Why Ambiguity Detection Is a Predictor of Early Reading Skill

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This study was designed to determine the contributions of metalinguistic skill and psycholinguistic processing ability to children’s ability to detect the ambiguity of sentences and the relationship among all three factors to early reading ability. A total of 20 first graders and 20 second graders were given tasks testing the following abilities: ambiguity detection, conservation, lexical processing, and reading comprehension. Although intercorrelations among all four tasks were highly significant, regression analyses indicate independent contributions of processing and metalinguistic skills to ambiguity detection, which is, in turn, the sole predictor of reading comprehension. A developmental sequence is hypothesized. The authors suggest that ambiguity detection can be used to identify children who are at risk for reading failure and that training in ambiguity detection can be used in reading-readiness training and as an intervention tool.

Keywords: language and linguistics; acquisition and development; literacy; vocabulary; elementary school age; quantitative designs; Piaget’s stages of cognitive development; reading; research

A number of metalinguistic skills have been shown to be associated with children’s ability to read in the early school years (Tunmer & Hoover, 1992). The most studied is phonological awareness: the ability to perceive the continuous spoken-speech signal, as composed of discrete phonemic segments. Clearly, this perceptual skill underlies the foundation of reading, the grapheme–phoneme correspondence, which allows words to be decoded. Testing of phonological awareness is a major component of programs to identify children who might be at risk for reading difficulty, and training in phonological awareness is incorporated into reading readiness and remedial reading programs (Adams, Foorman, Lundberg, & Beeler, 1998; Ball & Blachman, 1991; Blachman, 1997; Bradley & Bryant, 1983; Gillon, 2005; Hogan, Catts, & Little, 2005; Torgesen, 1999). The relationship of other metalinguistic skills to early reading is less well understood. One skill—namely, the ability to perceive and report that an ambiguous sentence has two distinct meanings—is the topic of the current study.

A small number of studies have demonstrated a link between ambiguity detection and early reading. Hirsh-Pasek, Gleitman, and Gleitman (1978) showed that good readers are better able than poor readers to detect the humor in jokes and puns that turn on ambiguity. Wankoff (1983) demonstrated a correlation between ambiguity detection ability and reading success in children from kindergarten to third grade. In a longitudinal study, Cairns, Waltzman, and Schlisselberg (2004) showed that the ability to report the dual meanings of lexically ambiguous sentences when children were prereaders is a significant predictor of reading ability a year later. In that study, ambiguity detection accounted for half the variability in the children’s reading scores a year later. A recent study of third graders (Zipke, 2006; Zipke, Ehri, & Cairns, 2008) demonstrated that training in riddle comprehension, as well as homonym and sentential ambiguity detection, produced an increase in reading comprehension scores, when compared with those of an untrained control group. Taken together, these studies suggest that testing and training in ambiguity detection can eventually take a place beside phonological awareness in reading readiness and remedial reading programs. A question of theoretical and practical interest then becomes, what is the nature of the ambiguity detection task that makes it a

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predictor and an accelerator of reading ability in school-age children?

Two distinct, though not mutually exclusive, explanations have been offered for the relationship between ambiguity detection and reading skill. It is the purpose of the current article to evaluate the contribution of both these factors. Wankoff (1983) and Zipke (2006) both suggested that it is the metalinguistic nature of ambiguity detection that makes it a predictor of reading skill. Metalinguistic skill is the ability of an individual to regard language as an object that can be manipulated independently from its expressive and receptive use. Such a skill includes the ability to dissociate form from meaning and engage in language play.

Metalinguistic skill is critical to reading ability because oral language knowledge is not sufficient for reading to develop. Rather, the individual must learn to bring his or her knowledge of oral language to bear on written language. From this perspective, reading ability appears to require a cognitive developmental achievement. The individual engages in controlled processing of language and appears to be able to reflect on the structural features of language: phonological, syntactic, lexical, and pragmatic, apart from content (Tunmer & Hoover, 1992).

