

Awareness of phonological segments and reading ability in Italian children

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ABSTRACT

The early evidence pertaining to the development of phonological segmentation abilities and their relation to reading was collected with English-speaking subjects. Although data from other languages have been obtained, explicit cross-language comparisons have not been made. It was considered that since languages vary in their phonological structures, they may also vary in the demands they make on the beginning reader. The present study compared the segmentation abilities of Italian children with those of English-speaking (American) children using the same methods of assessment and the same subject-selection criteria. At the preschool level, though the Italian children manifested a higher level of performance overall, their pattern of performance paralleled that obtained earlier with American children. In both groups, syllable segmentation ability was stronger than phoneme segmentation. After school entrance, this pattern remained unchanged in American children but was reversed in Italian beginning readers. In both language groups, however, phonemic segmentation ability distinguished children of different levels of reading skill. The discrepancies between the language groups were seen as reflecting phonologic and orthographic differences between the languages.

Those who would become proficient readers of a language that is written with an alphabet face a common problem: they must understand that the written letters represent segments of words. For this reason, mastery of an alphabetic system requires a metalinguistic capability that is quite unnecessary for acquisition of the spoken language, namely, some degree of metalinguistic awareness that words have those sublexical segments, the phonemes (Liberman, 1971, 1973). We

know that very young children may not have that capability. In fact, awareness of phonemic segmentation, for many English-speaking children, at least, is delayed until age six or beyond (Lieberman, Shankweiler, Fischer, & Carter, 1974). Experimental evidence from a variety of sources suggests that awareness of phonemic constituents of a word is highly correlated with reading achievement (Stanovich, 1982; Wagner & Torgesen, 1987). In fact, poor beginning readers and illiterate adults both tend to find the phonemic structure of spoken words quite opaque (Lieberman, Rubin, Duquès, & Carlisle, 1985).

Although a large part of the evidence pertaining to the development of segmentation abilities and their relation to reading has been collected with English-speaking subjects (see Bradley & Bryant, 1983; Fox & Routh, 1975; Liberman et al., 1974; Treiman & Baron, 1981), data from speakers of other languages have begun to be collected. In addition to the American and British studies of preschoolers and school children in the elementary grades, studies of Yugoslavian speakers of Serbo-Croatian (Ognjenović, Lukatela, Feldman, & Turvey, 1983), Swedish (Olofsson, 1985), French-speaking (Alegria, Pignot, & Morais, 1982), and Spanish-speaking children (de Manrique & Gramigna, 1984) have also been carried out with roughly similar results. The failure of illiterate adults to perform phoneme segmentation was first demonstrated with speakers of Portuguese (Morais, Cary, Alegria, & Bertelson, 1979). Similar findings have since been obtained in the U.S. with English-speaking semilliterate adults (Lieberman et al., 1985), and in China with readers of Chinese logograms who were unacquainted with the alphabet (Read, Zhang, Nie, & Ding, 1984).

Thus, studies of subjects from different language backgrounds have provided considerable support for the possibility of a significant relationship between phoneme segmentation and the mastery of the alphabetic principle. However, many questions that might be answered by cross-language studies have not yet been systematically explored. We know that languages vary widely in the complexity of their phonological structure. They may vary, for example, in their number of distinguishable vowels, in the incidence of morphophonemic alternation, and in the diversity of their syllable types. Moreover, alphabetically written languages differ not only in the complexity of their phonologic structure but also in the ways in which the orthography chooses to transcribe that structure (Klima, 1972; Liberman, Liberman, Mattingly, & Shankweiler, 1980). It would not be unreasonable, therefore, to ask whether the ability to analyze words into their component segments might be harder to acquire in some languages than in others. Further, it could be asked whether variations in phonological structure that affect the ease or difficulty of becoming aware of critical sublexical units do in fact also affect the ease or difficulty of learning to read (Lieberman et al., 1980). Cross-language comparisons that take into account the nature of both the language and the orthography can thus be of particular importance in sorting out the root causes of reading problems.

