschool-age children, Alves Martins et al. (2013) showed the impact of an individual invented spelling programme on children’s early spelling and reading. After spelling each word, children were confronted with alphabetic spellings made by another child and were asked to think about the two spellings, to choose one and to justify their choice. This was designed to create conditions for a cognitive conflict in which the situation itself led children to think about two ways of spelling. In the initial sessions, some facilitating words were used (Mann, 1993) – words in which the initial syllable matched a letter name (for example, ‘Peta’ [peta] (Lie), in which the syllable ‘pe’ coincides with the name of the letter P/pe/). This programme proved its efficacy in terms of the way in which children evolved in their spelling and in their reading at the end of the programme.

The current research is based on (1) the fact that some studies differ in the reported impact of invented spelling programmes on the development of early reading skills; (2) to date, no study using Portuguese has evaluated the impact of invented spelling group programmes on the reading and spelling of preschool-age children. For these reasons, we considered it of the utmost importance to develop group programme methodologies where the different interactions established during the programmes are the motor that may lead them to more sophisticated metalinguistic thinking. This programme is based on the hypothesis that if children are confronted with different proceedings to write down words suggested by their peers, even in the absence of conflict, they will be able to change the way they represent writing and their thinking about the grapheme-phoneme correspondences. Gilly (1988), when studying the way children interact with each other during problem-solving tasks, found that they may benefit from specific type of interactions, particularly the kind where children don’t just passively accept their peer’s suggestions, but disagree with each other, justifying the reasons and presenting arguments that support their choices. Pontecorvo (1987) also showed that thinking together in small groups may contribute to the improvement of children’s reasoning. Therefore, we assume that, in this social context and with adult mediation (Pontecorvo, 2005), the negotiation and the sequence of arguments children present may lead them to collectively evolve their writing (Zucchermaglio, 2005).

The present study evaluated the benefits of training Portuguese kindergarten children to be better invented spellers through a pre-test, post-test, comparison-group design. We expected children from the experimental group to have better post-test
results than children from the control group in terms of invented spelling and reading.

**Method**

**Design**

Children were given a pre-test and a post-test intended to evaluate their invented spelling and their reading. Between the pre- and the post-tests, children from the experimental condition underwent an invented spelling programme in small groups and children from the control condition participated in story readings.

**Participants**

The participants were 160 five-year-old children (83 boys and 77 girls) from eight kindergartens in Lisbon and Setubal. All children spoke Portuguese as their primary language and did not know how to read or write. Children’s reading and writing skills were assessed by means of individual reading and writing tests. Children who were able to write or read one or more words were not considered for this study. Their knowledge of letters (name and sound) were also assessed to screen for participants who knew at least the vowels (A, I and O) and six consonants (B, D, F, P, T and V), the letters composing the words used in the pre- and the post-tests. In Portuguese, these consonants have regular correspondences with the phonemes they represent; the same occurs with the vowel I; in contrast, the vowels A and O can have different phonetic values [a], [α] [ɔ] and [u].

The level of education of the parents completing the permission form averaged 14 years of formal schooling and ranged from 6 to 21 years.

Children were randomly assigned to the experimental or control conditions (80 per condition) with the constraint that children from the same classroom should be assigned to each condition, thus counterbalancing classroom/teacher with experimental and control conditions. In each classroom, children in the experimental condition were divided in groups of four, according to their initial level of spelling, as assessed in the pre-test (20 groups). We tried to create heterogeneous groups in order to maximise the possibilities of discussion within each group.

Children’s cognitive and phonological awareness were assessed to control for the equivalence of groups.

**Measures**

**Letters known**

In order to assess how many and which letters the children knew, they were given a set of cards with upper-case letters of the alphabet (excluding K, W and Y, which are very rare in Portuguese words), and were asked to name them and provide its sound. One point was awarded if children knew the name and the sound of each letter, so the possible score in this test ranged from 0 to 23.

**Cognitive ability**

Children’s cognitive ability was evaluated using the coloured version of Raven’s Progressive Matrices test (Raven, Raven, & Court, 1998), because it has a position
of centrality in the space of psychometric measures, and does not depend highly on verbal aspects. One point was given for each correct answer, so the results could vary from 0 to 36 points.