Other metalinguistic skills, many of which are also related to early reading, include syntactic awareness, the ability to make grammaticality judgments, word segmentation, and paraphrase comprehension (Bentin, Deutsch, & Liberman, 1990; Bohannon, Warren-Leubecker, & Hepler, 1984; Cairns, Schlisselberg, Waltzman, & McDaniel, 2006; Dermont & Gombert, 1996; Fowler, 1988; Nation & Snowling, 2000; Pratt, Tunmer, & Bowey, 1984; Scholl & Ryan, 1980; Tunmer, Herriman, & Nesdale, 1988). The metalinguistic account of the relationship between ambiguity detection and early reading skill is that ambiguity detection, like other metalinguistic skills, is symptomatic of a general appreciation of language as an object, distinct from being merely a tool for communication.

Cairns et al. (2004) put forward another hypothesis for the relationship between ambiguity detection and early reading. They took as their point of departure the simple view of reading (Gough & Tunmer, 1986; Hoover & Gough, 1990; Tunmer & Hoover, 1992)—namely, that successful reading is the product of decoding and listening comprehension skills. In recent years, psycholinguists have extensively studied the comprehension of spoken language, by children and by adults. There is a rich psycholinguistic literature detailing the contribution that the processes of lexical access and structural analysis make in sentence comprehension (Cairns, 1999; Frazier & Fodor, 1978; Mitchell, 1994; Pritchett, 1988, 1992; Simpson, 1994; Swinney, 1979). Because the meaning of a sentence depends on the meanings of its words and their structural organization, the comprehension of a spoken sentence depends on the ability of the hearer to access the words from his or her lexicon and provide a structural organization based on one’s ability to apply his or her grammatical knowledge. To perceive that a sentence with a single form can have two meanings, one must generate both meanings. Thus, the metalinguistic ability of ambiguity detection can be expressed only after the psycholinguistic processing operations have been applied to generate two distinct meanings. From this view, ambiguity detection is symptomatic of the flexible operation of lexical and structural processing operations, which are used in the comprehension of spoken language (listening comprehension) and in reading.

The dual meaning of a lexically ambiguous sentence rests on a single ambiguous word, such as in the sentence “The children found the bat near the fence.” The lexical processing operations involved in the comprehension of sentences with lexical ambiguities have been studied rather extensively. Studies of adults (Swinney, 1979) and children (Love, Swinney, Bagdasaryan, & Prather, 1999; Swinney & Prather, 1989) demonstrate that when they encounter an ambiguous word in a sentence, they retrieve both meanings and select one to insert into the meaning of the sentence being processed. Selection is determined either by prior context (if relevant) or by variables such as differential bias of the ambiguous item. In any event, only one meaning is ultimately computed for the lexically ambiguous sentence. The hearer is not consciously aware of the retrieval and selection processes, only of the final sentence meaning. To create two meanings of a lexically ambiguous sentence, the hearer must first compute one meaning, then reprocess the sentence, selecting in the second pass the alternative meaning of the ambiguous lexical item. Both are then held in working memory, and the ambiguity can be perceived.

Although the present study dealt only with lexically ambiguous sentences, a discussion of the relationship between ambiguity detection and early reading would not be complete without a brief mention of structurally ambiguous sentences. A structurally ambiguous sentence is one that is composed of unambiguous words but has two meanings by virtue of different structural organizations of those words. For instance, the sentence “The woman tickled the baby with the bear” is structurally ambiguous because the words can be organized so that (a) “with the bear” is associated with “tickled” and so
tells how she tickled the baby or (b) “with the bear” is associated with “the baby” and so tells which baby she tickled. Zipke (2006) tested and taught lexical and structural ambiguities but did not distinguish between them in her analysis. Cairns et al. (2004) used both kinds of ambiguities and found that first graders (pre-readers) were unable to perceive their ambiguity. However, when the children were in second grade, they were able to do so to some extent, and their scores were significant predictors of third grade reading success. Cairns et al. argue that detection of structural ambiguities relies on effective employment of structural processing skills.