Although the problems of acquiring literacy are increasingly being studied in different language communities, few actual cross-language comparisons have been undertaken of the development of phoneme segmentation and its relation to reading. In view of the evidence to date concerning the critical role of the phoneme in learning to read and write alphabetically, we considered it an urgent priority to conduct a parallel investigation in another alphabetic language with

different structural features than English. The present investigation is an attempt to replicate as closely as possible in Italian previous studies undertaken with English-speaking children.¹ Only by such a comparative study can we hope to distinguish biological maturational factors relevant to acquiring literacy skills from task factors which reflect specific features of a particular language and its writing system. Thus, eventually, we may learn whether it is universally true, as we suspect, that the phoneme is a particularly difficult unit for young children to abstract. Further, we may learn whether the ability to abstract the phoneme relates positively to reading success in any alphabetic system irrespective of differences in language structures and their means of representation in the orthography.

Italian is a useful candidate for comparison with English because it differs markedly in certain aspects of phonological structure. Let us consider several ways in which it differs. The first is in vowel structure. Spoken Italian can be fairly said to have only five vowels; spoken English has a dozen or more (depending on the criteria for analysis). Regardless of the context in which they occur, each of the five vowels in the alphabet has only one rendition in Italian speech, as contrasted with the several that can be found in English. We would not expect this contrast materially to affect the relative difficulties of phoneme and syllable awareness in the two language communities before reading instruction is begun. For preschoolers, the coarticulation of the sublexical phonemes in normal speech should still make phoneme awareness relatively more difficult than syllable awareness, whatever the language. Once children are exposed to the orthography, however, it is possible that linguistic awareness of both kinds might be better among the Italian children, because of the nature of the Italian vowels and their relation to the orthography.

Italian and English vary in other characteristics besides vowel structure that may affect phonological awareness differentially after reading instruction has been initiated. Italian has a relatively shallow phonology with, for example, relatively little morphophonological alternation as compared with English (e.g., telegraph, telegraphy). In addition, though Italian has a mixed stock of syllable types, it has fewer than half as many different types as English (Carlson, Elenius, Granström, & Hunicutt, 1985). Moreover, unlike English, which has a predominantly closed syllable structure (e.g., CVC, CVCC, CCVC, etc.), Italian's most frequent syllable form by far is the open syllable (e.g., CVCVCV, CVCV, etc.), with relatively few different variations (Carlson et al., 1985). It has been suggested (Lieberman & Shankweiler, 1979) that because the syllable is the basic unit of articulation, it has a perceptual saliency that allows it to be easily extracted from the speech stream. It is possible that, given the particular characteristics of its syllable structure, Italian might lend itself even more readily than English to sublexical awareness at the syllabic level. The simpler syllable structure, the smaller number of distinctively different vowels, and the greater consistency of the alphabetic representation in Italian might also be expected to give Italian an advantage in early reading acquisition that would, in turn, be reflected in greater phoneme awareness as well. The reciprocal effect of reading acquisition on phoneme awareness has frequently been proposed (see, for example, Vellutino, 1979).

The present study consists of two experiments: *Experiment 1* addresses ques-

tions relating to the development of metalinguistic awareness of sublexical segments. Experiment 1 allows us to tease apart the maturational component in the development of metalinguistic awareness of sublexical segments from the possible contribution of differences in language structure. Accordingly, it addresses the following questions: (a) Is the level of success in abstracting either syllabic or phonemic segments consistently higher for one language than the other? (b) Does ability to abstract either type of segment vary with age in the same manner in Italian children as in their English-speaking counterparts? *Experiment 2* is concerned with the relation between metalinguistic awareness and reading acquisition. It is directed at children of varying reading skill in the first two elementary school grades. It asks first whether the ability to single out syllable and phoneme segments is related to level of reading achievement in Italian children, as was found for English-speaking children, and second, whether a relatively straightforward orthography like Italian facilitates the acquisition of awareness of phonological segments more than a relatively complex orthography like English.

EXPERIMENT 1: DEVELOPMENT OF SEGMENTATION ABILITY

Subjects

The subjects included two samples of children from a largely middle-class school in the Sardinian town of Sassari (Italy): 60 preschool children and 160 school children from the first and second elementary classes. Children with known auditory, visual, language, or motor deficiencies were excluded from the sample, as were those with clinical histories indicating brain damage.

The preschool sample included 60 children from the regular second- and third-year preschool classes (roughly comparable to American nursery and kindergarten levels). They were then divided by class membership into two groups of 30 children, each of which contained equal numbers of boys and girls. The mean age of the younger group, Group A, who were members of the second-year preschool class, was 52.9 months, range 48 to 59. The older group, Group B, which included the third-year preschool class, was roughly 16 months older – mean age 68.8 months, range 62 to 72. Groups A and B were each further divided into subgroups, those given syllable (Syl) or phoneme (Pho) segmentation tasks. The mean ages of the subgroups were as follows: Group A-Syl, 51.8; Group A-Pho, 54; Group B-Syl, 69; Group B-Pho, 68.6.

