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## ON THE NATURE OF PRE-LITERATE SPELLING ABILITY

William D. O'Grady and Diana E. Gibbons

**ABSTRACT:** In this paper, we examine the nature of spelling ability in adults, relating this type of representational competence to aspects of phonological and cognitive development as well as to schooling. The phenomenon of pre-literate spelling in young children is assessed in light of what can be inferred about spelling ability in adults.

### Introduction

One of the most fascinating aspects of a young child's pre-literate representational competence is his ability to make use of his knowledge of letter names to write the words of his language. While only a minority of pre-literate children seem to develop their own system of invented spelling, there are remarkable uniformities in the way in which these children make use of the twenty-six letter names to represent the forty or so phonemes of their language. Among the more important properties of invented spelling are:

1. The use of a single letter to represent VC or CV sequences as well as diphthongal elements; e.g. R are, U you, NHR nature, BCAZ because, MAD made, LAD lady, NIT night, BOT boat, HOL hole. (See Read 1971, Chomsky 1975 and 1976, and Paul 1976.) This phenomenon reflects the fairly straightforward use of a 'letter name' spelling strategy.

2. The use of letter names containing an affricate to represent a homorganic fricative; e.g. HE she, FEHIG fishing, KRAFIH crayfish. (See Chomsky 1975 and 1976.) This spelling strategy would seem to indicate an awareness on the child's part that affricates contain a fricative component.

3. The use of diphthongal letter names to represent lax vowels with the same approximate place of articulation; e.g. E ([iy]) for [ɪ]: FES fish, FLEPR Flipper; A ([ey]) for [e]: FALL fell, LAFFT left; I ([aj]) for [a]: GIT got, CLIK clock, DIKTR doctor; O ([ow]) for [ɔ]: POS paws, WOTR water; U ([juw]) for [u]: TUK took, LUKS looks. (See Read 1971 and Chomsky 1975.) The sophisticated use of letter names just exemplified suggested that the child has a very precise understanding of the phonetic relationships among the phonemic segments of his language and that he is able to exploit this knowledge to increase the representational range of his spelling system.

4. The orthography is 'uni-directional' in that spellings can generally not be reliably decoded; e.g. CAT spells both cat and

can't; BAT spells both bait and bet; BET spells both beat and bit; and so on (see Chomsky 1975:507 and Read 1978:78). Interestingly, the children do not seem to be concerned by the illegibility of their spellings and they typically have no interest in reading what they have written down. As Charles Read (cited in Chomsky 1975:518) points out, the children see writing as a form of expression rather than communication.

The creation of a sophisticated spelling system on the part of a pre-literate, pre-school child obviously constitutes a remarkable achievement that is worthy of close attention. Given the uniform character of the orthographies invented by pre-schoolers, it is natural to entertain an interest in isolating the factors which might contribute to the development of a spelling system with the properties just noted. In this regard, there seem to be two promising avenues of inquiry -- one that concentrates on the linguistic and cognitive abilities peculiar to early childhood and one that assumes some sort of stable human 'graphic competence' and attempts to explain pre-literate spelling in terms of the properties of the set of letter names that the child has to work with. Let us consider each possibility in turn.

In terms of cognitive and linguistic development (as well as sensory experience), the pre-school child is uniquely equipped to develop a spelling system with the properties noted above. A 4- to 5-year old child will typically be in the pre-operational stage of cognitive development -- a stage characterized by the inability to reverse operations of thought (Piaget 1964:177). One could easily speculate that this general lack of reversibility accounts for the child's disregard for the legibility of what he writes: he simply does not see graphic representation as a bi-directional process that should allow communication as well as expression.

Linguistically, the pre-school child is also still developing and he has not yet acquired the abstract phonological representations that reflect the morphophonemic alternations found in word pairs like divine-divinity and serene-serenity (Moskowitz 1973). The child's apparent ignorance of the sophisticated morphophonemic alternations that characterize the adult's phonology could well underly his willingness to have the less abstract phonetic relationships that hold between pairs of phonemes like /iy-I/, /ey-ε/ and /č-f/ reflected in his spelling system.

Pre-school children are also known to have difficulty segmenting words into their component phonemes (Lieberman et al. 1974). Although the precise assessment of segmentation ability during early childhood is somewhat problematic (Read 1978), it seems reasonable to suggest that the absence of any strong intuitions about segmental boundaries, combined with a lack of familiarity with alphabetic orthographies, could account for the child's willingness to use single symbols to represent CV and VC sequences. It is also interesting to note in this regard that there is some evidence to indicate that syllabic writing systems are easier to learn than are alphabetic orthographies (Rozin and Gleitman 1977:99-100).