To report that a lexically ambiguous sentence has two distinct meanings, the hearer must go through the following operations: First, the lexical processor must generate two sentences; next, those sentences must be held in short-term memory while metalinguistic processes apply, thereby allowing the hearer to simultaneously address both sentences and report that a single sentence form has two meanings. Our goal in this study was to study these two sets of operations separately. We needed a task that would evaluate cognitive abilities underlying metalinguistic skill and another that would test the lexical processing operations that must take place before metalinguistic examination. Our plan was to measure the contribution of each skill to ambiguity detection ability and all three to reading comprehension.

Our task for the present study was to select tasks that would relate to each hypothesized ability underlying ambiguity detection. We needed a task that would test the metalinguistic aspect of ambiguity detection independent of lexical processing operations and another that would test lexical processing operations independent of metalinguistic skill. For the former, we selected the cognitive ability to conserve. The metalinguistic ability to separate form from meaning and address each simultaneously has been related to the cognitive ability to decenter, which develops in the Piagetian stage of concrete operations (Hakes, 1980; Tunmer & Hoover, 1992; Wankoff, 1983). Decentering is the ability to simultaneously evaluate a perceptual array from two different dimensions. It underlies the ability to conserve, which is a hallmark of the concrete operational period of development. For example, to report that the amount of liquid does not change when it is poured from a tall narrow glass into a short wide one, the child must simultaneously attend to the height and the width of the glasses. A number of metalinguistic skills have been shown to be related to conservation (Hakes, 1980; Schlisselberg, 1988; van Kleek & Reddick, 1992; Wankoff, 1983). The theory is that when a child moves into the cognitive stage of concrete operations, she or he develops the ability to decenter. That ability is reflected in perceptual tasks, such as conservation of mass, number, and so on, and in metalinguistic skills requiring form and meaning to be simultaneously regarded. In the current study, we have related children’s ability to detect lexical ambiguities to their ability to conserve. We take this relationship to be indicative of the cognitive development associated with the metalinguistic nature of ambiguity detection.

To identify the aspect of ambiguity detection that is indicative of lexical access skill, we selected a task designed by Frommer (1975) that is a psycholinguistic task that does not rely on the perception of ambiguity but does rely on flexible lexical-access processes. After ascertaining the child’s preferred meaning for an ambiguous sentence, we presented that sentence in a context that would bias it toward the other meaning. The logic is that if the child has sufficiently sophisticated lexical access skills, she or he will be able to access the nonpreferred meaning in response to contextual bias. Biasing contexts were placed either before or after the ambiguous sentence. Swinney (1979), Swinney and Prather (1989), and Love et al. (1999) showed that context affects not the retrieval of dual meanings for lexically ambiguous words but the selection of the appropriate meaning, which can occur before the completion of the sentence. When the biasing context occurs before the ambiguous sentence, it creates a context to guide initial meaning selection. Cairns et al. (2004) suggested that the relationship between lexical processing skill and reading lie in the child’s ability to reprocess sentences that have already been processed. Context following the ambiguous sentence mimics this aspect of processing. Its effectiveness tests the child’s ability to retrieve the second meaning in response to context. Note that neither aspect of the task requires that the child ever simultaneously hold both meanings of the sentence or report two meanings. The ability to switch meanings will then be an indicator of the contribution of psycholinguistic skill to ambiguity detection independent of metalinguistic ability. According to the lexical processing theory sketched above, context that occurs before the lexically ambiguous sentence will direct the initial selection of an appropriate meaning from the two retrieved. Context that occurs following the lexically ambiguous sentence would direct the reprocessing of the ambiguous word to select the alternate meaning to the one initially selected. We were therefore interested in determining whether context occurring before or after the lexically ambiguous sentence would be more successful in inducing switching.
The goal of our study was to investigate the relationship between reading skill and ambiguity detection ability and, furthermore, to determine the contribution of metalinguistic and lexical access skills to that relationship. To this end, first- and second-grade children carried out the following four tasks: a test of reading comprehension, a test of lexical ambiguity detection, a test of conservation skill, and a test of the ability to switch the interpretation of an ambiguous sentence in response to a context that occurred before or after the ambiguous sentence.

