

Word recognition by Portuguese school-graders: a comparison with Austrian and English children*

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INTRODUCTION

As stated among others by Wimmer and Goswami in their 1994 paper, theoretical models of reading development make the implicit assumption that reading develops through a uniform sequence of stages, across different alphabetic orthographies (Frith, 1985; Marsh, Friedman, Welch and Desberg 1981). However, results from recent studies evidence a marked contrast between children's reading strategies across orthographies with differing levels of transparency in the alphabetic rendition of the language (e.g. Cossu, Gugliotta and Marshal, 1995; Sprenger-Charolles and Bonnet, 1996; Wimmer & Hummer, 1990; Wimmer & Goswami, 1994).

Children learning to read in transparent orthographies in which grapheme-phoneme correspondences are largely consistent, appear to move into reading by relying on word recognition via assembled phonology. Differently, children learning to read in non-transparent orthographies, where the grapheme-phoneme correspondences are more complex and often unpredictable, and where the spelling of many words does not convey their pronunciation clearly and unambiguously (e.g. Lindgren, De Renzi and Richman 1985), seem to move into reading by relying on direct word recognition.

The study presented is a replication of the study carried out by Wimmer and Goswami (1994). It examines the nature of written word recognition procedures by Portuguese children. Wimmer and Goswami (1994) tested groups of Austrian and English 2nd, 3rd and 4th graders in three different continuous reading tasks: a numeral reading task, a number word reading task and a pseudo word reading task. They found that whereas reading time and error rates in numeral and number word reading were quite similar across the two orthographies, the Austrian children gave less errors than the English in reading the pseudo words. The majority of errors made by the Austrian children were other pseudo words, indicating they were reading *via* grapheme-phoneme conversion, which was in marked contrast to the errors made by the English children, that were largely (the wrong) real words, indicating they were relying on a direct look-and-say visual recognition strategy, without phonological mediation. The authors interpret this pattern of results as evidence for the initial adoption of different word recognition strategies in the two orthographies.

Portuguese orthography transparency level falls in between German and English. Portuguese is not totally transparent. It contains some irregularities, where the morphophonological influence prevails and manifests itself by the presence of unarticulated consonants (acto, baptismo, concepção, óptimo,) (Girolami-Boulinier and Pinto, 1994). It contains a lot of contextual regu-

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larities, where the same grapheme can correspond to two or more phonemes. For example, in the case of the vowel «e» the grapheme-phoneme correspondence can go up to a maximum of one grapheme («e») to six different phonemes. And in the case of the two graphemes «s» and «x», the grapheme-phoneme correspondence can go up to a maximum of one grapheme to four or five phonemes, respectively (Rebelo, and Delgado-Martins, 1978). But Portuguese is nevertheless a phonological orthography, with a highly predictable grapheme-phoneme relationship and in which the use of phonological rules affords more than 90% correct conversions (Viana, Andrade, Oliveira and Trancoso, 1991). For similar considerations, see also Da Fontoura and Sigel, (1995).

SUBJECTS, MATERIALS AND PROCEDURE

Sixty five children (37 girls, and 28 boys, from 2nd, 3rd and 4th school grades took part in the study. Second graders were 13 girls and 11 boys (n=24), mean age 7.4 (range, 6.5 – 8.8). Third graders were 10 girls and 8 boys (n=18), mean age 8.3 (range 7.8 – 8.11). Fourth graders were 14 girls and 9 boys (n=23), mean age 9.6 (range, 8.6 – 10.5). The method of reading instruction adopted by the school is phonics based.

Nine numerals and the corresponding Portuguese number words were used. Nine pseudo-words were created by interchanging onset and rime of the selected number words (for example, the number word *dois* would become the pseudo-word *nois*, or the number word *sete* would become the pseudo-word *dete*).

The nine items of each material type (numerals, number words and pseudo words) integrated 2 lists of 18 items, where items appeared twice but in a different order and never within the ordinal order. The order of the items within the lists of the three conditions (numerals, number words and pseudo words) was always the same, that is if a numeral list started by 2 10 7, etc., the corresponding number word list would start *dois dez sete* and the pseudo-word list, *nois cez dete*.