While it is obviously not feasible to account for invented spelling without making reference to human linguistic and cognitive capabilities,

it is possible to maintain that the hypothetical correspondence between the cognitive and linguistic stages of early childhood and properties of invented spelling are largely fortuitous and that any human being who attempted to create an orthography based on the letter names of the English alphabet would ultimately develop a spelling system with the properties noted earlier. Under this view, the segmentation of diphthongs and affricates, the use of a single letter to represent phonemic sequences and the general lack of reversibility in the writing system are seen as simple consequences of the fact that the writer must, with the help of some general and stable set of mental abilities, find a way to represent over 40 phonemic contrasts in an orthography that contains only 26 letters, none of which even have monophonemic names.

The two approaches to explaining the properties of pre-literate writing would seem to make different predictions about the type of invented spelling system that an adult would develop. To the extent that orthographies with the properties described earlier are a product of a felicitous combination of cognitive and linguistic immaturity, one would expect adults to develop a system of invented spelling that differed in specific ways from the pre-literate orthographies of early childhood.

Adults, for example, have attained either the concrete operational or the formal operational stage of cognitive development and therefore understand that certain operations are reversible. This fact, combined with their understanding of the function of an orthography, might well cause them to reject a spelling system that did not consistently yield readable forms.

In terms of linguistic development, adults have acquired the complete phonology of their language and could well be less willing to segment diphthongs and affricates into their component parts when this segmentation is not supported by any morphophonemic alternations. Fromkin (1971) has uncovered psycholinguistic evidence in support of the view that diphthongs and affricates behave as unitary segments in adult speech and Read (1973) has found that adults, unlike preschoolers, do not tend to associate tense vowels with their lax counterparts in the vowel quadrangle. Given these facts, it would not be surprising if mature speakers failed to perceive and exploit the relationships between /iy/ and /ɪ/, /ey/ and /ɛ/, and /č/ and /ʃ/ that underly the invented spellings of early childhood.

Finally, in terms of what has been called metalinguistic awareness, adults are capable of segmenting words into their component phonemes. One might expect that this ability, combined with a familiarity with an alphabetic orthography like that of English, would lead adults to reject a spelling system in which single letters represent phonemic sequences.

It would seem, then, that the study of invented spelling ability in adults should provide important insights into both the character of pre-literate spelling activity in children and the nature of graphic competence in general. In order to assess invented spelling ability in mature speakers, we conducted an experiment in which adults were required to

construct a system of invented spelling on the basis of exposure to a set of letter names. The subjects (20 unilingual, linguistically naive university students) were taught an alphabet consisting of 8 symbols whose names and shape bore little resemblance to those of the letters of the English alphabet (see Appendix I). The subjects were told that the mini-alphabet was from an unnamed foreign language and that the purpose of the experiment was to assess their ability to learn new alphabets. On each of the two days following the initial learning session, the subjects, who received no information about the sound-letter correspondences associated with the alphabet they had learned, were given the opportunity to write a total of 25 monosyllabic and bisyllabic nonsense words. The phonemes composing the nonsense words (see Appendix II) were chosen in such a way that the subjects were faced with approximately the same dilemma as pre-school spellers encounter. There were more phonemes than letters (13 vs 8) and there were no letter names consisting entirely of either a lax vowel or a fricative although both types of sounds were found in the words that had to be written.

### Results

An examination of the words written by the subjects reveals a remarkable reliance on the spelling strategies that were manifested in the writing activity of pre-literate children. The following phenomena are especially worthy of mention.

Use of the letter name strategy: There was a strong tendency for the adult subjects to use a letter name strategy wherever feasible. Of the 140 cases in which a CV or a VC sequence could plausibly be represented by either a single letter or two separate symbols (e.g. /sar/, /mub/, etc.), our subjects opted for the letter name strategy 81% of the time.<sup>2</sup> (See examples in Appendix III, Part 1.)