**Phonological awareness**

Children’s phonological awareness was assessed using two tests taken from Silva’s (2002) phonological tests: an initial syllable classification test and an initial phoneme classification test. Each test was made up of 14 items, preceded by two training items. In these tests, the children were given four drawings, each representing an oral word. There were no written words. Two words began with the same syllable or the same phoneme. The children had to categorise two target words out of four, using a syllabic or phonemic criterion. One point was given for each correct answer.

**Spelling in the pre- and post-tests**

In order to assess children’s spelling, we asked them to spell 20 words containing the consonants B, D, F, P, T and V and the vowels A, I and O. Thirteen words only contained the consonants that composed the words practiced during the programme (B, D, P and T), while seven words also contained the consonants F and V. All words (five monosyllabic and 15 disyllabic) were between two and four letters in length and represented a variety of syllabic features, although most of the syllables had a CV structure which is the most frequent syllabic structure in Portuguese. None of the words used during the pre- and post-tests was used during the programme. The words were presented in a fixed random order and no feedback was given.

We analysed whether the children correctly spelled the phonemes of the different words in the pre- and the post-tests, and allocated one point for each correctly spelled phoneme. The results could range from 0 to 68 points. When evaluated using Cronbach’s alpha, the internal consistency was .92 for the pre-test and .97 for the post-test. The scoring system was used separately by two researchers. The inter-scorer agreement in word-by-word classification using the Kappa statistic was .95 in the pre-test and .96 in the post-test.

**Reading in the pre- and post-tests.**

In order to assess children’s reading, we asked them to read the same 20 words that were used in the spelling task. The words were presented in a fixed random order. No feedback was given. The children’s reading was recorded. We analysed whether they correctly read each word or part of it. Two reading scores were computed: the number of words correctly read and the number of letters/graphemes correctly decoded. The results concerning the word-reading ranged from 0 to 20 points and the internal consistency using Cronbach’s alpha at the post-test was .94 (at the pre-test none of the members of the two groups were able to read). The results corresponding to the correctly decoded letters ranged from 0 to 68 points. When evaluated using Cronbach’s alpha, the internal consistency was .89 for the pre-test and .99 for the post-test.

**The invented spelling programme**

The spelling programme was designed by us to lead the children to write using conventional letters. It lasted for 10 sessions of 15–20 min each, over the course of five
weeks (two sessions per week). All the sessions were individually conducted by five graduate students on Educational Psychology who have received special training within our research team. The programme was conducted in small heterogeneous spelling groups of four children each. In each session, children were asked to discuss the spelling of four words and to reach an agreement. The adult mediated the discussion and wrote the letters the children dictated. When the word was written, they were shown the same word with alphabetic spelling written by a hypothetical child from another class. They were asked to compare their spelling with the alphabetic one, and to try to think which one was better and why. This procedure was based on the research of Alves Martins et al. (2013). In each of the first four sessions, the words began with the same consonant and the children’s attention was drawn to the first two letters in the word. Each of these sessions involved one word whose initial syllable matched the name of the initial consonant, so as to facilitate the use of that letter, for example, Dedo [dedu] where the first syllable [de] matches the name of the letter D [de]. The initial letter of the other words was followed by I, A or O (e.g. Data [datα], Dia [dια], Doto [dɔtu]). In each of the other sessions, children were asked to write four words beginning with different consonants (e.g. two words beginning with P and two others with T). In the initial sessions, children’s attention was drawn to the first and second letters and progressively to the other letters composing the words. All sessions were recorded and transcribed.

The interactions between four children, when writing the first letter of the word BOBI, are a good example of the dynamics that occurred in the experimental condition.

R: Now, let us think about the word BOBI. How do you spell it?
Duarte: It starts with a B.
Afonso: O.
R: Do you think it has an O, Afonso?
Afonso: Yes.
Duarte: It’s a B.
Afonso: No, it’s not B, it’s an O.
R: BO-BI. Francisco, how do we spell BO?
Francisco: With an O.
R: But Duarte thinks that the first letter of BO it’s a B.
Afonso: No, it isn’t.
R: Duarte, why do you think that BO begins with a B?
Duarte: Because it’s BO, BO, and BO starts with B! I can hear the sound B before O.
Maria: It’s B, B.
Francisco: Yes it’s B.
R: So, do you think that Duarte has a point when he says that BO begins with the letter B?
Children: Yes!
R: Shall we write the letter B in the first place?
Children: Yes.

(The researcher writes the letter B).

