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Developmental and acquired dyslexia: A comparison*

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Abstract

Jorm (1979a) has drawn attention to similarities between developmental dyslexia and acquired deep dyslexia, an analogy which has been criticized by A. W. Ellis (1979). A series of three experiments compared the two syndromes, using the techniques applied by Patterson and Marcel (1977) to adult deep dyslexics, to study a group of 15 boys suffering from developmental dyslexia. Patterson and Marcel's patients were able to perform a lexical decision task but showed no evidence of phonemic encoding of nonwords; our dyslexic children performed this task very slowly and with reduced accuracy but showed clear evidence of phonemic coding of the nonword items. Patterson and Marcel observed that their patients could not read out orthographically regular nonwords; our dyslexic children were able to do this task, although more slowly and somewhat less accurately than their chronological age or reading age controls. Finally, Patterson and Marcel observed that highly imageable words were more likely to be read correctly than words of equal frequency but low imageability; we observed a similar effect in both our dyslexic group and in their reading age controls. This implies that the imageability effect may not be peculiar to dyslexics but may be characteristic of normal reading under certain conditions. It is concluded that developmental dyslexics differ from the patients studied by Patterson and Marcel in demonstrating a pattern of reading which, though slow, is qualitatively similar to the reading of normal readers of a younger age. As such, our results do not support Jorm's position.

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Introduction

In a recent paper Jorm (1979*a*) makes three related points. First, he argues for an interpretation of developmental dyslexia in terms of a short-term memory deficit. Secondly he makes the case for a closer relationship between the study of developmental and acquired dyslexia, and thirdly he suggests that there may be important similarities between developmental dyslexia and deep or phonemic acquired dyslexia. We do not wish to take issue with either of the first two of these claims; we ourselves have noted the relationship between impaired memory span and developmental dyslexia, and concluded that a defect of some aspect of short-term memory may be a crucial factor in the impaired reading ability of developmental dyslexics (Baddeley, 1979; Ellis and Miles, in press). Like Jorm, we were concerned that there seemed to be so little contact between research on acquired and on developmental dyslexia, and as an initial step towards bringing these two areas somewhat closer, decided to study the reading performance of developmental dyslexics on a series of tasks which Patterson and Marcel (1977) had shown to produce an interesting pattern of results in deep dyslexic patients. Our results therefore bear closely on the third suggestion made by Jorm, namely that developmental dyslexics show important similarities to deep dyslexics in their reading disabilities, a view which has recently been criticized by A. W. Ellis (1979).

It has become increasingly obvious that acquired dyslexia may take any of several different forms (see Patterson, 1981 for an overview). While deep dyslexia may be one of the most extensively explored of these, there is by no means complete agreement that it represents a single unitary syndrome rather than a particular pattern comprising several defects. However Shallice and Warrington (1980) suggest that there is agreement that deep dyslexia can be defined by four key features, namely (1) the patient's difficulty in using the phonological route in reading as shown for example by very poor performance in reading nonsense syllables, (2) the tendency for word reading and performance to depend on part of speech, with nouns read most easily, followed by adjectives, verbs and finally function words, (3) the large effect of imageability on word reading performance, and (4) the fact that visual, semantic and derivational error types all occur. The disagreement between A. W. Ellis and Jorm essentially concerns the question of whether these characteristic features also apply to developmental dyslexics. The experiments which follow attempt to study the first and third of these key features, the availability of the phonological route and the sensitivity of reading to degree of rated imageability. The tasks used are those employed to study such factors in deep dyslexic patients by Patterson and Marcel (1977).

The use of the phonological route in reading is explored in the present study by means of two tasks, lexical decision and the reading of words and nonwords. In the lexical decision task, subjects are required to decide whether each of a series of letter sequences constitutes a word or a nonword. In one condition the nonwords are phonologically identical to real words (e.g., *brane*). Rubinstein, Lewis and Rubinstein (1971) and Coltheart, Davelaar, Jonasson and Besner (1977) have shown that normal subjects take longer to decide that such items are nonwords than would be the case for nonhomophonic nonwords (e.g., *brone*). Homophonic nonwords also produce a higher false positive rate. Patterson and Marcel showed that their deep dyslexic subjects were quite able to perform a lexical decision task, but showed no sign of being slower or less accurate in processing nonwords that were homophonic with words. Presumably their insensitivity to the nonword homophones indicates that their decision is not influenced by the phonological characteristics of the material. If, as Jorm suggests, developmental dyslexics resemble deep dyslexics in having an impairment in the phonological encoding of written words, one would expect them to show a similar insensitivity to the phonological characteristics of the nonwords. Experiment 1 therefore compared the performance of a group of developmental dyslexic boys with that of a group of normal readers of the same age. Before describing this study however it is important to specify more closely the group to be classified as developmental dyslexics.