Method

Participants

Participants for this study were attending a New York City public school in a primarily White middle-class neighborhood in Queens, New York. Participants comprised 20 first graders (ranging in age from 6.1 years to 6.8 years, with a mean age of 6.4 years) and 20 second graders (ranging in age from 7.2 years to 8.2 years, with a mean age of 7.7 years). Children were selected on the basis of parental permission slips that had been sent home. Students were judged to be of middle socio-economic status based on information obtained from classroom teachers regarding parent occupation. Parents were not asked about their ethnic affiliation; however, visual observation of the participants suggested that a majority—approximately 90%—were Caucasian whereas the remaining 10% were African American and Hispanic. Gender of the participants was not noted, because it was not a variable in the study. Approximately 60% of the participants were female and 40% were male. Children were considered to be functioning within normal limits, representative of the population, and deemed eligible to participate if they demonstrated that had (a) no suspected learning deficit, emotional disturbance, or retardation, according to the classroom teacher; (b) fluency in English, as reported by the classroom teacher; and (c) appropriate conversational skills, as demonstrated in a 5-min informal interchange with the first author, a certified speech-language pathologist. Dialogue involved elicitation of information and comments by the evaluator about the child’s family, interests, hobbies, reaction to school, and so on.

Materials and Procedures

Reading. Because we were interested in reading comprehension, two subtests of the Woodcock Reading Mastery Test (Woodcock, 1973) were administered, using standard procedures: first, Word Comprehension, in which the child provides the missing word from a verbal analogy after reading it to himself or herself (the highest possible score is 70, so the scores can range between 1 and 70); second, Passage Comprehension, in which the child provides missing words to sentences and paragraphs in a cloze procedure (the highest possible score is 85, so the scores can range between 1 and 85).

Conservation. The six tasks of the Concept Assessment Kit (Goldschmid & Bentler, 1968) were administered to evaluate conservation performance in six situations: two-dimensional space, number, substance, continuous quantity, weight, and discontinuous quantity. Standardized materials, instructions, and scoring procedures were used. In each task, the evaluator presented two equal quantities to the child. After eliciting a judgment of equality from the child, the evaluator altered the appearance of the one quantity, and the child was asked to explain his or her answer. Children were given 1 point for the correctness of judgment and 1 point for the correctness of the explanation. A child could earn 2 points for each task. Thus, a maximum of 12 points could be earned on the entire assessment.

Lexical ambiguity detection. Before receiving the ambiguity test, all children were required to pass a comprehension pretest. The pretest was designed to measure the child’s knowledge of each and his or her access to the two possible meanings for the eight lexical ambiguities. The instructions, the procedure, and the presentation of stimulus pictures were similar to those of the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981). Thus, the comprehension task tapped the child’s understanding of 16 meanings (2 meanings for each of the 8 ambiguous words). Each plate (16 total) consisted of four pictures, one of which represented one meaning for the ambiguous word. For example, if the evaluator said, “Show me ‘bat,’” the child would be required to point to the appropriate picture (e.g., either the baseball bat on one plate or the flying rodent on another).

The ambiguity detection task was administered following the pretest. Ambiguous sentences were constructed using the same words that had been pretested. Based on information from a pilot test, sentences were constructed so as not to be biased for either meaning of the ambiguity. Materials consisted of eight lexically ambiguous sentences and eight unambiguous sentences matched for length, syntactic complexity, and appropriateness. Two sets of sentences were independently randomized to control for effect of order of presentation.
One half of each grade received the first set of sentences first, whereas the other half received the second set of sentences first. See Appendix A for lists of all the experimental sentences.