The level of intelligence of the preschool subjects was measured by the Good-enough Draw-a-Person Test (DAP). This was the measure of intelligence used in the comparison study (Lieberman et al., 1974). The mean IQs on the DAP were as follows: Group A-Syl, 98.6; Group A-Pho, 105.8; Group B-Syl, 102.1; Group B-Pho, 101.2. Across preschool classes, the mean IQ was 102.2 for Group A, the younger class, and 101.6 for Group B, the older class.

The elementary school sample included two groups of 80 children each (half boys, half girls) attending, respectively, the first grade (mean CA 84.3) and the second grade (mean CA 96.8). The mean ages across segmentation tasks and grade were practically identical for the first grade: 84.2 and 84.3, respectively, for the Pho and Syl tests, and for the second grade, 96.8 for each task group.

The level of intelligence of the elementary school children was assessed by the Verbal Scale of the Wechsler Intelligence Scale for Children (WISC). When computed across tasks, the mean IQ was 107.2 for the syllable group, 107.4 for the phoneme group. When computed across grade levels, the IQs for first and second grades were 109.2 and 105.4 respectively.

Procedure

The procedures were modeled as closely as feasible after the procedure of Liberman et al. (1974). Under the guise of a "tapping game," the child was required to repeat a word spoken by the examiner and then to indicate, by tapping a small wooden dowel on the table, the number (from two to four)² of segments (phonemes for group Pho and syllables for group Syl) in the stimulus items. The test items were spoken by the examiner (and repeated by the child) in a natural manner. Each child received only one of the two types of tasks. Instructions were the same for all the subjects in both the preschool and elementary school groups.

Procedures for the two experimental groups followed an identical format, differing only in the test items used for the two tasks. Four sets of training trials containing three items each were given (see Appendix 1). During training, each set of three items was first demonstrated in an order of increasing complexity (from two to four segments). When the child was able to repeat and tap each item in the triad set correctly as demonstrated in the initial order of presentation, the items of the triad were presented individually in scrambled order without prior demonstration and the child's tapping was corrected as needed. The test trials, which followed the four sets of training trials, consisted of 45 randomly assorted individual items of two, three, or four segments that were presented without prior demonstration and were corrected by the examiner as needed immediately after the child's response. Testing was continued through all 45 items³ (see Appendix 2 for the stimulus items). Each child was tested individually by the same examiner in a single session near the end of the school year.

Materials

The stimulus materials, including training and test trials, were the same for both preschool and elementary-grade children. For the 15 two- and three-syllable words as well as for the three- and four-phoneme words, the stress was always on the first syllable. Among the four-syllable words, 5 had the stress on the second syllable and 10 on the third. This uneven distribution reflects the frequency of occurrence in Italian.

Results

The question of whether there are overall differences between the language groups in level of performance on metalinguistic tasks can be assessed by the same scoring procedure employed with English-speaking children by Liberman et al. (1974). In that procedure, the comparison was made in terms of the

Table 1. *Percentage of Italian-speaking and English-speaking* children reaching a criterion of six successive correct responses without demonstration*

Age	Task			
	Phoneme		Syllable	
	Italian	English	Italian	English
Nursery	13	0	67	46
Kindergarten	27	17	80	48
First Grade	97	70	100	90

*Data from Liberman et al. (1974).

percentages of four-, five-, and six-year olds who reached a criterion of six correct trials without demonstration in syllable and phoneme segmentation tasks. When we carry out this same procedure, we find that the pattern of performance in the two language groups is similar but the success rate is quite different. As can be seen in Table 1, a higher proportion of the Italian children at each age level succeeded on each task. Even from the nursery level, the markedly greater percentage of Italian children reaching criterion is apparent. Syllable analysis was relatively easy as compared to the phoneme even for the English-speaking children, but the advantage of syllable over phoneme becomes even more striking with the Italians, especially at the preschool levels.⁴

