Multiple Level Naming Abilities of Children with Word-finding Deficits

Karla K. McGregor and Sandra R. Waxman
Northwestern University

Word-finding deficits are a poorly understood and little studied concomitant of language disorders in young children. The deficit is manifested as significant difficulty in finding words accurately and quickly. In the preschool years, these inaccuracies frequently take the form of semantic substitutions such as *pants* for *dress*. Often these semantic substitutions are also visually similar to the intended targets (e.g., *lion* for *tiger*). Other behaviors symptomatic of the problem include comments on the word-finding difficulty (e.g., *I don't know*) as well as occasional errors of phonological form, overuse of nonspecific words, and circumlocutions (McGregor, 1996).

The word-finding difficulties of children with language impairments are frequently associated with broader deficits in storage and elaboration of words in the lexicon. Kail and Leonard (1986) reported a series of experiments demonstrating that, although children with word-finding deficits were similar to their peers in retrieval strategies, they were deficient in lexical storage. Converging evidence comes from clinical treatment studies (McGregor & Leonard, 1989; Wright, 1993). Intervention practices designed to increase breadth and depth of stored lexical information were more effective in reducing word-finding problems than were activities involving practice of retrieval.

There are several ways that lexical storage systems might be deficient (Dollaghan, 1992). First, there may be fewer entries. With such small vocabularies, overextensions of words during word finding would be common. Second, the entries that do exist, may be under elaborated. These shallowly mapped entries may support word finding in simple and familiar contexts but not in more novel contexts. Third, the entries within the lexicon may be poorly organized. Without appropriate links between related entries, the lexicon may not function efficiently resulting in word-finding failure.

Here, we examined the third case, organization within the lexicon. We focused on a fundamental feature of human conceptual and semantic organization: the ability to locate an individual object in multiple taxonomic classes at various hierarchical levels (e.g., *plant, flower, daisy*). Simply put, we asked whether children with word-finding deficits would name objects as flexibly and as accurately as their age-matched peers in a task that taps naming at multiple levels of the noun hierarchy.

To answer this question, we used an experimental paradigm designed by Waxman and Hatch (1992). This paradigm provided a solution to the tricky methodological problem of how best to get preschool children to name at multiple levels rather than just at the preferred basic level (Rosch, Mervis, Gray, Johnson, & Boyes-Braehm, 1976; Waxman, 1990). To elicit multiple labels for a given object, the paradigm exploits children's sensitivity to the contrastive and hierarchical principles of hierarchical systems of organization (Miller &

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Johnson-Laird, 1976; Horton, 1983). The contrastive principle concerns the horizontal relations among classes: it insures that at any given level of abstraction, class membership will be mutually exclusive. For example, a member of the class *sunflower* cannot also be a member of the class *cornflower*. The hierarchical principle concerns the vertical inclusion relations among classes within a hierarchical system: it insures that class-inclusion relations maintain. For example, the members of the class *sunflower* constitute a logical subset of the more inclusive class *flower*.

In Waxman and Hatch (1992), the examiner presented a series of object pictures to 40 3- and 4-year-old children. The children were instructed to teach a puppet "all the different names for each picture." The puppet asked contrast questions at each level of the hierarchy. For example, upon presentation of a picture of a rose he would ask, " Is this an animal?" to elicit "no, it's a plant," "Is this a tree?" to elicit "flower" and "Is this a daisy?" to elicit "rose".

In Waxman and Hatch (1992), the experimenter presented contrast questions in ascending order (subordinate, basic, and superordinate) for some participants and in descending order (superordinate, basic, subordinate) for other participants. Waxman and Hatch also manipulated the morphological form of the subordinate labels. This variable was included to test the claim that compounds are the earliest subordinates acquired because their morphological from makes them more transparent (Clark, Gelman, & Lane, 1985; Gelman, Wilcox, & Clark, 1989). This transparency follows from the fact that they include the basic level name within them (e.g., *flower* is part of *cornflower*). For half of the targets, the subordinate labels consisted of compound or modifier + noun phrase (e.g., *cornflower*) for the other half, a simple noun was used (e.g., *daisy*). The purpose of this condition was to see whether the more transparent compound/phrasal models led to more subordinate naming than the simple nouns.