The two lists of each condition were always presented in immediate succession. There were six different orders of presentation. Words and pseudo words were printed left to right, separated only by spaces, in three different lines and in lower case characters. Numerals were printed following the same rules and in such a way that its localisation on the sheet corresponded to the first letter of the words and/or pseudo words.

Each child was tested in a single experimental session. The child was informed that the experiment was not intended to evaluate her school work and asked to read, the better and the faster he could, the materials he would be presented with and that in case of not being able to read one item he should try to read the next. Total reading time of each list was measured and errors were noted. In order to familiarise the child both with the need to read fast and with the characteristics of the experimental lists, three 6 item training lists were presented prior to the experimental session and in the same order in which the child would receive the experimental conditions.

RESULTS AND DISCUSSION

Performance was examined in terms of mean reading time per item and number of errors per condition. Reading speed was averaged across the two lists used in each condition.

ERRORS IN NUMERAL RECOGNITION AND IN NUMBER WORD READING

There were no errors in numeral recognition and only five children made a few errors in reading the number words (errors' range 1 – 2).

ERRORS IN PSEUDO WORD READING

As in Wimmer and Goswami's study, pseudo word pronunciations were scored as correct whenever a real word analogue for the chosen pronunciation existed. That is, whenever a pseudo word was pronounced in the same manner as would be any real word with equivalent syllabic structure and vocalic alternation, it was considered as correct.

There were no refusals in pseudo word reading and only five children (one 2nd grader, one 3rd grader and three 4th graders) read between 12 and 13 of the 36 pseudo words incorrectly.

The majority of errors were other pseudo words and involved deletion, substitution or order inversion of consonants and/or vowels from the original stimulus. Furthermore, there was a significant correlation (.87) between number word reading speed and pseudo word reading speed, suggesting that the same strategy was being adopted in reading both kinds of material.

Table 1: Means and standard deviations of errors for the pseudo words in each grade.

Grade	Mean	sd
2	5.8	3.2
3	4.2	3.7
4	6.4	3.8

The number of errors made by the Portuguese children in pseudo word reading falls in between the number of errors made by the English and the Austrian children tested by Wimmer and Goswami.

However the Portuguese children's error pattern is close to the one of the Austrian. In fact, although the number of errors made by the Portuguese did not differ across school grades ($F(2, 62) = 2.07, p > .12$), inspection of Table 1 reveals that 4th graders made more errors than the two other groups. This could be interpreted in terms of a tendency to trade accuracy for speed. In fact, there was a positive, but small, correlation between number of errors and reading time for the pseudowords. The same occurred with the Austrian children.

Wimmer and Goswami give support to their assumption that English and Austrian children recognise words according to different reading strategies (direct recognition vs. assembled pronunciations), on the bases of error-type in pseudo word reading across the two orthographies. In the present study we carried out an analysis of error type in pseudo word reading allowing us to examine the possible use of different reading strategies, an indirect phonological strategy vs. a direct lexical one. Errors in pseudo word reading were classified as (1) phonological, if involving deletion, substitution or order inversion of consonants and/or vowels but leading to the production of another pseudo word and as (2) lexical, if involving lexicalisations of the stimuli.

Figure 1: Mean number of error-type per school-grade.

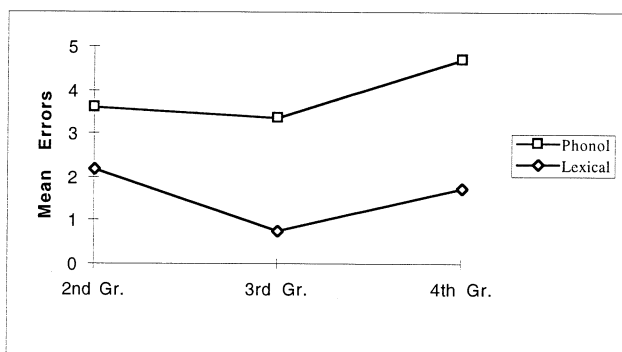
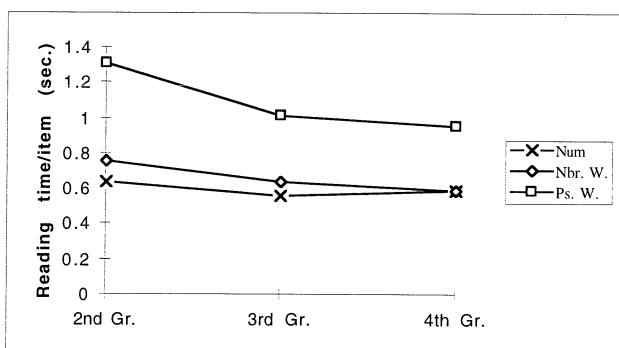