In assessing further the question of whether the ability to abstract either type of segment varies with age in the same manner in Italian children as in their English-speaking counterparts, we tabulated the overall number of errors made by each child on the 45 items. The results of this tabulation are displayed in Figure 1. Considering the findings for all 220 children, it is apparent that there is, as would be expected, a marked improvement in performance level with increasing age. The errors of phoneme segmentation range from a high of 72.6% in four-year olds to 65.6% in kindergarteners, followed by a striking drop to 6.9% in the first elementary school grade and then a slight decrease to 5.8% in the second grade. Performance on syllable segmentation shows a similar falling trend across grade levels, but initial performance is much better and progress is more gradual (nearly linear) from grade to grade, decreasing from 35.1% in four-year-olds to 9.4% in the seven-year-olds (second graders).

The total error scores were subjected to a two-way analysis of variance. The effect of grade, $F(3,212) = 168.02, p < .0001$, task, $F(1,212) = 17.84, p < .0001$, and the interaction of task and grade, $F(3,212) = 45.86, p < .0001$, are all highly significant.

The significant effects of grade and task were anticipated, but the interaction is a new outcome. As may be seen from Figure 1, the interaction may result in part from an apparent reversal in the relative difficulty of the two tasks for the preschool and the school-age groups. As we noted earlier, the preschoolers found

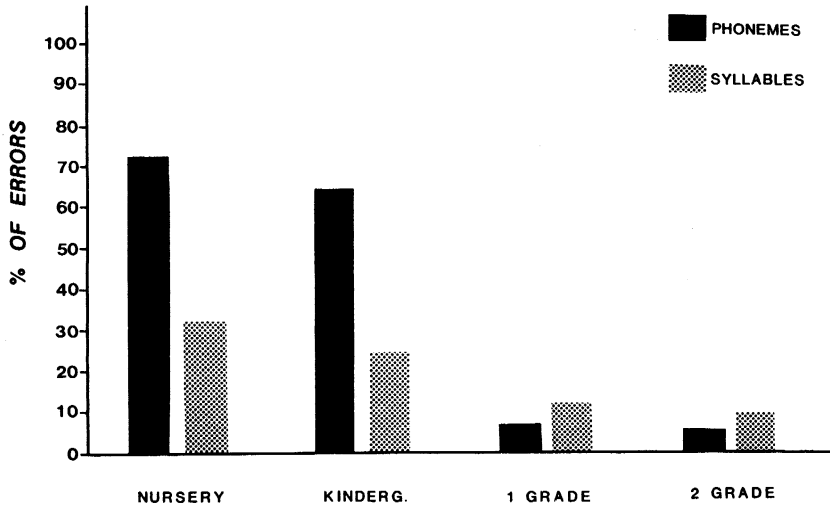


Figure 1. Percent errors in segmentation on the phoneme test and the syllable test in children at four age levels.

the Pho task much more difficult than the Syl task, just as their American counterparts did. In contrast to the preschoolers, the first- and second-grade elementary school children made relatively few errors on either task, but there were more errors on the Syl task than on the Pho task at both the first and second grade levels. Comparison of the differences by post-hoc t-tests shows them to be significant (first grade: $t(212) = 3.70$ $p < .001$; second grade: $t(212) = 2.99$, $p < .005$), an outcome to which we will return in the discussion below.

EXPERIMENT 2: SEGMENTATION ABILITIES IN READERS OF VARYING SKILL

For the purposes of this experiment, the 80 elementary school subjects from grades 1 and 2 were divided into groups of good, average, and poor readers by grade. A reading test consisting of 60 bisyllabic words derived from word lists in first- and second-grade reading texts (Carlino-Bandinelli, 1984) was used to assess reading achievement. For each grade, the 30 best and 30 poorest achievers were selected, leaving the remaining 20 as average readers. One half of each group was allocated to the Syl task and one half to the Pho task. Mean ages and IQs for these subgroups are given in Table 2.