There are clearly many potential reasons why a child might have difficulty learning to read, ranging from lack of intelligence through specific sensory defects such as blindness or deafness to learning difficulties stemming from emotional problems. It is therefore unsatisfactory to define a dyslexic group purely in terms of a mismatch between chronological age (CA) and reading age (RA), since a group defined in such a way is unlikely to show any clear and meaningful relationship between reading performance and other measures. We shall therefore use the term 'reading disability' to refer to this general group while keeping the term 'dyslexia' for a particular pattern of difficulties involving inconsistency between reading/spelling performance and intelligence level in the absence of sensory defects or primary emotional disturbance. Such 'developmental dyslexia' becomes apparent during the process of learning to read, and must of course be distinguished from 'acquired dyslexia' occurring as a result of brain damage, typically to a previously normal adult reader.

Miles (1978) has argued that developmental dyslexics display a consistent pattern of performance on a range of tests. Despite normal intelligence, they show impaired forward and backward digit span; some are unable at a relatively late age to perform sequencing tasks such as reciting the months of the year; some have difficulty in calculation and almost all have particular difficulty in reciting arithmetical tables; many show remarkable hesitations when given directional instructions such as 'Point to my left ear with your right hand'. In contrast, however, they have a normal vocabulary and unimpaired memory for visually presented nonverbal material (Ellis and Miles, in press).

Experiment 1 studied lexical decision using 15 developmental dyslexic boys and 15 controls of comparable age. The dyslexic boys came from a residential school for children with dyslexia and the controls were boys from a residential private school. Table 1 shows the characteristics of the two groups together with those of a reading age control group based in Experiments 2 and 3. Details include chronological age, reading age as measured by the Schonell graded word reading test and IQ based on a well-established intelligence test, usually the Wechsler or the Terman. Although we have followed traditional practice in giving a numerical value (IQ) to the child's performance on the tests in question, this does not mean that we wish to be committed to the concept of a uni-dimensional scale—a concept which is particularly dubious in the case of a dyslexic child in view of the irregularity of his performance. For research purposes, however, it is necessary to be sure (a) that any weaknesses displayed by retarded readers are not simply associated with general dullness and (b) that there are no gross discrepancies in general intellectual ability between dyslexic and control subjects. The use of an IQ figure, whatever its limitations, provides a reasonable assurance on these two points.

Table 1. *Chronological age, reading age and IQ of the three groups tested*

	Mean chronological age (yrs : mths)	Mean reading age (yrs : mths)	Mean IQ
Dyslexics	12 : 10	10 : 3	108
CA Controls	12 : 10	13 : 3	110
RA Controls	9 : 11	10 : 3	113

Method

The material used was that devised by Patterson and Marcel and comprised three- to six-letter single-syllable familiar nouns, verbs and adjectives (minimum frequency of occurrence, 10 per million (Kučera and Francis, 1967) and three- to six-letter single-syllable nonwords that were orthographically regular and easily pronounceable by a normal person. Of these, half were homophonic with real words (e.g., *stane*, *frute*), and half were non-homophonic (e.g., *dake*, *selt*). Subjects were tested on four lists, each comprising 17 words and 17 nonwords. The lists were printed in lower case letters on a sheet of paper with order of words and nonwords randomized. In the case of two of the lists, the nonwords were homophonic with real words, and for the remaining two they were non-homophonic. The lists were presented in *A B B A* design, with the first and last list always being non-homophonic. Subjects were asked to respond by underlining the letter strings they recognized as being real words. Subjects were tested individually, and the time taken to complete the list was recorded by stopwatch.

