Word awareness in hearing-impaired children

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ABSTRACT
Normally hearing children (aged 4-10) and hearing-impaired children (aged 6-14) were tested on word awareness skills, such as the distinction between words and their referents, and their ability to provide explicit definitions of word. Older children performed significantly better than younger children, and normally hearing children performed significantly better than hearing-impaired children. However, orally educated children with mild or moderate hearing losses did not perform better than children with severe or profound losses. Instead, hearing-impaired children exhibited marked metalinguistic deficits, regardless of their degree of hearing loss. Finally, bimodally educated children performed significantly worse than orally educated children on the metalinguistic tasks of the present study. The implications of these findings for educational instruction are discussed.

Metalinguistic ability refers to the conscious awareness of language and the ability to reflect on it; more specifically, it is the knowledge of language forms and functions (Bialystok, 1991). As such, it encompasses a diverse and extensive range of skills and knowledge (Scribner & Cole, 1981). Recent scholarly interest in this domain stems from the presumed relation of metalinguistic skills to cognitive development in general (Bialystok, 1986; Hakes, 1980; Markman, 1976; Templeton & Spivey, 1980; Van Kleeck, 1982) and to literacy in particular (Lundberg, 1978; Mattingly, 1984; Ryan, 1980).

Van Kleeck (1982) suggested that children in the preoperational period focus on either the content of a message or its form, but cannot do both. Because the content is more salient, they tend to ignore the form. By contrast, children in the concrete operational period can consider both aspects simultaneously, which permits them to view language as an object in its
own right. Several investigators have drawn attention to the striking links between metalinguistic abilities and reading acquisition (e.g., Allen, 1982; Bowey & Francis, 1991; Bryant, 1986; Ehri, 1979; Stuart & Coltheart, 1988). For example, prereaders often confuse syllables with words or phonemes, in contrast to readers, who readily segment sentences into words and syllables (Ehri, 1975; Liberman, 1973; Mann & Liberman, 1984). Moreover, there are age-related changes in associating spoken and written word length (Lundberg & Torneus, 1978).

Tunmer and Bowey (1984) outlined four types of metalinguistic skill that are specifically related to reading achievement: word awareness, awareness of phonological constraints, awareness of form, and pragmatic awareness. Word awareness, the focus of the present study, consists of various components of knowledge, including the notion that a word is a unit of language and an arbitrary phonological label (i.e., the word-referent distinction), and that the term word has specific, defining features (Bowey & Tunmer, 1984).

Papandropoulou and Sinclair (1974) first studied the development of children’s understanding of the concept word. They found that bilingual (French-Italian) 4-year-olds fail to separate words from their referents, accepting strawberry as a word “because it grows in the garden.” By about 5 to 7 years of age, children conceptualize words as labels, and by 8, they detach words from the objects they represent, understanding them in the context of meaning (e.g., “bits of a story”). Few children younger than 8 years are capable of distinguishing phrases from words, being inclined to accept word strings such as “from the house” as a word (Templeton & Spivey, 1980). Finally, between 8 and 10 years of age, children understand words as autonomous, meaningful units that are elements of grammatical classes (Papandropoulou & Sinclair, 1974).

Some studies of metalinguistic development have revealed an accelerated course of metalinguistic development for bilingual compared to monolingual children (Ben Zeev, 1977; Ianco-Worall, 1972). One interpretation of these findings is that different language experiences result in different patterns of metalinguistic development as opposed to overall acceleration (Bialystok, 1986).

The domain of metalinguistic awareness should be of special concern for populations with delays in speech, language, or reading. For example, 5- to 8-year-old language-disordered children have more difficulty making judgments of grammaticality and correcting agrammatical utterances than do peers, whether matched on chronological age, mental age, or language comprehension (Kamhi & Koenig, 1985; Liles, Schulman, & Bartlett, 1977). Moreover, such language-disordered children are also deficient in word, syllable, and sound awareness (Kamhi, Lee, & Nelson, 1985).