Three results reported by Waxman and Hatch (1992) are of particular interest here. First, though these normally developing preschoolers most frequently provided names at the basic level, they also readily produced more than one label for each object. Second, the children supplied subordinate labels more readily than superordinate labels. Third, although the children matched the morphological form of their subordinate labels to the form of the model (whether simple noun or compound), their ability to name at the subordinate level did not vary with model type. Thus, although these normally-developing children were sensitive to the morphological form of a label, this transparency did not, in itself, lead them to produce more subordinate level names.

We applied this paradigm to young children who were diagnosed as having word-finding deficits. Our goal was to examine their organization and access to stored information in the lexicon. In particular, we asked:

1) Do children with word-finding difficulties provide as many labels at multiple levels as their age-matched peers?

2) Do children with word-finding deficits name as accurately at multiple levels as their age-matched peers?

3) When labeling beyond the preferred basic level, are children with word-finding deficits more likely to use subordinates or superordinates?

4) Are children with word-finding deficits more likely to depend on the morphological transparency of compounds to name at the subordinate level?

Method

Participants

Twelve children with word-finding (WF) deficits and 12 normally developing (ND) children participated. The children ranged in age from 3;7 (years;months) to 6;7 with a mean age of 5;1. Each participant in the ND group was matched ± 3 months to a participant in the WF group.

Participant Selection

Children in both the WF and ND groups passed pure tone audiometric tests administered at 500, 1000, 2000, and 4000 kHz at a level of 25 dB bilaterally. All children passed screenings of oral-motor structure and function. On the *Arthur Adaptation of the Leiter International Performance Scale* (Arthur, 1952) all children earned a standard score of 85 or above (test mean = 100, sd = 15).

The children in the WF group all were diagnosed by speech-language pathologists as having deficient word finding and were receiving speech-language therapy at the time of their participation in this study. Pretests in our own lab, conducted prior to the experiment, confirmed the clinical judgments of the speech-language pathologists. Further, they revealed that the word-finding problems appeared to be primarily expressive language deficits: Although all children in the WF group achieved scores on the *Peabody Picture Vocabulary Test-Revised* (Dunn & Dunn, 1981) that were within normal limits, they were significantly less accurate in word retrieval compared to their peers on the noun naming subtest of the *Test of Word Finding* (German, 1989) ($t=3.641$, $df=22$, $p=.001$); the verb naming subtest of the *Test of Word Finding* ($t=4.073$, $df=22$, $p=.001$) and in a story retell task ($t=4.304$, $df=22$, $p<.0001$).

Procedure

In the experiment itself, children were asked to teach a puppet names for 12 objects. To elicit multiple labels for each, we followed Waxman and Hatch (1992) by having the puppet ask contrast questions that descended the noun hierarchy (e.g., for rose: "Is this an animal?" "Is this a tree?" and "Is this a dandelion?") for each stimulus picture. For half the targets, the subordinate-level label was a simple noun (rose); for half it was a compound or modifier + noun phrase (sunflower). The contrast models and targets are presented in Table 1.

Table 1. Stimulus targets and models.

Target	Model contained within each contrast question		
	Superordinate	Basic	Subordinate
rose	animal	tree	dandelion
sunflower	animal	tree	cornflower
palm	animal	flower	oak
apple tree	animal	flower	pear tree
eagle	plant	dog	owl
blackbird	plant	dog	bluebird
collie	plant	bird	dachshund
firedog (dalmatian)	plant	bird	bulldog
sandals	food	pants	boots
cowboy boots	food	pants	party shoes
jeans	food	shoes	shorts
sweat pants	food	shoes	dress pants

We compared performance of ND and WF groups on two analyses. The first examined whether the children's naming behavior was contrastive, that is, whether their responses matched the hierarchical level of the label in the contrast question. The purpose of this analysis was to determine how flexible children were in providing names at more than one level of the hierarchy. In this analysis, no attention was paid to whether the naming response was a correct label for the object. When, for example, a subordinate label was required for a picture of an eagle, the response "crow" was accepted because it was at the correct hierarchical level. The second analysis concerned the accuracy of the labels at each level. The criterion here was more strict: A response was accepted if and only if it was contrastive and correct. In this case, the only acceptable response for a picture of an eagle following a subordinate model would be "eagle." In both analyses, we compared the WF group to the ND group.