Results and discussion

Table 2 shows the mean processing time per word and the mean number of occasions on which a word was mis-classified as a nonword and *vice versa*. While there is a very clear tendency for overall processing rate to be slower in the dyslexic group ($U = 15.5$, $n_1 = n_2 = 15$, $p < 0.001$, Mann Whitney), the dyslexic subjects show as clear a tendency to be influenced by the phonological nature of the nonword as do the controls. Homophonic nonwords lead to slower performance for 12 of the 15 dyslexic subjects, ($p < 0.02$, Sign Test) and for 13 of the 15 control subjects ($p < 0.001$, Sign Test). Dyslexics were 8.0% slower, and controls 9.7%, a difference which does not approach significance ($p > 0.05$). In the dyslexic group, 13 of the subjects show an overall tendency to make more errors on lists containing homophonic nonwords, with one subject showing the opposite ($p < 0.01$, Sign Test), while 11 of the control subjects show a similar effect, with two showing the reverse ($p < 0.02$, Sign Test). Subjects from both groups are somewhat more likely to mis-classify a nonword than a word; this is significant in the case of the dyslexics ($T = 7.5$, $N = 12$, $p < 0.02$, Wilcoxon Test), but does not reach significance for controls ($T = 18$, $N = 12$, $p > 0.05$). Homophonic nonwords are more likely to be mis-classified as words than are the non-homophonic letter strings for both controls ($T = 6$, $N = 13$, $p < 0.01$) and dyslexics ($T = 6$, $N = 14$, $p < 0.01$).

Overall, therefore, our dyslexic subjects are slower and less accurate than controls of the same age, as one might expect in view of their reading difficulty. More importantly, however, the general pattern of reading times and errors is comparable for the two groups; both groups show a consistent tendency for homophonic nonwords to lead to slower and less accurate decisions, indicating the use of phonological coding in both groups. This

Table 2. *Speed and accuracy of lexical decisions by dyslexics and controls of the same chronological age*

	Mean processing time per item (sec)		Mean error rate (%)			
			Falsely rejected words		Falsely accepted nonwords	
	Nonhomophonic Lists	Homophonic Lists	Nonhomophonic Lists	Homophonic Lists	Nonhomophonic Lists	Homophonic Lists
Dyslexics	1.78	1.94	8.2	10.6	15.1	27.4
CA Controls	0.77	0.85	0.6	2.2	2.0	5.3

contrasts with the results of Patterson and Marcel (1977) whose acquired dyslexic patients showed no evidence of such coding.

Although our results are internally highly consistent, they differ from those obtained by Barron (1979) using a comparable task and comparing good and poor readers. He also observed an effect of the phonological characteristics of the nonwords on the reading rate of good readers, but the effect was not significant for his poor readers, and he concludes that they do not show clear evidence of phonological coding in this task. He does however find an effect comparable to ours when performance is measured in terms of errors, and it seems possible that his subjects may have been maintaining their speed by reducing accuracy. In the case of homophonic nonwords, subjects would have a graphemic representation indicating a nonword, in direct competition with a phonemic representation suggesting that it *is* a word. Our own subjects make decisions that are both slower and less accurate under these conditions. Barron's subjects appear to maintain a constant speed, but only at the expense of an increase in errors. In line with our own results, a decrease in speed and increase in errors on lexical decision has been observed by Seymour and Porpodas (1979) who also used severely dyslexic subjects. Hence, although the pattern for Barron's group is somewhat unclear, the balance of data suggests that developmental dyslexic subjects do use phonological coding in performing the lexical decision task. As such they differ from Patterson and Marcel's deep dyslexic patients who showed no evidence of such encoding.

Could it be argued that our results reflect a greater visual similarity between our homophonic nonwords and real words rather than a phonological relationship? This seems unlikely since we used exactly the same material as Patterson and Marcel (1977), whose patients showed no difference between homophonic and non-homophonic nonwords; if the two sets differed in visual characteristics, their patients should have been just as likely to be influenced by this as our developmental dyslexics.

Experiment 2

One of the more striking features of the performance of deep dyslexic patients lies in their inability to read out nonwords, even though these are orthographically regular and easily pronounceable by normal subjects. This defect was illustrated very clearly by Patterson and Marcel (1977) and we therefore decided to attempt to repeat their experimental procedure using exactly the same material with our dyslexic children. The test was run on the two groups of 15 subjects tested in Experiment 1 who were matched for choronological age (CA) and as far as possible for IQ but differed in reading age (RA). In this and the next experiment however we also included a second RA control group. These comprised 15 boys who were normal in their reading development, but matched the dyslexics in reading age, being approximately three years younger in chronological age, again matched as far as possible for IQ. As in the case of the other two groups they were pupils at a private boarding school; details of age, reading age and IQ are given in Table 1.