The segmentation of affricates: The adult subjects, like preliterate writers, were willing to use an affricate letter name to represent a homorganic fricative. In fact, ʃ was used by itself to denote /ʃ/ in 32.5% of the subjects' attempts to spell words containing this phoneme. (For examples, see Appendix III, Part 2.) It is interesting to note in passing that the symbol ɸ (with the fricative letter name /sa/) was used to represent 22.5% of all occurrences of the phoneme /ʃ/. The choice between ɸ (/sa/) and ʃ (/ʃe/) as the symbol corresponding to /ʃ/ is a subtle one since /ʃ/ and /s/ have the same place (but different manners) of articulation while /s/ and /ʃ/ have a common manner (but not place) of articulation. Although we did not pursue this matter further, it is likely that the invented spelling activity of adults could be used to develop insights into their understanding of phonetic structure (see, for example, Read 1973).<sup>3</sup>

The representation of lax vowels. As was the case with young pre-literate spellers, the adult subjects exhibited a tendency to use diphthongal letter names to represent lax vowels with the same approximate place of articulation. The symbol ɹ (/ɹw/) was used to represent 47.5% of all instances of the phoneme /ɹ/ and 54% of all instances of the phoneme /a/

(see Appendix III, Part 3). Although the phonetic similarity between /ʌ/ and /a/ has been noted in the pre-literate spelling activity of young children, who frequently use I (/aj/) to represent /ʌ/ (Read 1971:10),<sup>4</sup> it is somewhat puzzling that adults did not use Γ (/aj/) to denote /a/. While this orthographic convention was used for 8 of the 100 instances of /a/, its infrequency suggests that adults are generally either unable or unwilling to segment the diphthong /aj/ into its component parts. If this phenomenon reflects the influence of the hypothetically more abstract phonological representations often attributed to adults, it constitutes the only case we observed in which the adults' writing behaviour could be said to differ from that of children because of qualitative differences in linguistic development.<sup>5</sup> It is also worth noting that the adults were able, as stated above, to exploit the phonetic relationship between /č/ and /š/ even though this relationship, like that between /aj/ and /a/, is not supported by any morphological alternations.

Besides the important similarities just noted, the adults' spelling activity resembled that of pre-literate writers in a number of other suggestive ways. Like the children (Read 1971:9), our adult subjects made no attempt to expand their alphabet by adding new symbols or by using diacritic conventions even though they were not prohibited from doing so. Moreover, like the children (Paul 1976:199), our subject exhibited a tendency to attack each word as a new problem with the result that there were inconsistencies in the way in which different instances of the same sound were represented graphically. Thus, to take but two examples, the /a/ in /ras/ was consistently spelled in both writing sessions by only 50% of the subjects while the words /čʌb/ and /bʌč/ were spelled the same way in both sessions by fewer than 40% of the subjects. Even more interesting is the fact that some sounds were spelled in different ways within a single session. During the second writing session, for example, 8 of the 20 subjects assigned different spellings to the two occurrences of /š/, while 17 used at least two different spellings for the three instances of /ʌ/.

Finally, it is interesting to note that the subjects were willing to use spellings that did not allow unequivocal recovery of the form's pronunciation. Strictly speaking, almost any written form could represent two or more pronunciations (e.g. фдп corresponds to /sʌwč/ as well as /sʌš/, /sʌš/ and so on), but it was especially interesting to find our subjects assigning identical spellings to perceptually distinct forms that occurred in the same writing session. It was discovered, for example, that 13 of our 20 subjects assigned the same spelling to /čab/ and /čʌb/ during at least one of the writing sessions. (A post-test indicated that the subjects had no difficulty making the perceptual distinction between /čʌb/ and /čab/ and that they had assumed that phonetically distinct words had different meanings in the 'language' they were working with.) At no time during the course of the experiments did subjects complain or seem to realize that the orthography they were developing was non-reversible in that pronunciations were not uniquely recoverable from the graphic representations.

All of this is not to say that the adults' invented spellings did not differ in certain systematic ways from those of pre-literate children. There were, for example, strong indications that adults were sometimes subject to interference from conventional English orthography. This was especially evident in the attempts of some subjects to spell /ʌ/ with the help of Б (/ju/) (Appendix II, Part 3). This spelling, which was used for 19% of the words containing /ʌ/, was almost certainly motivated by the fact that a letter with the same name (U) is used to represent the same phoneme in English (e.g. cut, but, etc.). It is important to note, however, that our subjects used Д (/ʌw/) or Г (/aj/) far more often than Б to denote /ʌ/ -- a fact which suggests that the 'transfer effect' from conventional English orthography was actually quite weak.<sup>6</sup> Certainly, as we have already seen, familiarity with the English alphabet did not prevent our subjects from using single symbols to represent CV and VC sequences or from creating spellings that could not be 'reversed'.