First, the evaluator explained the notion that sentences can have more than one meaning. Three practice trials of ambiguity detection were discussed with the aid of accompanying pictures. The child was told that he or she would hear a number of sentences, some of which would mean one thing and some of which would mean two things. After hearing a sentence, the child was asked to judge whether the sentence in question had two meanings (ambiguity detection task). The child was then asked to put the sentence meanings into his or her own words. If only one meaning was given, the child was asked if the sentence could mean anything else. This was done for each sentence, whether the sentence was ambiguous or not. If the child detected the presence of two possible meanings, he or she was asked to indicate which of the two possible meanings he or she noticed first.

Children were given three opportunities for ambiguity detection:

**Spontaneous detection:** Children immediately perceived the dual meanings without additional prompting.

**Verbal probe condition:** If the child did not detect the ambiguity spontaneously, he or she was asked a question as a prompt—for example, “What did the bat look like?” (see Appendix B for verbal probe questions).

**Picture probe condition:** If the child still did not perceive a second meaning for the sentence, picture prompts were used. The evaluator had a collection of 8 × 10 line drawings—specifically, two pictures for each ambiguous sentence. The stimulus sentence was presented again, and the child was asked to point to the picture or pictures that represented the sentence meaning. If the child selected one picture, he or she was asked if the other picture could be appropriate as well. The child was then asked to listen to the stimulus sentence again and judge whether the sentence could mean one thing or two things. If the child said that the sentence could have two meanings, then she or he was asked to explain the two meanings.

Scoring was as follows: Children earned 3 points for a spontaneous detection, 2 points for a verbally prompted detection, and 1 point for a picture-prompted detection. Thus, the maximum score that a child could earn was 24, if the ambiguity of all eight sentences were detected spontaneously.

**Switching task.** The switching task was administered to 19 of the first graders and 19 of the second graders. It was designed to reflect the ability of children to switch from their initial interpretation of a lexical ambiguity to the other possible interpretation. For eight lexical ambiguities and four filler sentences, contexts were prepared. For each ambiguity, two contexts were devised, one for each possible interpretation. Each context would therefore disambiguate the lexically ambiguous sentence toward one of the two possible meanings.

Children were arbitrarily divided into two groups, to test the effect of the position of the context sentence—either preceding or following the ambiguous or filler sentence. Stimulus sentences for each group were counterbalanced for position of context sentence. The context sentence that was used with a stimulus sentence was preselected for each participant, depending on his or her preferred or initial interpretation of the lexical ambiguity. (This information had been obtained in the ambiguity detection task).

Participants were told that they were going to hear a little story and that they would be asked to provide some information to explain their understanding of the story. Following presentation of the context–sentence pairs, the child was asked a series of questions designed to tap his or her present interpretation of the lexical ambiguity—that is, whether the child had switched from his or her preferred or initial interpretation of the lexical ambiguity to the one suggested by the contextual information provided in the task. (See Appendix B for stimulus sentences, context sentences, and follow-up questions).

**Results**

Table 1 presents the means for the four measures that we administered. Independent-sample *t* tests indicate that the first and second graders differ significantly in ambiguity detection, *t*(38) = 4.154, *p* < .0001, conservation, *t*(38) = 4.11, *p* < .0001, and comprehension, *t*(38) = 6.763, *p* < .0001, but not in numbers of switches, *t*(36) = 1.41, *ns*. Neither did position of the context sentence have an effect, *t*(38) = .71, *ns*. We can conclude that switching is easier than ambiguity detection because although all children were able to switch on at least a few trials, 6 first graders (32%) had ambiguity detection scores of zero.