Results

We now turn to further analysis of the data for first and second elementary grade children whose overall performance was depicted in the right-hand portion of Figure 1. Figure 2 displays their performance on the Syl and Pho tests separately

Table 2. Mean age and IQ by grade level, task, and reading achievement

		First Grade (n = 80)		Second Grade (n = 80)	
		Mean age	IQ	Mean age	IQ
Good readers (n = 30)	Pho	83.1 [79-92]	115.0 [89-135]	96.3 [91-101]	105.8 [80-128]
	Syl	84.4 [79-89]	106.9 [89-131]	98.2 [93-104]	105.8 [81-130]
Average readers (n = 20)	Pho	85.2 [75-90]	118.3 [81-138]	94.9 [89-103]	108.2 [80-142]
	Syl	84.8 [81-90]	106.3 [80-130]	95.0 [87-102]	115.0 [97-142]
Poor readers (n = 30)	Pho	84.6 [78-91]	103.0 [90-115]	98.5 [93-104]	98.1 [84-113]
	Syl	84.0 [77-92]	107.6 [90-140]	96.5 [90-102]	103.8 [84-131]

for subgroups of good, average, and poor readers. The differences between the subgroups were evaluated by a two-way analysis of variance with task (Syl and Pho tests) and level of reading achievement as factors. Both factors are significant: task, $F(1,148) = 8.63, p < .004$; reading level, $F(2,148) = 4.27, p < .02$. There was no interaction between them.

In spite of the absence of a significant interaction, two striking characteristics of Figure 2 prompted a more detailed assessment of differences in the performance of the reading achievement subgroups at grade 1 and grade 2. First, inspection of the figure suggests that the average readers improved in phoneme segmentation from grade 1 to grade 2, although the good and poor readers did not. This suggestion was supported statistically by t-tests: for average readers, $t(148) = 3.40, p < .001$ for the Pho task, while the results for good and poor readers were nonsignificant. For the Syl task, the poor readers improved significantly from grade 1 to grade 2, $t(148) = 4.53, p < .001$, while for the other two reading achievement groups the differences were nonsignificant. Thus we find that some changes in performance of each task occur between first and second grade. But since the changes are specific to reading level, they are more powerfully detected when we examine the reading-achievement subgroups separately.

DISCUSSION

Our concern in this investigation was to begin to sort out the effects of specific language characteristics on the development of metalinguistic awareness and the early stages of reading acquisition. To this end, and to eliminate confounding by procedural differences, we elected to attempt a direct replication with Italian children of an earlier study of American children (Lieberman et al., 1974). Accordingly, both in subject selection and in experimental design, the two studies are as similar as was practicable. But even so, in our attempt to make the Italian study match its American counterpart, we were thwarted to some degree by the

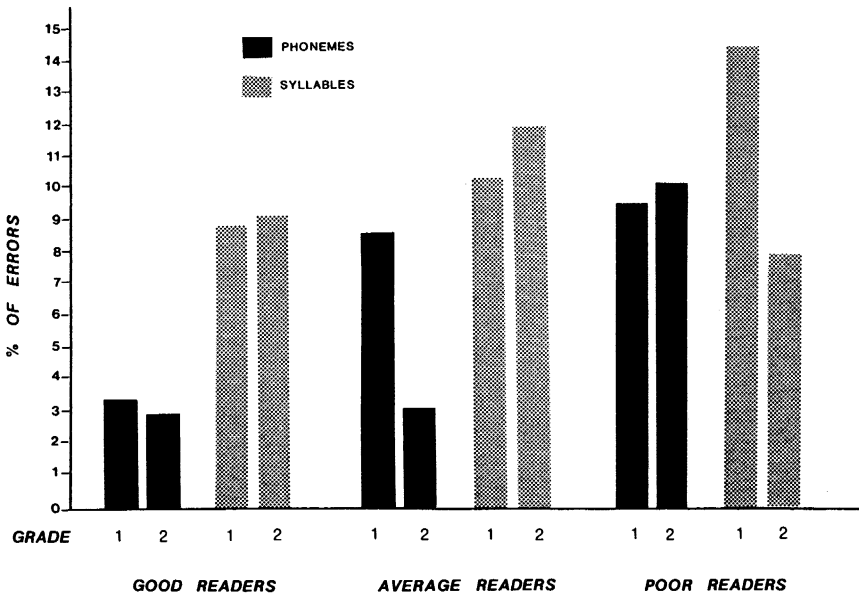


Figure 2. Percent errors in segmentation on the phoneme test and the syllable test in first- and second-grade children grouped by reading ability.

very nature of the language differences themselves. For example, because Italian contains very few monosyllabic words, it was not possible to construct a phoneme judgment task with monosyllables, as had been done in the English-language study. Similarly, since high-frequency Italian words tend to contain greater numbers of syllables than their counterparts in English (Carlson et al., 1985), the syllable test, which in the English version contains one-, two-, and three-syllable words, contains two-, three-, and four-syllable words in the Italian version. Though these differences might be expected to make the stimuli more difficult than in the American study, they apparently did not have a deleterious effect on performance, as we will see later. One further difference, but one which does not affect the comparisons we are making, is that the Italian study was expanded in scope to include second graders in addition to children in preschool and first-grade classes.