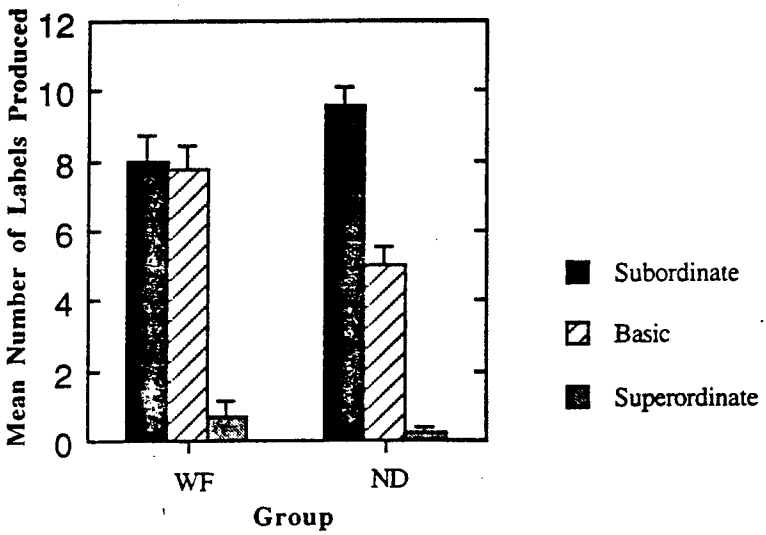
Results

Providing Contrastive Names

Figure 1 displays the number of contrastive level labels given at each level of the hierarchy. A two-way ANOVA was conducted with group (WF vs. ND) as a between-subjects variable and level (superordinate, basic, subordinate) as a within-subjects variable. There was no significant group difference. Both groups were equally likely to give more than one label. In fact, individual variation across groups was quite similar. The number of targets out of a

possible 12, named at multiple levels ranged from 2 to 11 across individuals in the WF group and from 1 to 12 for the ND group.

Figure 1. Labels produced at each level of the hierarchy that matched the level of the model provided in the contrast question. WF and ND groups are compared.

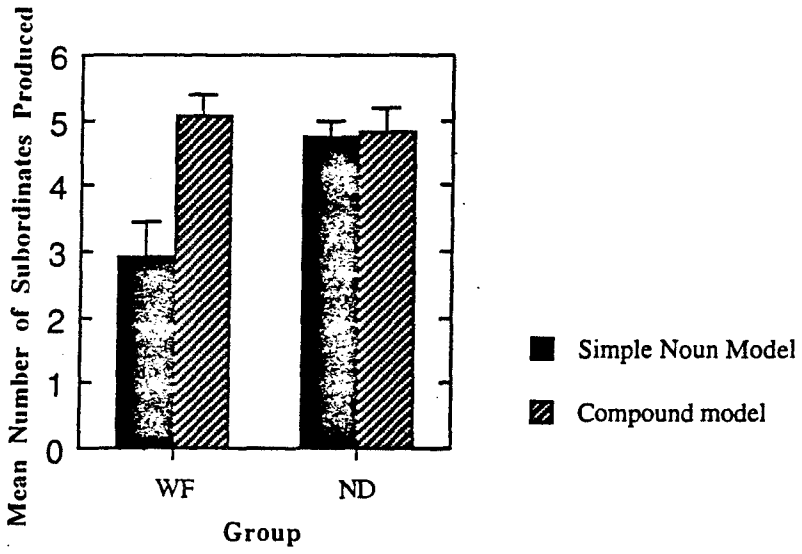


The frequency of contrastive naming did vary significantly across levels ($F(2,66)=120.277$, $p<.0001$). A Tukey HSD post hoc test demonstrated that the frequency of responding contrastively at each level was significantly different from responding at all other levels (beyond the .0001 level). For both participant groups, contrastive naming was least frequent at the superordinate level. Surprisingly, naming at the subordinate level was more frequent overall than naming at the basic level. This seems to run counter to the expectation that the basic level is the preferred naming response for children (and adults). Compared to Waxman and Hatch (1992), who presented contrast questions in both ascending and descending orders, we used a descending presentation order only. The children in both groups seemed to have an awareness of the descending order and quickly dropped to the subordinate level. This was more common for the ND than the WF group as reflected in a significant interaction between group and level ($F(2,66)=7.694$, $p=.001$). A Tukey HSD post hoc test demonstrated that WF children provided more basic level terms in response to basic level models than their ND peers (different at .01 level). The ND children more often responded to basic level contrast models with a subordinate term.

At times, children in both groups accepted the model in the contrast question. For example, when the puppet asked, "Is this a cornflower?" we expected the answer, "no, it's a sunflower" but instead some children answered, "yes, you got it right!". This occurred only in response to subordinate models. Models incorporating compound noun subordinates were accepted more often than simple noun subordinates. Of 72 compound subordinates modeled for the WF group, they accepted 17 as correct; they accepted only 5 of the 72 simple nouns. Similarly, the ND group accepted 15 of 72 compounds and 6 of 72 simple nouns.[1]

Analysis of naming responses at the subordinate level revealed some deviations between WF and ND groups (see Figure 2).