One population that is at risk for language and communication delays on the basis of reduced or degraded auditory input is the hearing impaired (for reviews, see King & Quigley, 1985; Quigley & Paul, 1984). Aside from speech intelligibility problems (Brownell, Trehub, & Gartner, 1988; McGarr, 1983; Monsen, 1983), the referential messages (in spoken or signed English) of 6- to 10-year-old hearing-impaired children are less precise than
those of their normally hearing peers (MacKay-Soroka, Trehub, & Thorpe, 1987), and their reception of referential messages (in spoken English or Signed English) is likewise delayed (MacKay-Soroka, Trehub, & Thorpe, 1988). These language and communication problems are compounded by deficiencies in syntactic achievement (Quigley, Wilbur, Power, Montanelli, & Steinkamp, 1976) and reading ability (Trybus & Karchmer, 1977). Nevertheless, there has been little metalinguistic research with hearing-impaired children, and the principal focus of existing studies has been on phonological segmentation skills. This research has revealed hearing-impaired children’s ability to segment their fingerspelled lexicons (Hirsh-Pasek, 1987), as well as age-related increases in the segmentation of Signed English sentences into words (Zorfass, 1981). Thus, we know that young hearing-impaired children are aware of words as units of language, at the very least.

Their awareness of aspects of meaning as opposed to form may be more problematic. For example, judging the synonymy of pairs of sentences (Signed English, Pidgin Sign English, or American Sign Language) seems to exceed the capabilities of 4- to 10-year-old hearing-impaired children (Borman, Stoefen-Fisher, Taylor, Draper, & Neiderkline, 1988).

In the present study, we focused on the relation between form and meaning, specifically, the distinction between words and their referents. We were also interested in comprehension of the term word, as reflected in children’s explicit description of form–function relations. As noted, normally hearing children go through a series of stages in their understanding of such concepts, from word–referent confusion at about age 4 to word–referent detachment by about age 8 (Papandropoulou & Sinclair, 1974; Templeton & Spivey, 1980). Moreover, children progressively refine their definition of word, culminating in adultlike defining criteria (i.e., incorporating form and meaning) by about age 10. Of particular interest in the present study was whether hearing-impaired children would exhibit a similar developmental sequence within a similar time frame. Although the normative or reference research in this domain had been accomplished in a foreign cultural context with bilingual children (Papandropoulou & Sinclair, 1974), the basic findings had been replicated with a sample of English-speaking children (Templeton & Spivey, 1980). Nevertheless, we felt it necessary to include a comparison sample of normally hearing children from the same geographic region as the hearing-impaired children.

On the basis of the well-documented English-language deficits of hearing-impaired children, we expected them to perform more poorly than normally hearing children. Nevertheless, we expected age-related improvement to be evident for both hearing-impaired and normally hearing children.

METHOD

Subjects

Hearing-impaired (HI) children (aged 6–14) were recruited as follows. School board authorities within and surrounding a major metropolitan area were asked to distribute letters to parents of HI children under their
jurisdiction who met the following criteria: normal intelligence as reflected in IQ test scores (i.e., 100 or above), no known disability aside from hearing loss, and age-appropriate class placement. All HI children were tested if (a) their parents consented, in writing, to their child’s withdrawal from classes for participation in the research, and (b) the children were in attendance at school on the test dates. The orally educated children were mostly mainstreamed with regular support from itinerant teachers of the hearing impaired and additional support, in some cases, from speech pathologists and auditory/verbal therapists. A few children spent part of their school day in a special class (exclusively oral) for the hearing impaired. These orally communicating children had no signing skills, to the best of our knowledge (and that of their parents or teachers). The bimodally communicating children were all in segregated classes in regular or special day schools in which simultaneous communication, consisting of Signed English (Bornstein, Saulnier, & Hamilton, 1980) and spoken English, was the medium of instruction. A number of the bimodally communicating children had some exposure to American Sign Language (ASL) from a few deaf peers of deaf parents in their school setting. Telephone interviews with parents revealed that some bimodally communicating children had been in intensive oral programs, without success, before changing to a total communication (TC) program. The parents reported their own use of simultaneous communication (spoken and Signed English) with their children. One TC child had HI parents and a normally hearing (NH) sibling. Accordingly, this child was exposed to ASL (from both parents) and spoken English (the sibling and one parent who often spoke) at home and Signed English at school. The reported hearing loss of each child was verified by obtaining a copy of the child’s most recent audiogram from the appropriate hospital or audiology clinic. Similarly, a review of school records confirmed that each child had average or better IQ test scores. No formal evaluation of language or reading proficiency was available on any of the children, although teachers reported, by means of a behavior checklist, that all of the HI children in the final sample were managing well, both socially and academically, at school.