The materials and procedure were based on that used by Patterson and Marcel (1977) and involved presenting the subject with two sheets, each comprising 17 words and 17 nonwords randomly arranged in two columns. The nonwords were created by changing a single letter in an English word so as to produce a pronounceable but non-meaningful item (e.g., *dake*). The subject was instructed to work down the column reading each item as quickly and accurately as possible, and the correctness of his response and total time per sheet were recorded.

Results and discussion

The mean reading time and error rate for the three groups is shown in Table 3. There is a very clear tendency for the dyslexics again to be slower than either of the control groups, ($U = 20$, $n_1 = n_2 = 15$, $p < 0.001$ in each case) which do not differ significantly from each other ($U = 74.5$, $n_1 = n_2 = 15$, $p > 0.05$). Overall error rate is clearly much lower in the CA control than

Table 3. *Speed and accuracy of reading words and nonwords by dyslexics and controls*

	Mean reading time per list of 34 items (secs)	Mean % Errors	
		Words	Nonwords
Dyslexics	68.00	6.3	41.6
CA Controls	27.90	0.4	6.7
RA Controls	31.96	6.9	32.4

in either of the groups of lower reading age for both words and nonwords. The dyslexic group shows about the same error rate as the RA control group for words, as one might expect since the groups were matched on ability to read single words ($U = 91$, $n_1 = n_2 = 15$, $p > 0.05$). In the case of nonwords however, the dyslexics do show a significantly higher error rate ($U = 47.5$, $n_1 = n_2 = 15$, $p < 0.02$). Even so, the RA controls seem much more similar in accuracy to the dyslexics than to the other controls who differ only in being two and a half years older. Using a similar task, Seymour and Porpodas (1979) found dyslexics to be slower but no less accurate than RA controls in nonword reading. Considered overall, therefore, dyslexics do not appear to be qualitatively different from their RA controls in their pattern of reading errors. In all three groups, subjects make more errors on nonwords than on words; this tendency is shown by all subjects in the dyslexic and reading age control groups, and by 13 of the 15 chronological age controls, although the latter group clearly showed a very much smaller overall error rate.

Once again, our dyslexic group was substantially slower than controls of comparable age, and indeed were much slower than the children of a similar reading age who were virtually three years younger. Our dyslexic group also made substantially more errors than controls of the same age and somewhat more than their reading age controls, particularly in the case of nonwords. The difference between these groups is however far from dramatic in comparison with the disproportionate difficulty in reading nonwords displayed by deep dyslexic patients.

Experiment 3

One of the most intriguing and oft cited features of deep dyslexic patients is their difficulty in reading words of low rated imageability (Marshall and Newcombe, 1973; Patterson and Marcel, 1977; Richardson, 1975; Shallice and Warrington, 1975). Members of our developmental dyslexic group and the two control groups of Experiment 2 were therefore tested with lists of words devised by Patterson and Marcel (1977) to study this phenomenon in deep dyslexic patients. These comprised 20 words of high rated imageability and 20 of low imageability (Paivio, Yuille and Madigan, 1968), the two lists being balanced for word length, word frequency and rated concreteness. Each word was printed on a card, and the cards were shuffled so as to give each subject a different random order of presentation. Each subject was then required to read the word out loud at his own pace. The experimenter noted down the correctness of his responses but unfortunately the detailed nature of the errors was not recorded.

Results and discussion

Table 4 shows the 20 high and 20 low imageability words, together with the total errors for the three groups. It is clear from these results that dyslexic

Table 4. *Imageability and accuracy of reading words in dyslexics and control subjects. Errors out of a maximum of 15*

High imageability				Low imageability			
Word	CA Controls	Dyslexics	RA Controls	Word	CA Controls	Dyslexics	RA Controls
agony	0	7	7	amount	0	0	3
beauty	0	0	0	answer	0	0	0
danger	0	0	0	decree	1	11	9
disaster	0	4	4	edition	1	7	7
drama	0	2	0	excuse	0	6	1
kingdom	0	0	0	fact	0	1	0
lecture	0	0	1	gain	0	1	1
lovely	0	0	1	grown	1	5	1
marriage	0	2	0	hint	0	1	0
merry	0	3	0	incident	0	6	3
murder	0	1	0	occasion	0	11	11
narrow	0	2	0	origin	3	9	10
profit	1	5	2	patent	7	10	11
revolt	0	2	4	phase	4	12	12
savage	0	1	0	position	0	1	4
slavery	1	4	3	reality	5	11	5
uncle	0	1	0	reason	0	4	0
warmth	0	2	2	scene	0	8	5
wealth	0	4	0	unit	0	3	4
Total	2	40	24		22	110	88