Figure 2. Number of subordinates provided in response to simple noun and compound models. WF and ND groups are compared.



An ANOVA with number of subordinates named as the dependent variable revealed a significant effect for group ($F(1,44)=4.369$, $p=.042$), a significant effect for type of model (compound or simple noun) ($F(1,44)=8.822$, $p=.005$) and a significant interaction ($F(1,44)=7.563$, $p=.009$).[2] Compared to their ND peers, the WF group named fewer subordinates overall. Also, the children in the WF group were more likely to name subordinates following compound models. Therefore, the WF group used morphological transparency of compound/phrasal subordinates to name with specificity. This contrasts with the ND group studied

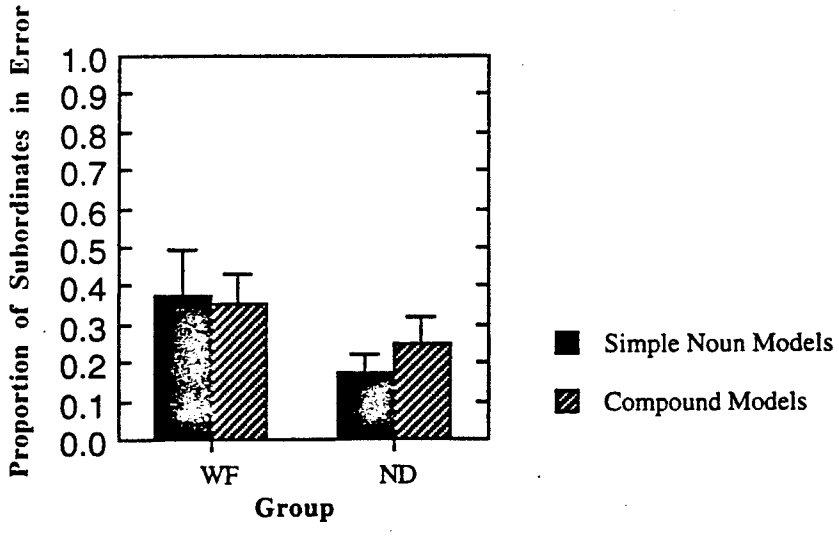
here (and the younger ND group studied by Waxman and Hatch (1992)) who were equally likely to provide subordinates after simple and compound models.

Children in both groups matched form of contrast questions. In the WF group, matching of forms occurred in 80% and 77% of all cases for compounds and simple nouns, respectively. In the ND groups the rate of matching was 85% and 63% for compounds and simple nouns, respectively. An ANOVA with percentage of responses matched as the dependent variable revealed no significant group difference with both groups equally likely to match forms. There was a significant difference between form types ($F(1,44)=4.08$, $p=.05$) reflecting the fact that compound forms were matched proportionately more often than simple forms. There was no significant interaction between subject group and form of model.

Providing Accurate and Contrastive Names

In this analysis, we considered the accuracy of naming at each level of the hierarchy. No child in either group made any error in labeling at the superordinate or basic levels. That is, no child ever made a mistake like "horse" for "dog" or "plant" for "animal" (though recall that few superordinates labels were given). Both groups did make errors at the subordinate level (see Figure 3).

Figure 3. Proportion of subordinate labels that were in error following simple noun and compound models. WF and ND groups are compared.



Errors at the subordinate level included acceptances of the contrastive model (e.g., "Yes, it is a cornflower!") as well as misnamings (e.g., *parrot* for *bluebird*, *long underwear* for *sweat pants*). At the subordinate level, children in the WF group exhibited an average error rate of 34% compared to an error rate of 21% for the ND group. An ANOVA comparing error rates on subordinates across participant groups (WF, ND) and form of model (simple noun, compound) revealed a group difference at the .06 level of significance ($F(1, 43)=3.662$, $p=.062$). There was no effect for level and no interaction between group and level. From these results, we conclude that the WF group members were somewhat less accurate in naming subordinates than their peers and that compound/phrasal models, which helped the children with word-finding deficits to provide a name more consistently at the subordinate level, did not help them to name more accurately.