The NH children were 4, 5, 6, 7, 8, 9, and 10 years of age (±3 months) and were recruited from a large pool of families who had participated in auditory perception projects in our laboratory within the past few years. These children were drawn from a geographic area located within that sampled for the HI children, and a number of them attended the same schools. Like the HI sample, and like volunteers in our previous studies, these children were largely from middle-class families. According to parental report, the school-aged NH children were in age-appropriate grades in community public or Catholic (but publicly funded) schools. Moreover, parents of all NH preschoolers and school-aged children reported having no HI relatives. Finally, mothers of eight NH participants were tested to provide a small set of adult reference data. These women (aged 26–32) all had normal hearing, as well as no family history of speech, language, or hearing problems. Moreover, they all had some postsecondary education.
Table 1. Characteristics of the normally hearing (NH) and hearing-impaired (HI) children

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number</th>
<th>Age range (years)</th>
<th>Mean age (years)</th>
<th>Hearing loss* (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-olds</td>
<td>15</td>
<td>3;9-4;3</td>
<td>4;1</td>
<td>-</td>
</tr>
<tr>
<td>NH younger</td>
<td>20</td>
<td>5;9-8;0</td>
<td>7;4</td>
<td>-</td>
</tr>
<tr>
<td>HI oral younger</td>
<td>20</td>
<td>6;7-9;9</td>
<td>8;3</td>
<td>40-108 dB (67)</td>
</tr>
<tr>
<td>NH older</td>
<td>19</td>
<td>8;0-10;3</td>
<td>9;9</td>
<td>-</td>
</tr>
<tr>
<td>HI oral older</td>
<td>19</td>
<td>10;0-14;0</td>
<td>12;5</td>
<td>44-103 dB (68)</td>
</tr>
<tr>
<td>TC</td>
<td>11</td>
<td>6;8-14;0</td>
<td>9;9</td>
<td>85-120 dB (107)</td>
</tr>
</tbody>
</table>

*Unaided pure tone thresholds averaged over 500, 1000, and 2000 Hz.

School-aged participants were divided into younger and older subgroups (see Table 1). For children to be included in the final sample, the audio- or videotaped records of the test session had to be intact, and all of their responses (spoken or signed) had to be fully intelligible to trained observers. The final HI sample consisted of 11 children from TC programs and 39 from oral programs, the latter group subdivided into 20 younger children (6;7-9;9) and 19 older children (10;0-14;0). Although 15 NH children were tested at each of the seven age levels (4-10), a subset of 20 younger (5;9-9;0) and 19 older (8;0-10;3) school-aged children was randomly chosen from the larger group for the final NH sample. Thus, the final sample of HI children was older than that of NH children, a difference that was statistically significant for the younger group, \( t(38) = 3.64, p < .001 \), as well as the older group, \( t(36) = 8.15, p < .001 \). This age advantage of the HI children generated an even stronger test of the hypothesis of poorer performance by HI children. The entire group (\( N = 15 \)) of 4-year-olds (3;11-4;3) was retained for general comparison purposes, despite the absence of age-equivalent HI children. Characteristics of the sample, including unaided pure tone thresholds of the HI children, are presented in Table 1.