Table 2 shows the intercorrelations among all the measures, and all are highly significant. Details of the interrelationships among the variables—the purpose of this study—were investigated through two regression analyses. The first examined the contributions of the variables of
conservation, switching ability, grade, and ambiguity detection to reading comprehension, $R^2 = .645, F(4, 33) = 15.006, p < .0001$. Making independent contributions to reading comprehension were grade ($\beta = .534, t = 4.078, p < .0001$; partial correlation = .579, $p < .0001$) and ambiguity detection ($\beta = .375, t = 2.063, p = .014$; partial correlation = .413, $p = .014$), but neither conservation ($\beta = -.033, t = -.239, ns$; partial correlation = -.042, $ns$) nor switching ability ($\beta = .057, t = .464, ns$; partial correlation = .08, $ns$) made any independent contribution. Thus, neither switching nor conservation bears an independent relation to ambiguity detection.

We performed a second regression analysis to examine the contributions of switching ability and conservation to ambiguity detection. For the full model, $R^2 = .41, F(2, 35) = 12.158, p < .0001$. Both switching ability ($\beta = .329, t = 2.32, p = .027$; partial correlation = .364, $p = .027$) and conservation ($\beta = .431, t = 3.025, p = .005$; partial correlation = .455, $p = .005$) make significant separate contributions. Thus, ambiguity detection has independent relationships with switching and conservation.

We take these results to mean that the contribution of switching and conservation to reading comprehension is mediated by their relation to ambiguity detection. Thus, switching ability (a measure of lexical retrieval skill) and conservation (a measure of the cognitive underpinning of metalinguistic skill) both independently contribute to ambiguity detection. As such, ambiguity detection is a predictor of reading comprehension, but neither switching nor conservation is an independent predictor.

**Discussion**

Given the results, we propose an answer to the question posed by the title of this article. It is not the case that people need to detect ambiguity in sentences to read successfully; rather, the ability to detect ambiguity is symptomatic of two characteristics of successful beginning readers. First, there is a metalinguistic component to ambiguity detection that contributes to reading skill. This is the ability to consciously apply language knowledge to linguistic tasks such as reading. Second, there is a psycholinguistic processing aspect to ambiguity detection that also contributes to reading skill. In the present study, this was the ability to access lexical items flexibly and automatically. This conclusion is based on the fact that conservation and switching ability make independent contributions to ambiguity detection. The former we take to be a measure of the cognitive development underlying metalinguistic skill, and the latter we take to be a measure of lexical processing efficiency.

This model of the factors contributing to the detection of ambiguity in sentences allows us to make predictions about the developmental course of each contributing factor. First, the child develops lexical representations for ambiguous words and the ability to access either meaning individually. The first metalinguistic development (not addressed in the present study) is the ability to perceive and report that homophones sound the same but have two distinct meanings. This is clearly a demonstration of the metalinguistic ability to separate form (the sound of the word) from content (the meaning of the word). Peters and Zaidel (1980) reported that this skill begins to emerge when the child is about 4.5 years old. Shakibai (2008) has demonstrated that there are kindergarten children who can perceive the dual meaning of homophones but are poor at detecting the ambiguity of sentences containing those same ambiguous words. Thus, the ability to perceive the dual meaning of homophones appears to be the first metalinguistic skill that develops. Cairns et al. (2004) argued that perceiving the ambiguity of a sentence is more difficult than perceiving the dual meanings of the lexical item creating the ambiguity because

### Table 1

<table>
<thead>
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<th>Task</th>
<th>First Graders</th>
<th>Second Graders</th>
<th>Maximum Score</th>
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<tr>
<td>Conservation</td>
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<td>Reading comprehension</td>
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<td>53.05</td>
<td>85</td>
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### Table 2

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<th>Conservation</th>
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<tbody>
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<td>Reading comprehension</td>
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<td>.688**</td>
<td>.514**</td>
</tr>
<tr>
<td>Switching</td>
<td>.506**</td>
<td>.409**</td>
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</tr>
<tr>
<td>Ambiguity detection</td>
<td>.595**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$. ** $p < .01$. The full model, $R^2 = .645, F(4, 33) = 15.006, p < .0001$. Making independent contributions to reading comprehension were grade ($\beta = .534, t = 4.078, p < .0001$; partial correlation = .579, $p < .0001$) and ambiguity detection ($\beta = .375, t = 2.063, p = .014$; partial correlation = .413, $p = .014$), but neither conservation ($\beta = -.033, t = -.239, ns$; partial correlation = -.042, $ns$) nor switching ability ($\beta = .057, t = .464, ns$; partial correlation = .08, $ns$) made any independent contribution. Thus, neither switching nor conservation bears an independent relation to ambiguity detection.