Figure 2: Mean reading time per item for the three grades. There is a net improvement in reading time between grade 2 and grade 4, particularly clear in the pseudo word reading condition



Analysis of variance on the number of errors made in pseudo word reading, including Error Type (Phonological vs. Lexical) and Grade (2nd, 3rd and 4th) as main factors showed a significant effect of Error Type ($F(1, 62) = 29.43, p < .0001$); and a non-significant effect of Grade ($F(2, 62) = 2.07, p > .12$). The interaction Grade \times Error Type was also non significant ($F(2, 62) = 1.16, p > .25$).

The two way analysis of variance on the mean reading time per item taking Grade (2nd, 3rd and 4th) as between-subject factor and Condition (numerals, number words and pseudo words) as within-subject factor showed significant effects of both factors ($F(2, 124) = 4.49, p = .015$ and $F(2, 124) = 159.48, p < .0001$, respectively) and a significant interaction Condition \times Grade ($F(4, 124) = 3.022, p < .025$) related to the fact that 2nd graders were much slower on reading the pseudo words than 3rd and 4th graders.

Similar to the results from the Austrian children and very different from the English tested by Wimmer and Goswami (1994), Portuguese children's performance suggests that they read by relying on word recognition *via* assembled pronunciations. This interpretation is supported by the fact that even the youngest Portuguese group had little difficulty in pseudo word reading, by the strong positive correlation between number word reading time and pseudo word reading time and by the overall tendency to produce phonological errors.

The present results, obtained with the Portuguese orthography which is halfway between the highly transparent German and the opaque English orthographies, underline the effect of orthographic transparency on reading development.

REFERENCES

- Cossu, G.; Gugliotta, M.; Marshal, J. 1995. Acquisition of reading and written spelling in a transparent orthography: Two non parallel processes? *Reading and Writing*, 7, 9-22.
- Da Fontoura, H. A.; Siegel, L. S. 1995. Reading, syntactic, and working memory skills of bilingual Portuguese-English Canadian children. *Reading and Writing*, 7, 139-153.
- Frith, U.; 1985. Beneath the surface of developmental dyslexia. In K.E. Patterson, J.C. Marshall & M. Coltheart eds. *Surface Dyslexia*, 301-330. Hillsdale, N. J., Erlbaum.
- Girolami-Boulinier, A.; Pinto, M. C.; 1994. A ortografia em crianças francesas, inglesas e portuguesas. *Línguas e Literaturas – Revista da Faculdade de Letras da Universidade do Porto*, XI, 115-129.
- Lindgren, S. D.; De Renzi, E.; Richman, L. C.; 1985. Cross-national comparisons of developmental dyslexia in Italy and the United States. *Child Development*, 56, 1404-1417.
- Marsh, G.; Friedman, M. P.; Welch, V.; Desberg, P. A. 1981. A cognitive developmental theory of reading acquisition. In T.G. Waller, G. Mckinnon eds., *Reading Research: Advances in Theory and Practice*. Vol. 3, 199-221. N. Y., Academic Press.
- Rebelo, D.; Delgado-Martins, M. R.; 1978. *Linguagem Oral e Ortografia*. Lisboa, INIC.
- Sprenger-Charolles, L.; Bonnet, P. 1996. New doubts on the importance of the logographic stage: a longitudinal study of French children. *Cahiers de Psychologie Cognitive*, 15, 173-208.
- Viana, M. C.; Andrade, E.; Oliveira L. C.; Trancoso, I. M. 1991. Ler P.E.: Um utensílio para o estudo da ortografia do Português. *Actas do VII Encontro da Associação Portuguesa de Linguística*, Lisbon, 474-489.
- Wimmer, H.; Goswami, U. 1994. The influence of orthographic consistency on reading development: Word recognition in English and German Children. *Cognition*, 51, 91-103.
- Wimmer, H.; Hummer, P. 1990. How german-speaking first graders read and spell: doubts on the importance of the logographic stage. *Applied Psycholinguistics*, 11, 349-368.