children do show a disproportionate frequency of errors in reading the words of low imageability. However, far from being a specific feature of dyslexia, this appears to apply to all three groups. Even in the case of the older control group, where the numerical size of the effect is small, presumably due to a ceiling effect, it is shown by 10 of the 15 subjects, with only one subject showing better performance on the words of low imageability ($p < 0.01$, Sign Test). The effect is very marked in the two groups of lower reading age, where it is shown by all 30 children. While there appears to be a slight tendency for the effect to be stronger in the dyslexic group, this is not significant ($U = 102.5$, $n_1 = n_2 = 15$, $p > 0.05$).

The previous analysis suggests that the tendency for words of high imageability to be easier to read occurs for all three groups. Is it, however, characteristic of the samples of words or is it due to one or two atypical items? The consistency of the imageability effect was tested by summing the number of errors across subjects for each word, and comparing the two samples of words. In the case of the dyslexic subjects, a Mann-Whitney test indicated that frequency of error differed between the high and low imageability sets ($U = 113.5$, $n_1 = n_2 = 20$, $p < 0.01$). In the case of reading age controls the comparison showed again that the two distributions differed ($U = 97.5$, $n_1 = n_2 = 20$, $p < 0.01$). In chronological age controls, errors were unfortunately too infrequent to allow a comparison across word sets.

Considered as a whole, the results of Experiment 3 indicate that our dyslexic boys did experience difficulty in reading low imageability words and that this effect was not due to one or two atypical items. However, a very similar set of results for the reading age control group indicates that far from being a peculiarity of dyslexic reading, this tendency is characteristic of normal reading, provided the level of performance is sufficiently low to produce errors. Hence, the one feature of the performance of our developmental dyslexics which appears to resemble Patterson and Marcel's deep dyslexic patients turns out to be a much more general phenomenon. As such, it does not argue for a common basis for deep and developmental dyslexia; once again, the performance of our developmental dyslexics appears qualitatively to resemble that of younger children.

The observation of imageability effects in the reading performance of normal children suggests that A. W. Ellis (1979) was right in questioning Jorm's interpretation of his earlier finding (Jorm, 1977) of an imageability effect in the reading performance of developmental dyslexics. In his reply to Ellis's criticism, Jorm (1979*b*) argues against the potential importance of imagery in adult reading on the grounds that Richardson (1976) found no significant effect of word imageability on either pronunciation latency or word-nonword classification time. It is however by no means necessarily the case that accuracy and latency depend on the same factors. For example articulatory suppression consistently influences the accuracy with which subjects perform a reading task while having no effect on reading speed (Baddeley and Lewis, in press).

How should one interpret the imageability effect? Jorm (1979*b*, p. 425) suggests that 'word imagery affects the ease with which a word can be read *via* the direct visual route'. He assumes that this effect is masked when the phonological route is operating efficiently. The fact that we have clear evidence of imageability effects in our reading age controls would, on this view, seem to imply that there is a gradual shift from a direct reading route to a phonological route with increasing age. Such a view seems somewhat unlikely for three reasons. First, our data and those of Seymour and Porpodas (1979) show no evidence for an absence of phonemic coding in the performance of our dyslexic readers. Secondly, available evidence suggests that phonemic coding tends not to be essential to the fluent adult reader (Coltheart, 1980). Thirdly, Doctor and Coltheart (1980) in a study where children are required to read sentences for meaning show that reliance on phonological recoding decreases with age, the exact opposite to what Jorm would need to assume.

A further problem for Jorm's view is raised by the question of just why imageability should influence reading by the direct route rather than by the phonological route. The process whereby imageability influences readability is obviously a puzzle for any theory of reading at present. Hence, despite the fact that imageability is a potent variable, it has virtually no *explanatory* power. Before coming up with detailed suggestions for mechanisms involving imagery however, it might be wise to explore alternative explanations. Perhaps the most plausible of these is an explanation in terms of age of acquisition (Marshall, Newcombe and Holmes, 1975). There may be a tendency for imageable words to be acquired earlier than low imageable abstract words, and unpublished preliminary experiments of our own suggest that age of acquisition may be a powerful variable in the reading performance of young children.