### Conclusion

As the above remarks clearly indicate, the differences in the stages of cognitive and linguistic development characteristic of early childhood and adulthood do not seem to manifest themselves in invented spelling activity. While familiarity with conventional English orthography seems to exercise an occasional influence on adult spelling practices, the writing behaviour of adults and pre-literate children is remarkably similar. This finding is, of course, significant in light of our earlier discussion of competing accounts of pre-literate invented spelling. As it now stands, the evidence would seem to indicate that the characteristic properties of pre-literate invented spelling are probably not due to the cognitive and linguistic immaturity of the pre-school child, but rather result from the interplay between some basic sort of graphic competence and the limited resources provided by the orthography itself. Far from downplaying the remarkable achievement that pre-literate writing represents, this conclusion suggests that the special abilities that underly invented spelling activity are in place relatively early in life and are not subject to significant modification by the cognitive and linguistic development of middle and late childhood.

### Appendix I

<u>Symbols</u>	<u>Letter Names</u>	<u>Symbols</u>	<u>Letter Names</u>
Б	/yu/	Ф	/sa/
Л	/če/	Ж	/ma/
Г	/aj/	Д	/ʌw/
Ю	/ub/	И	/ri/



## Appendix II

### Nonsense Words

First Writing Sessions. 1. /sɫw/, 2. /yʊm/, 3. /sʊm/, 4. /čɫb/,  
5. /ras/, 6. /bɫč/, 7. /sajb/, 8. /čab/, 9. /ɫsub/, 10. /sar/.

Second Writing Sessions. 1. /mub/, 2. /suč/, 3. /sɫwč/, 4. /bɫč/,  
5. /šajm/, 6. /rus/, 7. /ras/, 8. /čab/, 9. /ɫsub/, 10. /ušmu/,  
11. /sar/, 12. /yam/, 13. /yumb/, 14. /risaj/, 15. /čɫb/.

## Appendix III

### Spelling Strategies

Part 1. Examples of the letter name strategy: Ф И (/sar/), Ж Ю (/mub/),  
Б Ж (/yʊm/), И Ф Г (/risaj/).

Part 2. Graphic representation of /š/

- a. Segmentation of an affricate letter name (32.5%): Л Г Ж (/šajm/),  
Б Л Ж Б (/ušmu/).
- b. Use of Ф (22.5%): Ф Г Ж (/šajm/), Б Ф Ж Б (/ušmu/).
- c. Use of Ф Л (45%): Ф Л Г Ж (/šajm/), Б Ф Л Ж Б (/ušmu/).

Part 3. Representation of lax vowels

(i) The phoneme /ɫ/

- a. Segmentation of Д (47.5%): Л Д Ю (/čɫb/), Ю Д Л (/bɫč/).
- b. Use of Б (19%): Л Б Ю (/čɫb/), Б Ф Ю (/ɫsub/).
- c. No attempt at representation (19%): Ю Л (/bɫč/).
- d. Segmentation of Г (8%): Г Ф Ю (/ɫsub/).

(ii) The phoneme /a/

- a. Segmentation of Д (54%): Л Д Ю (/cab/), И Д Ф (/ras/).

- b. No attempt at representation (19%): И Ф (/ras/), Л Ю (/čab/).
- c. Segmentation of Ф (12%): Л Ф Ю (/čab/), Б Ф Ж (/yam/).
- d. Segmentation of Г (8%): И Г Ф (/ras/), Л Г Ю (/čab/), Б Г Ж (/yam/).

## NOTES

1. The letters of the English alphabet have names which are either syllabic (B, C, F) or diphthongal (A, E).

2. Statistical comparison of our results with those of the pre-school spellers is unfortunately impossible since virtually no studies of pre-literate invented spelling include the relevant numerical data.

3. A curious phenomenon that may be related to the adult's perception of phonetic structure was the use of Г (/aj/) rather than Б (/yu/) to represent the glide /y/ in the word /yam/. In the twenty instances of this word, Г was used 7 times and Б 11 times.

4. This practice was also observed in our subjects, who used Г (/aj/) to represent /a/ in 9 of the 120 words containing this phoneme.

5. We are assuming that the adults carried their knowledge of English phonology over to the nonsense words in the writing task. One consideration which suggests that our adult subjects were able to segment /aj/ was their use of Г to represent word-initial /y/ (See footnote 3.) It is also conceivable, of course, that our subjects' reluctance to use Г to represent /a/ stems from the fact that the English letter of the same name (I) cannot denote this sound.

6. The only other frequent spelling practice that might plausibly be attributed to a transfer effect involved the use of ФЮ to represent /š/ (47% of the time). Unfortunately, it is unclear whether the use of Ф (/sa/) reflects an attempt to 'soften' the affricate in Л (/č/) or results from the influence of the digraph sh of English orthography.

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