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perceiving the ambiguity of sentences involves sentence-processing operations beyond homophone knowledge. Following the ability to perceive homophones, the ability to judge the ambiguity of lexically ambiguous sentences emerges.

Lexical processing skill is first manifested in lexical retrieval ability, which may be responsible for the well-known vocabulary spurt (Dapretto & Bjork, 2000). As the lexicon develops and homophones come to have two distinct lexical entries, then the child will manifest the ability to retrieve either meaning of an ambiguous lexical item (which we measured in our pretest). Next comes the ability to switch the meaning of an ambiguous lexical item based on the context. This does not require realization that a word has more than one meaning; so, it is not a metalinguistic skill, but it does require that the lexical retrieval system be sufficiently flexible to respond differentially to context. Finally, the ability of the lexical processor to calculate both meanings of a lexically ambiguous sentence emerges.

We have suggested that the ability to switch meaning based on context is a precursor to the lexical processing ability underlying ambiguity detection and that homophone detection is a precursor to the metalinguistic skill associated with ambiguity detection. Cairns et al. (2006) suggested that the ability to make grammaticality judgments and correct ill-formed sentences is a precursor to the structural processing ability that underlies the detection of structurally ambiguous sentences.

There are then two aspects to detection of the ambiguity of sentences. First, the lexical (or structural) processor produces two meanings based on a single form of the sentence. Then, metalinguistic skill enables the child to simultaneously attend to those two meanings and judge meaning as being distinct from form. We can think of the former as a bottom-up activity and the latter as a top-down skill. Both are critical to successful reading.

A fruitful research program would examine the relationship between each stage of metalinguistic and processing ability and determine its ability to predict future reading skill. Zipke (2006) demonstrated that training third graders in homophone and ambiguity detection improved their reading skills, and Shakibai (2008) demonstrated that homophone detection and ambiguity detection can be taught to kindergarten children. It is plausible to suggest that early testing of ambiguity detection and its precursors will allow us to identify children who are at risk for reading failure.

Further research in the area of reading intervention is sorely needed. Zipke (2006) showed that metalinguistic training improves reading comprehension but not decoding ability. We suggest that children with reading comprehension deficits (rather than weak decoding skills) are more than likely to benefit from training in lexical ambiguity detection than in phonological awareness. Preliminary pilot data from a language- and learning-disabled fourth grader from a Hispanic home who presented with good word-reading skills and poor reading comprehension indicate that training ambiguity detection can have a positive impact on reading comprehension. These data suggest that training ambiguity detection can facilitate the metalinguistic abilities and psycholinguistic processes that govern reading comprehension. For children with poor reading comprehension and vocabulary weaknesses, training in ambiguity detection and homonym detection could enhance the metalinguistic awareness of and access to word meanings, thereby producing a direct and positive impact on reading comprehension abilities. This type of clinical intervention could be particularly useful for children who are English-language learners and for those with specific language impairment.