The observation that imageability, or some closely related variable, is an important determinant of the readability of words by normal readers, does not of course make that result an uninteresting one. It does however argue against the use of the imageability effect as a crucial indicant of dyslexia. Furthermore, by indicating the generality of the effect, it considerably weakens Jorm's argument that developmental and deep dyslexia are similar because they are both sensitive to imageability.

General discussion

We began with the question of whether the reading performance of developmental dyslexic children is qualitatively similar to the performance of deep dyslexic patients. Using a lexical decision task, Patterson and Marcel found no evidence of phonological encoding in their patients; our dyslexic children showed clear evidence of such encoding. Deep dyslexic patients are almost completely unable to read orthographically regular nonwords, implying a clear defect in the system responsible for prelexical phonology (c.f. Glushko, 1979; Marcel, 1980). Our dyslexic children, like those of Seymour and Porpodas (1979), though markedly slower and somewhat less accurate than children of comparable reading age, were by no means incapable of such reading. Considered as a whole then, whereas deep dyslexic patients appear to have a gross defect in the operation of the grapheme-phoneme component in reading, our dyslexic children appear to have some capability of using such a route, albeit more slowly and less efficiently than either CA or RA controls. Both developmental and deep dyslexics appear to be similar in finding words of low imageability harder to read than highly imageable words; normal readers of comparable reading age, however, showed an exactly similar pattern.

While our results are reasonably clear-cut, some caution should be used in making generalizations. First, it is logically possible that the deep dyslexic patients and the dyslexic boys may have suffered from the defective operation of the same components of reading, but that the pattern of performance is changed either because the patient has a much more dramatic and complete impairment, or because an impairment during the stage of learning to read has a different effect from a similar impairment in a previously fluent reader. A further complication arises from the fact that the dyslexics were all attending a school which explicitly aimed to train them to cope with their dyslexia and develop normal reading. Their programme includes an emphasis on phonics, and it is hence conceivable that dyslexic children trained in some other way might show no evidence of using the grapheme-phoneme route. This suggests that our study should be replicated using dyslexic children from a range of sources before concluding that some utilization of the grapheme-phoneme route is typical of all dyslexic children. We can however conclude from our group that the pattern of disabilities associated with dyslexia in children is not *necessarily* associated with a gross inability to use the grapheme-phoneme route, and in this respect it appears to differ from the deep dyslexia studied in Patterson and Marcel's adult patients.

In conclusion, although we agree with Jorm's suggestion that developmental dyslexics may suffer from an impairment of the verbal short-term memory system and support his view that work on developmental and acquired dyslexia should be coordinated, our results fail to support his claim that developmental and deep dyslexia have a common basis. It would therefore seem more profitable at this point to explore the relationship between developmental and surface dyslexia as suggested by Holmes (1973; 1978) on the basis of an extensive qualitative analysis of the reading errors made by surface and developmental dyslexics.

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Résumé

Jorm (1979*a*) a attiré l'attention sur les similitudes entre dyslexie au cours du développement et dyslexie profonde acquise. Cette analogie a été critiquée par Ellis (1979). Nous avons utilisé pour comparer les syndromes des deux dyslexies les techniques de Patterson et Marcel (1977) pour les dyslexiques profonds adultes. Les sujets des trois expériences présentées sont 15 garçons souffrant de dyslexie développementale. Les patients de Patterson et Marcel sont capables de réussir une tâche de décisions lexicales mais sont incapables d'encodage phonémique des non-mots; nos enfants dyslexiques sont très lents et montrent une précision réduite dans cette tâche mais sont capables d'encodage phonémique des non-mots. Patterson et Marcel observent que leurs patients sont incapables de lire des non-mots orthographiés régulièrement; nos enfants en sont capables quoique ils performent plus lentement et parfois moins bien que les contrôles d'un même âge chronologique ou d'un même niveau de lecture. Enfin Patterson et Marcel observent que les mots très figuratifs ont plus de chance d'être lus correctement que des mots de même fréquence mais moins figuratifs; nous observons un effet similaire dans le groupe des dyslexiques comme dans le groupe contrôle de lecteurs du même niveau. Cela implique que l'effet dû à l'imagerie n'est pas particulier aux dyslexiques mais peut caractériser un lecteur normal sous certaines conditions. On conclut que les dyslexiques développementaux diffèrent des patients étudiés par Patterson et Marcel et montrent un pattern de lecture qualitativement similaire quoique plus lent à celui de lecteurs normaux plus jeunes. Nos résultats n'appuyent pas la position de Jorm.