In discussing the findings, we will consider first the question of the development of metalinguistic awareness that was pursued in Experiment 1 and then the relation to reading achievement, which was investigated in Experiment 2.

Development of awareness of phonological segments

The present study demonstrated evidence of cross-language similarities as well as differences concerning the development of metalinguistic skills in pho-

nological segmentation. Let us first note the similarities. At the preschool level, the present study confirmed an improvement with age from nursery school to kindergarten, a progression that is consistent with a view that the early development of segmental analysis ability is under maturational control. It also confirmed that the greater difficulty of abstracting phonemic units than syllable units applies across languages that differ in their phonological structure. Up to the first-grade level, the findings on Italian children in Experiment 1 yield a pattern of results on both the Syl and Pho tests that is essentially consistent with the results on American children. At both preschool ages, the Italian children, like their American counterparts, had relatively little success in identifying phonemes and were more successful in identifying syllables.

To account for the earlier accessibility of the syllable in both language groups, we appeal to the suggestion by Liberman (1971) that the syllable may be easier to identify, whatever the language, because it is a temporally discrete phonetic unit, whether speech is considered from an articulatory or an acoustic point of view. Unless they already happen to be syllables, most phonemes, in contrast, have no independent existence, being always assimilated by coarticulation. On these phonetic grounds it makes sense that most phonemic segments would be harder to bring to consciousness.

Even after reaching school age, the Italian children of the present study show a basic similarity to their American counterparts. In both language communities, a sharp improvement in performance follows instruction in reading. In both, there was a marked decline in errors in both segmentation tasks after a short period of reading instruction. It is therefore judged that the present findings give further credence to the suggestion (see Read et al., 1984) that exposure to an alphabetic orthography has a positive effect on metalinguistic awareness of phonemic segmentation.

So much for the similarities. The present study also brought to light several differences from its English parallel, which may be ascribed in part to structural differences between the languages. At the preschool level, we found a quantitative difference in the degree of accuracy in the two language groups – the Italians made fewer errors on both tasks. It is notable also that the Italian children performed more accurately despite having to deal with items containing greater numbers of syllables. We may speculate as to the reason for this difference in performance. We have suggested that because of the simpler open-syllable structure as well as the small number of syllable types and vowel distinctions in Italian, segmental analysis into syllables would be easier than in a language like English, with its closed-syllable structure and more numerous syllable types and vowel distinctions. Similar results should therefore be attained in other languages that are similar in structure to Italian, like Spanish – an expectation that is borne out in the research of de Manrique and Gramigna (1984).

The level of performance of both groups improves markedly with first grade attendance. But there is a difference. By first grade, the Italian children are at ceiling on both tasks, but the Americans are not. The difference is most marked on the phoneme task, where only about 3% of the Italian children failed to reach criterion. By contrast, 30% of their English-speaking counterparts still fail the phoneme test at this age.

Several factors may account for the relative superiority of the Italian children's performance. These relate both to language structure and the orthography. As we have said, the uniform, open-syllable structure and the smaller number of different vowel sounds in the language must surely make the basic analytic task easier. Once reading instruction is initiated, the closer correspondence between letters and phonemes in the Italian orthography should further facilitate the child's development of sensitivity to sublexical structure. There is more often than not a closer one-to-one correspondence between letters and phonemes in Italian than is common in English. In consequence, it is fair to say that if one knows how to spell an Italian word, its phonemic makeup is almost automatically revealed.

In Figure 1, we note a further disparity with the results of Liberman et al. (1974): the errors on the Pho test for Italian first graders actually drop below the level of error on the Syl test, whereas for the American first graders, the Pho error rate, though dropping, remained higher than that for the syllables. (Although the error rate continues to diminish somewhat in the Italian second grade, the same reversal is evident.)