Discussion

Contrast questions were used to prompt naming at superordinate, basic, and subordinate levels of the noun hierarchy. The results of this task revealed both similarities and differences between 12 children with word-finding problems and their 12 age-matched normally-developing peers.

Similarities between WF and ND children

Both groups provided multiple labels. In fact, the children in the WF group labeled as many pictures with multiple labels as the ND group. For both groups, superordinates were the least frequently named. Because children with word-finding problems use many nonspecific words like *thing* or *stuff* (Wiig & Semel, 1980), we were surprised to find that the WF group did not name more frequently at the superordinate level, the most general level of the hierarchy.

Both groups were sensitive to the morphological form of the model in the contrast questions. They matched the form of the compound and simple noun models in their responses. This replicates and extends Waxman and Hatch's (1992) work with younger, normally-developing children.

Both groups named accurately at basic and superordinate levels but made errors at the subordinate level. The errors involving subordinate labels may have occurred because these are less frequently used than the words at the basic and superordinate levels and therefore were less familiar and less over-learned.

Finally, neither group demonstrated the expected preference for naming at the basic level in this particular task. We think this was due to the nature of the task itself where a strict adherence to a descending order of contrast question presentation emphasized the need to find increasingly specific labels. Sensing this, children in both groups provided more subordinates and fewer basic-level terms than we expected.

Differences between WF and ND children

The first difference between the participant groups relates to the lack of basic level naming preference discussed above. Though the WF group demonstrated

fairly equivalent rates of subordinate and basic level naming, the ND children displayed a clear preference for use of subordinates in this task. Even at the basic level of contrast questions, the ND group responded as often with a subordinate as a basic term. The WF group was significantly more likely than the ND group to name basic terms in response to basic level contrast questions. Either the ND children were more influenced by the descending nature of the contrast questions than the WF children or they knew and could find more subordinates than the WF children. Further differences between groups are consistent with the latter interpretation.

Further group differences involved naming of subordinates. For example, at the subordinate level of contrast, the WF children supplied significantly fewer subordinates and were marginally less accurate than the children in the ND group. Also, unlike their ND peers, the frequency of subordinate naming by the WF group varied with the form of the subordinate contrast question. The WF group provided more subordinates after compound models than after simple noun models. The ND children studied here (and in Waxman and Hatch, 1992) were equally likely to name subordinates whether they heard compound or simple noun models. There are several possible explanations for the dependence of the WF group on compound/phrasal subordinates which accord with the view of word-finding deficits as part of a broader limitation in lexical storage (cf., Kail & Leonard, 1986; McGregor & Leonard, 1989; Wright, 1993). First, the WF children may have known more subordinates that have compound forms. The morphological transparency of some subordinate-level terms may have facilitated their storage (Clark et al, 1985; Gelman et al., 1989). Another possibility is that the storage strength of the phonological form of the target words was weak and the compounds, by directly providing part of the phonological form, facilitated the efforts of the WF group to name. Finally, we should consider that the WF children may have been better at using productive word formation strategies than at retrieving stored words. That is, the compound contrast questions modeled a strategy for naming that did not require retrieval of a specific simple lexeme. Indeed, the fact that the WF group named subordinates more frequently but not more accurately after compounds suggests that these children may have been using the compound models as a basis for forming novel, unconventional labels.

In conclusion, the ability to construct hierarchically organized semantic systems is a robust developmental phenomena. Young normally developing children and young children who have documented word-finding deficits were quite similar in their flexibility of naming at multiple levels. However, the children with word-finding deficits did differ from their peers in their ability to find subordinates frequently and accurately. Subordinates are more precise and less common than basic and superordinate terms. Therefore, we suspect that the difficulty experienced by the children with word-finding deficits had more to do with under-elaborated mapping of specific exemplars rather than poor hierarchical organization per se.

Of course, one limitation of this task is that it provided only an indirect view of lexical organization. Given that many words do not exist in hierarchical relations to other words, it is also an incomplete view. We look forward to

future research into other aspects of lexical organization and storage in children with word-finding deficits.

Endnotes

*We thank Amy Wang for her aid in subject recruitment. Special thanks are due to the children and their families who participated in this study.

[1]In the ANOVA reported above, we counted acceptances of the puppet's model as subordinate level responses. We also conducted a supplementary analysis excluding these as subordinate responses. Because both groups of children were similar in their acceptance of the puppet's models, the results of this ANOVA were identical to the first.

[2]Again, the results are the same whether or not acceptances of the contrastive model are excluded. In this ANOVA, they were included as subordinate responses.

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