In addition to its use in intervention programs, measurement of ambiguity detection skill could assist in the identification of children who are at risk for reading difficulty. Training in homonym and ambiguity detection could be incorporated into reading readiness programs. Of course, the efficacy of all these approaches must be tested experimentally. But there is an abundance of current research showing that homonym and ambiguity detection are related to reading ability. These skills are teachable and will enhance reading comprehension (if the child is trained), which makes us optimistic about the educational and clinical value of their inclusion in assessment, readiness, and intervention programs.
Appendix A: Stimulus Sentences for Ambiguity Detection Task

Ambiguous Sentences

1. The children were told to stop because nails were making too many scratches on the furniture.
2. We saw the bat lying near the fence.
3. Peter felt terrible after the punch at the party.
4. The waitress became upset when the glasses fell on the floor and broke.
5. It was the cold that made Betty feel terrible.
6. The little boys told the cowboy that they loved playing with the straw that they found.
7. The man in the shop brought the pipe home in his car.
8. The lady was annoyed by her wait/weight in the doctor’s office.

Unambiguous Sentences

1. The shiny ladies’ shoes were always on the couch.
2. The children were asked to stop playing ball on the new grass.
3. The teachers were asked not to allow eating in the school.
4. The man saw the puppy with the four white paws.
5. The man almost ran over the doll with the car.
6. The tired little girl was ready to sleep.
7. The new car was ready to drive.
8. The happy baby’s room had a crib in it.

Appendix B: Stimulus Sentences, Context Sentences, and Follow-Up Questions for Ambiguity Switching Task

1. The baby was dirty and needed a bath. (filler)
   The mother put the baby in the tub that was filled with water. (context)
   What was the mother doing?
   What about the tub?
   What kind of tub was it?
2. The boys told the cowboy that they loved playing with the straw that they found. (lexical ambiguity)
   (drinking) The ranch hands had been sipping soda all afternoon.
   (cow) The ranch hands had been cleaning out the barn.
   What did the boys do?
   What about the straw?
   What kind of straw was it?
3. Peter felt terrible after the punch at the party. (lexical ambiguity)
   (physical) The children were fighting and were told to leave
   (drink) Drinking or eating too much always makes him sick.
   What was the matter with Peter?
   What about the punch?
   What kind of punch was it?
4. The clowns saw the elephant running towards the fence. (filler)
   Everybody in the circus was getting ready for the show. (context)
   What did the clowns see?
   What about the fence?
   What kind of fence was it?
5. We saw the bat lying near the fence. (lexical ambiguity)
   (baseball) The baseball game was fun to watch.
   (flying) The haunted house scared the children.

(continued)
Appendix B: (continued)

What did we see?
What about the bat?
What kind of bat was it?

6. It was the cold that made Betty feel terrible. (lexical ambiguity)
   (sick) She stayed in bed for three days.
   (outside) She forgot to bring her heavy sweater.
What was the matter with Betty?
What about the cold?
What kind of cold was it?

7. The children were told to stop because nails were making too many scratches on the furniture. (lexical ambiguity)
   (finger) Billy and Tommy were tapping on the table.
   (hammer) Billy and Tommy were playing with a hammer.
What were the children doing?
What about the nails?
What kind of nails were they?

8. The children were building a tower out of blocks and the cat knocked it down. (filler)
   Pets can be a nuisance when children want to play. (context)
What were the children doing?
What about the tower?
What kind of tower was it?

9. The lady was annoyed by her wait/weight in the doctor’s office. (lexical ambiguity)
   (weight) The diet did not seem to be working
   (wait) It was six o’clock and her appointment was at five.
What happened with the lady?
What about the wait/weight?
What kind of wait/weight was it?

10. The waitress became upset when the glasses fell on the floor and broke. (lexical ambiguity)
    (drinking) The customers were thirsty and wanted something to drink.
    (wearing) She couldn’t read the price on the menu.
What happened with the waitress?
What about the glasses?
What kind of glasses were they?

11. The man brought the pipe home in his car. (lexical ambiguity)
    (smoke) He wanted to try out his new tobacco.
    (sink) He hoped the plumber would fix the leak.
What did the man do?
What about the pipe?
What kind of pipe was it?

12. The little boy saw the puppy and wanted to buy it. (filler)
    Many children love to play with baby animals. (context)
What did the boy see?
What about the puppy?
What kind of puppy was it?

References


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