As we can see from this interaction example, children collectively construct one solution for the problem presented to them, benefiting from the adult’s help. The adult, therefore, not only mediates children interactions leading them to explicitly justify their thinking, but also draws attention to the different sounds of the target word.
The control group programme
The control group programme was equivalent in time to the experimental one and consisted in storybook readings.

Procedure
Children were withdrawn from class and assessed individually in a quiet room within their school. Selection of participants was assessed in November and December by five graduate students in educational psychology who were doing their Masters internship in the schools where the research took place. They also conducted the pre-test, which took place in January, and the experimental and the control group programmes, which began in February and lasted for five weeks.

The post-test took place one week after the programmes were concluded and was conducted by two research assistants who didn’t know each child’s group.

Results
In order to compare the equivalence of the two groups prior to training, we performed t-tests using the group as the independent variable, and age (in January), letters known, level of cognitive ability and results in two phonological awareness tests as dependent variables. Table 1 shows the means and standard deviations for the two groups’ results for these variables.

There were no statistically significant differences between the two groups ($p > .45$ in all cases).

Invented spelling
Regarding invented spelling, Table 2 shows the descriptive statistics for the number of letters correctly written by children from the experimental and the control group at the pre- and post-test moments of the invented spelling test.

We conducted a one-way analysis of covariance (ANCOVA) using the group (experimental or control) as independent variable, the results in the pre-test (number of letters correctly spelled) as covariate and the number of letters correctly spelled in the post-test as the dependent variable. The two groups differed significantly in the results obtained in the post-test ($F(1, 156) = 211.88$, $p < .001$, $\eta^2_p = .58$), with the experimental group obtaining better results. The covariate significantly contributed to the post-test results ($F(1, 156) = 105.75$, $p < .001$, $\eta^2_p = .40$) and did interact with the independent variable ($F(1, 156) = 8.73$, $p < .005$, $\eta^2_p = .05$).

Table 1. Means and standard deviations for the age (months), knowledge of letters, cognitive ability and phonological awareness of the two groups.

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>L.</th>
<th>C. Ability</th>
<th>I. S. C.</th>
<th>I. Ph. C.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>SD</td>
<td>$M$</td>
<td>SD</td>
<td>$M$</td>
</tr>
<tr>
<td>E.G.</td>
<td>66.35</td>
<td>3.48</td>
<td>16.61</td>
<td>4.13</td>
<td>16.95</td>
</tr>
<tr>
<td>C.G.</td>
<td>66.29</td>
<td>3.54</td>
<td>16.28</td>
<td>4.03</td>
<td>16.89</td>
</tr>
</tbody>
</table>

Notes: E. G. = experimental group; C. G. = control group; C. ability = cognitive ability (max. = 36); L. = letter knowledge (max. = 23); and I. S. C. = initial syllable classification (max.=14); and I. Ph. C. = initial phoneme classification (max. = 14).
Figure 1 shows the spelling of five words by two children from the experimental group and the control group respectively, in the pre- and the post-tests.

As can be seen in Figure 1, in the pre-test, both children in the control and experimental groups used string letters that have no relation to the words they were asked to write, showing that they were not able to analyse the sounds accordingly. In the post-test, however, the child from the experimental group was already able to correctly represent most of the letters of the words, whereas the child from the control group, was not.

Reading

Concerning reading, Table 2 shows the descriptive statistics for the number of letters correctly decoded by children from the experimental and the control group at the pre- and post-test moments of the reading test.

We conducted a one-way ANCOVA using the group (experimental or control) as independent variable, the number of letters correctly decoded in the pre-test as
covariate and the number of letters correctly decoded in the post-test as the dependent variable. The two groups differed significantly in the results obtained in the post-test ($F(1, 156) = 45.75, p < .001, \eta^2_p = .23$), with the experimental group obtaining better results. The covariate ($F(1, 156) = 23.29 p < .001, \eta^2_p = .13$) significantly contributed to the post-test results but did not interact with the independent variable ($F(1, 156) = .11, p = .745, \eta^2_p = .00$).

Regarding the number of words correctly read by the two groups at the post-test moment (at the pre-test none of the members of the two groups were able to read), the experimental group ($M = 5.11, SD = 5.70$) was able to correctly read a higher number of words than the control group ($M = .69, SD = 1.58$). A $t$-test confirmed the existence of statistically significant differences between the two groups ($t_{(91.07)} = 6.69; p < .001$, Cohen’s $d = 1.06$).