Given that for children below elementary school age phonemic segmentation was still so much more difficult than segmentation by syllable, what accounts for the reversal of difficulty for the Italian first- (and second-) graders? Our study does not provide a final answer to that question. Since there are so few errors of either phoneme or syllable segmentation in the Italian data, we probably need not be too concerned about the difference. However, we may speculate that given its fairly regular orthography, the small number of vowels, and the open syllable structure, reading and spelling practice in Italian may actually provide daily phonemic training for the learner, since each phoneme would be readily identified with a particular letter (and vice versa). If this line of reasoning is correct, skill in phonemic segmentation could increase at a faster rate than syllabic segmentation skill, thus accounting for the apparently paradoxical situation of a reversed pattern between Pho and Syl skills. The difference is particularly evident in the performance of the better readers, who presumably have made best use of the information provided.

Awareness of phonological segments and reading ability

We now turn to consider the analysis of the effects of differences in reading attainment on segmentation skills at each grade level. In the Italian study, unlike the parent American study, we have data for both first and second school years and for average readers as well as the extremes. As may be seen in Figure 2, the relationship between level of performance on the two segmentation tasks is different for good, average, and poor readers: the average group, not the good readers or the poor readers, showed the greatest improvement in phoneme analysis between first and second grade. Conceivably, this is the group that benefited most from continued instruction. The good readers may not have benefited so much because their performance was already near the asymptote. The poor readers may not have benefited because they still had unresolved problems with the orthography.

On the Syl test, on the other hand, it is the poor readers who appear to gain

with experience. Their relatively high error rates in first grade are consistent with initial confusion about how this unit relates to the orthography. It is of interest in this regard that the first-grade poor readers have a striking tendency to overestimate the number of syllables in a word. That is, an error analysis revealed that when poor readers made a mistake, their errors were overestimates three times more often than underestimates. This is consistent with the possibility that they are overestimating the number of syllables because they are sometimes confusing syllable structure with phonemic structure.

The question arises whether IQ can account for the differences we found on segmentation performance. Although there are differences among the age groups and reading ability groups on IQ, there is no consistent relationship between IQ and number of errors either on the Syl or the Pho test. For example, for Grade 1, the number of Pho errors is least for good readers (3.5%) and greater for average readers (8.5%) and poor readers (9.5%), but mean IQ for these groups does not decrease consistently with error rate. Instead, the good readers have a *lower* IQ (115.0) than the average readers (118.3), with the lowest IQ appearing for the poor-reader group (103.0). Similarly, Pho errors for the second graders are nonmonotonically related to IQ. Finally, in the one case where Syl errors do show an apparent relation with IQ – among second-graders, the direction of the relationship is counterintuitive: higher IQ is associated with the greater number of syllable errors. Thus, it seems implausible that IQ is an important factor.

In summary, the present study demonstrated evidence of cross-linguistic similarities as well as differences concerning the development of metalinguistic skills in phonological segmentation and their relationship to reading ability. At the preschool level, the present study confirmed that the greater difficulty of abstracting phonemic units than syllable units applies even across languages that differ in their phonological structure. In both language communities, a sharp improvement in performance also follows instruction in reading. In both, there was a marked decline in errors in both segmentation tasks after a short period of reading instruction. Concerning the relationship between level of reading skill and segmentation ability, Italian poor readers, like their American counterparts, are differentiated from the good readers by the phoneme test.

The present study, however, also brought to light several differences from its English parallel, which may be ascribed in part to structural differences between the languages. At the preschool level, we found a quantitative difference in the degree of accuracy between the two language groups – the Italians made fewer errors on both the syllable and phonemic tasks. In regard to the syllable task, the open-syllable structure of the Italian language was thought to play a facilitative role. In regard to the phoneme task, that factor in combination with the smaller number of vowels and relatively more shallow orthography may be relevant.⁵

The most striking disparity between the two language groups, however, appeared after school entrance. The decline in errors of both types was considerably more marked in the Italian sample. Moreover, with the decline there appeared in the Italian children a pattern of performance opposite to that displayed by both the Italian preschool group and its English counterpart. For the Italian first graders, syllable analysis now produced more errors than phonemic analysis. A similar reversal is evident in the Italian second grade, where there are no

comparable data in the English sample. We have speculated that differences in language and orthography are again at work. Of course, there is always the possibility that differences in teaching method should be held responsible to some degree for the differences found here. This is an unlikely explanation, however, since instruction in the Sardinian public schools, like the American, is an eclectic mixture of different approaches. Future research in other language communities and careful control of teaching methods will be needed to explore these possibilities further.