Procedure

Each child was interviewed individually, either in a quiet room in school or on the university premises. The interview session was audiotaped or videotaped in the case of NH children and was videotaped and audiotaped in the case of HI children. The interviewer, a hearing person with deaf parents, had extensive experience in employment (including professional interpreting) and social contexts with HI individuals who spoke or signed. The interview was conducted in spoken English for NH and orally educated HI children and in Signed English for bimodally educated children. Most of the bimodally educated children communicated in Signed English, with vocal accompaniment but little intelligible English. Nevertheless, two of these children did communicate simultaneously in Signed and spoken English. A second tester was present to record the children’s responses (verba-
tim) on data sheets for later comparison with written transcripts derived from the audio and video records. (Transcripts of the bimodally educated children were later prepared by an NH adult who was skilled in Signed English and ASL. Transcripts of the orally educated HI children were prepared by an NH adult who interacted regularly with deaf adults and children.) Participants were asked a series of questions to probe their understanding of the concept word. First, they were asked, “What is a word?” Then, they were asked, “Is happy (chair, because, pnifm, sleep, the) a word? Why is/isn’t X a word?” In addition, they were asked to provide examples of long, short, and difficult words, and to justify each answer. Finally, they were asked to make up a word and to use the made-up word in a sentence.

RESULTS

Scoring for the questions “What is a word?” and “Why is/isn’t X a word?” was as follows: 1 point if there was no response or it was irrelevant; 2 points if the word was tied to the referent (e.g., “chair is a word because you can sit on it”); 3 points if the child referred to elements of words such as sounds or letters (“a bunch of letters”) or to global functions (e.g., “something you say” or “means something”); and 4 points if the child referred to specific linguistic functions (e.g., “part of a sentence”). Examples of long, short, difficult, and made-up words received 1 point if they were irrelevant or inappropriate, 2 points if they were correct but unjustified, and 3 points if correct and appropriately justified. The maximum total score across all questions was 40 points. Two of the authors (GMG and SET) refined the coding scheme until there was near-perfect agreement for the NH sample. Independent coding of a subset (20%) of the HI children by a relatively naive observer also yielded near-perfect agreement (94–100% for each of the questions and response categories). The high level of reliability was likely attributable to the anchoring of each point of the scale by specific examples from children. Children’s provision of relatively similar answers also facilitated the coding process. Performance of NH and HI children can be seen in Figure 1.

The main statistical analysis focused on the groups of younger and older NH and HI children of school age. The size of the HI sample precluded consideration of the degree of hearing loss in this analysis. Moreover, the small TC sample necessitated their exclusion from this analysis. Performance comparisons were effected with a 2 (hearing status) × 2 (age group) analysis of variance. There was a main effect of age, $F(1, 74) = 19.55$, $p < .0001$, and of hearing status $F(1, 74) = 19.02$, $p < .0002$, indicating that older children performed better than younger children, and that normally hearing children performed better than hearing-impaired children. Neuman–Keuls multiple comparisons revealed that the older NH children (8+ years) performed significantly better than all other groups, whether NH or HI. These tests also revealed that the older HI children outper-
formed the younger HI children, and that the younger NH children outperformed the younger HI children.

A separate evaluation of performance as a function of degree of hearing loss (collapsed across age) failed to reveal differential performance for orally educated children with severe-to-profound hearing losses compared to those with mild-to-moderate losses, $t(37) = .94, p > .35$. Finally, to compare TC with oral HI children, 11 children with severe-to-profound losses were selected randomly from the oral sample ($N = 39$), with the constraint of children’s ages being equivalent to those of the TC sample (age range = 6;1–14;0; mean age = 9;9). This analysis revealed significantly better performance by oral HI children (mean hearing loss = 88 dB) than by TC children (mean loss = 107 dB), $t(20) = 3.31, p < .001$.