Figure 2 shows examples of the reading of five words by a child from the experimental group, and by another one from the control group, in the pre- and the post-tests.

As we can see, in the pre-test, both children tried to read the words with little or no success indicating that their reading skills were still incipient. Nevertheless, in the post-test, the child that underwent the invented spelling programme showed an ability to correctly and consistently decode almost all the print words. In contrast, the child from the control group exhibited no progress in her reading strategies, which proved to be still inefficient.

We then conducted a more detailed analysis of the results to see if the progress in spelling and reading of the children in the experimental condition depended on their invented spelling group. We performed two ANOVAs using the spelling group as independent variable and the evolution from the pre- to the post-tests in spelling and reading as dependent variables. There were no statistically significant differences in spelling $F(19, 79) = .97; p = .510$, but there were statistically significant differences in reading $F(19,79) = 1.85; p < .05$. A post hoc analysis using the Tukey test revealed differences between two groups. The group where we found most evolution in terms of reading had a mean progress from the pre- to the post-tests of 52.75 correctly decoded letters and read eight words in the post-test, whereas

<table>
<thead>
<tr>
<th>Experimental G.</th>
<th>Control G.</th>
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</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Caneta</td>
<td>Padé</td>
</tr>
<tr>
<td>Francisco</td>
<td>Fadá</td>
</tr>
<tr>
<td>Secretária</td>
<td>Vota</td>
</tr>
<tr>
<td>Pedra</td>
<td>Bado</td>
</tr>
<tr>
<td>Playmobil</td>
<td>Tapa</td>
</tr>
</tbody>
</table>

Figure 2. Examples of word reading from the pre- and the post-tests by a child from the experimental group and a child from the control group.
the group with the least evolution had a mean progress of only two letters correctly decoded and were unable to read any word in the post-test.

We wanted to find out, then, if there were any differences between these two groups in terms of letter knowledge, phonological awareness and performance in spelling and reading in the pre-test, since these variables could influence the results in the post-test. In order to do so, we performed \( t \)-tests, using the above variables as dependent variables and the spelling group as independent variable. There were no statistically significant differences between the two groups (\( p > .25 \) in all cases).

We then analysed the interactive dynamics that occurred throughout the sessions with these two groups. We coded the quality of interactions in all the sessions of these two groups. The sessions of the group that had evolved more in terms of word reading from the pre- to the post-tests were characterised by certain dynamics wherein a child’s letter suggestion was built upon by the group with other suggestions, and so on, until they agreed the word was well written. When children didn’t agree with the solution, they explained their point of view and often made an alternative suggestion. In this case, all children in the group participated equally in the construction of a solution that was, finally, accepted by all the members. On the other hand, the interactions between the members of the group who evolved less in reading were characterised by having one child who stood out in the number of suggestions made, while the other members of the group either accepted or refused them without further justification, in an almost passive way. In this sense, the number of explanations made by the group who evolved most was three times higher to those of the group who had the least evolution.

Table 3 shows examples of these two types of interaction dynamics.

As we can see, in Example 1, all children gave their contribution to the solution, suggesting, accepting or justifying their choices until they reached a consensus. The suggestion of the letter B made initially by Maria, for instance, was accepted by Francisco who presented an explanation for why that is the correct letter, indicating he didn’t simply accept the suggestion without really thinking about it. In contrast, in example 2, Alexandre suggested the letter B as the correct letter to begin BI, but while Filipa, Rita and Catarina disagreed with that suggestion, they did not present a justification for their disagreement, nor did Alexandre for sustaining his own opinion. In this case, no solution was provided. These two examples are paradigmatic of the interaction dynamics underlying each one of the groups.

Discussion

Our research demonstrated that an invented spelling programme in small groups of preschool-age children, where a metalinguistic reflection process on writing is induced, had important consequences on the evolution of invented spellings, reading of words and decoding ability. This conclusion is sustained by the successful outcomes of the experimental group in terms of the number of letters correctly used in their spellings in the post-test, as well as their superior performance in reading words and in decoding letters. These results are quite relevant and confirm, in the line of those obtained by Ouellette and Sénéchal (2008b) and Ouellette et al. (2013), that invented spelling is beneficial because of the analytical approach and self-directed learning that takes place during the process of writing down words.