APPENDIX 1

Training Trials (number of segments in parentheses)

Phonemes			Syllables		
(2)	(3)	(4)	(2)	(3)	(4)
DO	ALA	CENA	RETE	LIMONE	SERENATA
SO	APE	URTO	CASA	PORTONE	ELEFANTE
NE	UVA	ALTO	LUNA	ALBERO	TELEFONO
LI	ZIO	NOCE	ASTA	CAVOLO	RITORNELLO

APPENDIX 2

Test Trials (number of segments in parentheses)

	Phonemes				Syllables		
LUCE	(4)	DI	(2)	TERMOMETRO	(4)	NEVE	(2)
MI	(2)	ERBA	(4)	BARBA	(2)	PIEDE	(3)
VOLO	(4)	DAL	(3)	AMICO	(3)	RUOTA	(3)
ORA	(3)	SE	(2)	UOVA	(3)	ORTO	(2)
SU	(2)	IERI	(4)	TEMPORALE	(4)	MARZIANO	(4)
LE	(2)	VASO	(4)	MURO	(2)	CARTONE	(3)
PER	(3)	SEI	(3)	SARTO	(2)	COPERTA	(3)
MA	(2)	TAC	(3)	FUTURO	(3)	TRENO	(2)
BAR	(3)	PIPA	(4)	BIRRA	(2)	RAMO	(2)
FUMO	(4)	MAI	(3)	LUMACA	(3)	ASCENSORE	(4)
NOI	(3)	SALE	(4)	INSALATA	(4)	MELONE	(3)
SI	(2)	ARCO	(4)	LAMPADINA	(4)	ARTICOLO	(4)
DUE	(3)	CI	(2)	ENTRARE	(3)	TAVOLO	(3)
FARO	(4)	TRA	(3)	GATTO	(2)	FINESTRA	(3)
AL	(2)	NO	(2)	CULLA	(2)	FORZA	(2)

APPENDIX 2 (cont.)

Test Trials (number of segments in parentheses)

	Phonemes			Syllables			
ARTE	(4)	TUBO	(4)	PRETE	(2)	FIUME	(3)
CON	(3)	UNTO	(4)	TOPOLINO	(4)	GAROFANO	(4)
BA	(2)	SUO	(3)	RAPINARE	(4)	VETRO	(2)
FA	(2)	BLU	(3)	CLIMA	(2)	CAVALLO	(3)
UNO	(3)	VA	(2)	TAMBURO	(3)	INCIDENTE	(4)
STOP	(4)	OTRE	(4)	PANTALONE	(4)	MONTANARO	(4)
SIR	(3)	IN	(2)	CARTOLINA	(4)	DRAGO	(2)
TU	(2)			PAPAVERO	(4)		

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NOTES

1. An earlier Italian-English comparative study by Lindgren, De Renzi, and Richman (1985) was an epidemiological investigation which had quite different objectives from the present research.
2. The segment-counting tests of Liberman et al. (1974) contained items with one to three segments. The scarcity of words of one phoneme or one syllable in Italian necessitated the change. Language differences also prevented forming the triads for the training trials in the Italian study in the same systematic fashion with which they were formed in the English-language materials.
3. In the Liberman et al. (1974) study, testing for each child was continued through the entire list or until the child reached the criterion of tapping six consecutive items correctly without demonstration. In the present study, all children were given the entire list but data are available for direct comparison of mean number of errors to passing (or failing) the criterion and of the mean number of children reaching criterion in both tasks.
4. The same pattern of differences was noted across the Italian and American studies when the data were tabulated in terms of trials to reach criterion, and in terms of mean errors to passing and failing the criterion.
5. Because of its many phonological similarities to Italian, the Spanish language would be a place to seek confirmation of these hypotheses. As it happens, the Spanish study by de Manrique and Gramigna (1984), to which we referred earlier, might have been

an appropriate candidate for such a comparison, particularly since, in regard to its stimulus materials at least, it was closer to the original Liberman et al. (1974) study than our Italian replication. Unfortunately, several procedural differences in the Spanish investigation prevent direct comparison with either of the other studies; these differences include absence of a four-year-old group, sampling at the beginning rather than the end of the school year, and special syllable segmentation training provided for the kindergarteners. It can be said, nonetheless, that the findings are in general agreement as to the relative difficulty of the phoneme over the syllable for the preschool ages.

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