Perhaps the data can best be understood in the context of descriptive information about the NH sample. Children aged 6 and younger were puzzled by the question “What is a word?” and responded primarily with “I don’t know” or irrelevant utterances (“There’s a wolf outside” [4;0]). Sometimes they answered this definitional question by providing an instance of a word: please (4;2), yes (4;3), elephant (4;3). By age 6, many children included word elements in their responses (“some letters mixed together” [6;3]). By age 8, they referred to global functions of words (“something you say and something you use to write with” [8;3]). By age 10, children had a more sophisticated understanding of the concept word, but their definitions were still somewhat imprecise. Their responses typically included descriptions of specific linguistic functions (“A word is something that you would use in a sentence” [10;0]), but no child made explicit reference to the arbitrary relation between words and referents or effectively distinguished word from phrase. Moreover, the definitions of even the oldest children focused
on either speech or writing, but not both. Despite adults’ use of richer vocabulary and more complex sentence structure, their definitions embodied limitations similar to those of 10-year-olds. For example, they also ignored the distinction between word and phrase (“A word is something you say verbally that makes sense or means something”; “A word is an idea”) and typically referred to spoken or written language, but not both.

Children’s pattern of responses to content words (“Is happy, chair, sleep a word?”) revealed that word–referent confusion was prevalent (sleep: “because when you’re really tired, you take a little nap” [4;3]) until about age 8 (“... because you could use sleep in a sentence” [8;0]) and was still evident in a number of 8- and 10-year-olds. In the case of function words (“Is because, the a word?”), “I don’t know” responses were common until age 7, after which there was increasing mention of global functions (“The is a word because it is made up of a whole bunch of letters” [8;1]) or linguistic functions (“... because it can start a sentence for you” [9;11]). Interestingly, children’s mention of specific linguistic functions appeared earlier for function than for content words. Since function words have no concrete referents, children may be able to reflect on their functional role at an earlier age.

There was considerable uncertainty surrounding the word status of *pniifm*, with “I don’t know” responses being prominent at all ages. By age 8, the typical response was inadequate or incomplete, referring mainly to subjective criteria (“I wouldn’t use it in a sentence” [8;1]); “It’s not a word because I don’t know what it means” [8;3]). Although many 10-year-olds were similarly confused, some showed awareness that *pniifm* might be a word even though it was not in their own vocabulary (“I don’t know that word – maybe a cold” [9;11]); “It may be Hindu” [9;11]). Adults offered surprisingly egocentric justifications (“because I’ve never used it”; “I’ve never heard of it before”). No adult mentioned *pniifm*’s phonological characteristics and, therefore, its likely exclusion from English.

In the case of long, short, and difficult words, children aged 6 and younger offered objects with associated properties (e.g., *snake*), justifying their choice with reference to relevant attributes (e.g., “some snakes are very long”). The 6-year-olds often gave ambiguous answers (e.g., a long word describing a long object), but could not justify them (“Dinosaur – it is just long” [6;2]). By age 8 and beyond, most children provided appropriate examples and justifications (“department ... cause it’s got so many letters” [10;0]). (Further qualitative and quantitative analyses of the responses of a larger sample of NH children are provided in Gartner, 1986.)

HI children’s special difficulties with word awareness can be brought into perspective by means of specific examples. Their definition of *word* often consisted of word lists (“tune, Wayne, name, go, stop, because” [7;4: oral, profound]; “two, Mr. Crawford, Mrs. Frankie, Anne, away” [8;6: oral, severe]; “something like what, how, shoe, people, verb, noun, pronoun” [11;9: oral, profound]). Moreover, their justifications revealed considerable word–referent confusion, such as accepting *sleep* as a word because “you go to sleep every night” (11;0: oral, moderate) or *chair* “because it’s an
object” (13;5: oral, severe). Such responses occurred relatively frequently with normally hearing 4- and 5-year-old children, but rarely with older children. A 9-year-old HI child (oral) responded to the request for a long word as follows: “Here’s a sentence about Christmas. If you want a thing, you’d better watch out. Because you know the sentence is a long word.” Again, this degree of confusion was atypical in normally hearing children beyond 5 or 6 years of age.