Therefore, our study strengthens the view that invented spelling has direct impact on reading, like Alves Martins et al. (2013), Clarke (1988), Richgels (1995),
Table 3. Examples of interactions that occurred in the two groups.

<table>
<thead>
<tr>
<th>Example 1 - group that evolved more</th>
<th>Example 2 – group that evolved less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher – Who can help me write the second part of BOBI, BI. Francisco – I. Duarte – I also think it has an I.</td>
<td>Researcher – Lets now try to write the second part of BOBI, BI, BI. Filipa – I, I. Researcher – Filipa says it’s an I. What do you think?</td>
</tr>
</tbody>
</table>

Ouellette and Sénéchal (2008b), Ouellette et al. (2013), Sénéchal et al. (2012) observed, and supports the idea that acquisition of spelling and reading may be mutually facilitative.

Our intervention programme, as those developed by Ouellette and Sénéchal (2008b), Ouellette et al. (2013), is based on a Vygotskian approach. Nevertheless, there are some differences between them. On the studies of Ouellette and Sénéchal (2008b), Ouellette et al. (2013) the scaffolding is provided by the nature of the feedback given to the children – each child was shown a spelling containing one more letters than those he/she was able to produce. In our study, the scaffolding is provided by the adult’s help, mediating children’s interactions and encouraging metalinguistic thinking. This help was tailored to be within the child’s zone of proximal development. The adult stressed the proposals of more advanced children to help those less advanced and lead children to discuss their points of view that were not very distant from each other. The nature of the words children were asked to spell also helped them to evolve as one word in each of the initial sessions was a facilitating one, leading children to discover which appropriate letter should be written. In addition, the confrontation between the two spelling versions (the spelling version of the group and that of the hypothetical child) induced children to think about the nature of the relation between the oral segments of words and the corresponding letters. These differences between the teaching procedures used and the linguistic characteristics of the Portuguese and the English languages in what concerns their transparency (Portuguese being more transparent than English) may be responsible by the bigger effect sizes obtained in our study.
Concerning the positive effect this programme had in the development of invented spelling and reading, other studies developed in Portugal had already found that individual programmes with preschool- age children lead them not only to evolve in their spelling and phonological skills (Alves Martins & Silva, 2006), but also made them progress in their reading skills (Alves Martins et al., 2013). Once again, there are some relevant differences on the teaching procedure used.

It is our belief that the impact of the programme we developed with small groups in the improvement of reading and writing abilities was in part due to the fact that children were led to argue and discuss what they thought to be the correct spelling of the words presented to them, and had to explain their suggestions and defend their points of view. A situation of collective problem solving, in which it was possible to negotiate meanings, share and compare solutions or different interpretations of the same material, lead to the improvement of children’s reading and spelling abilities (Pontecorvo, 2005). However, the impact of this programme developed with small groups is also related to the type of interactions that occurred within the groups. The group that most evolved in reading was dominated by interactions where a child made a suggestion, which was continued by another group member, until a solution was reached that was accepted by all children. And almost every time a suggestion wasn’t accepted, they argued and thought about the relation between writing and speech, that is, they clearly used metalinguistic thinking. The superior outcomes reached by the group where these interactive dynamics took place more frequently are in line with Pontecorvo (1987) and Zucchermaglio (2005). Our results suggest that the discussion and arguments used by children about the correct letter to code a certain sound led to destabilisation (Gilly, 1988) in the way children represent the written code. In contrast, in the group where dynamics of opposition without further justification were more predominant, progresses was compromised.

Finally, we would like to point out some limitations of our study. First, we should have analysed, in a more systematic way, the interactions that occurred in the different groups during all the sessions of the training programme, in order to clarify the effects that different interaction dynamics have upon outcomes. Second, we should have analysed in detail the adult’s interventions during the group discussions, which seem essential to adjust the adult’s role, as mediator, in fostering the emergence of more effective dynamics. Third, we didn’t conduct a delayed post-test which could be important to know if the benefits obtained by children were maintained on first grade.

Considering the progress children made in terms of their performances in the invented spelling task and in reading, we think that the principles that underlie this training programme are suitable to be transferred to educational practices, but it is necessary to clarify the adult’s role and to test the methodology that was used with larger groups. In future research, it would also be interesting to use this methodology in more opaque languages in order to evaluate if similar results as those obtained with Portuguese children could be reached.

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References