The TC children exhibited the greatest skill deficits. One 12½-year-old replied that chair was a word “because it’s a seat for you to sit on,” a response characteristic of normally hearing 4- and 5-year olds. Similarly, an 11-year-old offered sleepover as a long word “because friends sleep over in a big house.”

HI children, regardless of age or educational program, had great difficulty making up a word, a task that was also difficult for NH 4-year-olds (sweater; 4;3), but seemed perfectly reasonable for NH 7-year-olds and rather easy for NH 8-year-olds. Although a number of the older HI children complied, many hesitated for periods of 3 or 4 minutes, ultimately offering a very familiar word (e.g., Thursday, after noticing a calendar with Thursday circled [12;3: oral, profound]; thing [12;0: oral, moderate]). Although hearing loss had a considerable impact on performance in the sense that HI children performed much more poorly than their NH peers, degree of loss had no clear effect. What was particularly surprising was that mildly and moderately impaired children, who had no obvious expressive language deficits (word: “Some people use it in a sentence or diary” [9;10: oral, mild]; happy: “It’s part of a sentence but it’s also an expression of feeling” [13;6: oral, moderate loss]) and whose speech was at least superficially similar to that of their normally hearing peers, still struggled with a few of the questions. They often took several minutes to generate less-than-adequate answers to the creative as opposed to explanatory questions—made-up word: “I can’t” (8;5: mild); hard word: “I can’t think of anything” (12;0: moderate); long word: “chocolate . . . it has two words in it” (10;0: moderate); short word: “ouch . . . it has two letters in it” (9;10: mild). In this sense, mildly and moderately impaired children performed much like their severely and profoundly impaired peers.

DISCUSSION

The results revealed an orderly pattern of age-related improvement in word awareness in normally hearing and hearing-impaired children. Word-referent confusion was prevalent in normally hearing 4- and 6-year-olds and in hearing-impaired children in general. The oldest normally hearing children (10-year-olds) had less-than-perfect performance, but they typically described words in terms of their linguistic functions and readily offered appropriate examples and justifications of long, short, and difficult words. However, the imperfect explanations of adults challenge conventional wisdom about the metalinguistic awareness of actual as opposed to idealized
adults and underline the importance of adult reference data when evaluat-
ing children.

The present data reveal that the sample of children with intact hearing followed a similar course of development to French–Italian bilinguals (Pap-
dropoulou & Sinclair, 1974) and to unilingual English speakers (Tem-
pleton & Spivey, 1980) with respect to word awareness. What is also clear, however, is that word awareness in hearing-impaired children lags substan-
tially behind that of their normally hearing peers. Despite the significant age advantage of the hearing-impaired children, they experienced consider-
ably greater difficulty providing definitions, justifying their answers to questions, and, most especially, generating long, short, difficult, and made-
up words. Moreover, this difficulty was greatest in the case of bimodally educated (via spoken and Signed English) children.

With the exception of one child (85 dB loss), the bimodally educated children had profound hearing losses (>90 dB), which means that their mean hearing loss exceeded that of the comparison group of orally commu-
nicating children with severe or profound losses. It is, therefore, impossible to determine whether the substantial performance deficits of the TC chil-
dren stemmed from their considerably greater hearing loss, their educa-
tional program, their conventional mode of communication (Signed En-
lish), or some combination of these factors. Given the independence of degree of hearing loss and performance in the present sample of orally educated children, it is difficult to imagine how hearing loss, in itself, could account for the performance differences between the oral and TC children.

The orally communicating children typically used spoken, as opposed to written, language as their frame of reference in the present task (e.g., word: “something you say”). Presumably, this perspective would be less available to TC children and would likely result in poor performance on tasks with a spoken language bias. Nevertheless, their conception of signs might be comparable to, or even exceed, their oral peers’ conception of words. This question could be examined directly in future research. In principle, how-
ever, TC children could have used written language as their frame of refer-
ence. Finally, since oral programs continue to carry more prestige than TC programs in the educational jurisdiction from which these children were selected (Toronto area), it is possible that other factors such as superior family climate or intellectual potential differentially favored the orally edu-
cated children.

In any case, it is clear that hearing-impaired children perform very poorly on some metalinguistic tasks, specifically those concerned with word aware-
ness. If such skills are critical to reading acquisition, as some have claimed (e.g., Tunmer & Bowey, 1984), then it is hardly surprising that hearing-
impaired children exhibit substantial delays in reading. What is less clear, however, is the direction of effects. Do deficiencies in metalinguistic skill result in reading delay or do they result from reading delay? Some investiga-
tors contend that certain metalinguistic skills are byproducts of reading instruction (Bowey & Francis, 1991; Ehri, 1975), whereas others view cogni-
tive development as the mediator of both skills (Lundberg & Torneus, 1978; Van Kleeck, 1982).
Perhaps it is not surprising that hearing-impaired children with clear linguistic delays also exhibit metalinguistic delays. What also emerged, however, was that hearing-impaired children whose conversation before and during the test session revealed no obvious difficulties were nevertheless deficient in word awareness. This is not to suggest that these hearing-impaired children would exhibit no deficiencies on sensitive tests of linguistic ability, but rather to highlight the substantial discrepancy between their skills in the linguistic and metalinguistic domains. These findings point to the potential utility of adding word awareness or other metalinguistic skills to the language assessments of hearing-impaired children.

It is important to distinguish between what a child knows and what he or she can express clearly to others. For example, a child may understand a verbal form, but lack the productive use of that form (Snow, 1990). Templeton and Spivey (1980) referred to the former as performance-based knowledge and to the latter as verbalizable or reflective knowledge. It is possible, of course, that the hearing-impaired children had such performance-based knowledge, but were simply unable to verbalize the relevant concepts. Some examples could be seen in children who defined word by providing a list of words. In other cases, the relevant class of deficient knowledge was much less clear. For example, when children responded with “I don’t know,” did the problem stem from deficient performance-based knowledge or deficient verbalizable knowledge? In any case, disembedded or decontextualized communication, such as that required for the definitions and justifications of the present study, is deemed to be intimately involved in the development of literacy (Wood, 1988).

Conceivably, hearing-impaired children could profit from specific training and practice in the metalinguistic domain, as has been demonstrated for normally hearing children. For example, Bowey (1983) reported gains in word awareness after only nine 15-minute lessons, claiming that such gains also led to enhanced reading achievement. There is no reason to believe that word awareness training could not be adapted to the needs of hearing-impaired children, but its efficacy in promoting reading improvement remains to be demonstrated unequivocally. There are also reports of phonemic segmentation training leading to improved performance in reading (Bradley & Bryant, 1983; Oloffson & Lundberg, 1983; Treiman & Baron, 1983), but this domain is likely to present special challenges for hearing-impaired children. Perhaps a more promising remedial avenue is to engage hearing-impaired children in activities that have been shown to promote reflection on the adequacy and informativeness of spoken messages (Brown, Anderson, Shillcock, & Yule, 1984; Wood, 1988). Gains in the informational adequacy of hearing-impaired children’s messages would be of considerable value, whether or not they could be translated into gains in reading. There are suggestions, as well, that definitional skill is related to opportunities for practice (Snow, 1990).

Finally, the metalinguistic deficits observed in the present investigation were apparent in the oldest (aged 10–14) hearing-impaired children tested. It is important to establish whether the understanding of such concepts improves during adolescence, culminating in adultlike awareness of words,
albeit at a later date. It is also important to ascertain the precise relations between word awareness and reading achievement so that educators can have an informed basis for remedial action.

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