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MOTHERS' LEXICON OF INTERNAL STATE WORDS IN SPEECH TO CHILDREN WITH DOWN SYNDROME AND TO NONHANDICAPPED CHILDREN AT MEALTIME

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This study examines internal state words in mothers' speech to children with Down syndrome, and the relation between the use of internal state words and the children's levels of social-adaptive, communicative, and linguistic functioning. Results indicate qualitative differences in mothers' use of internal state words to children with children Down syndrome, compared with a sample of maternal speech to nonhandicapped children who were matched on the Vineland scales for their level of adaptive functioning. Differences include use of fewer internal state words overall to children with Down syndrome, and different kinds of internal state words: more words referring to physiological states, and fewer words referring either to affect or to cognition. In general, child Mean Length of Utterance (MLU) was associated with the pattern of inner state words used by mothers, whereas no associations were found between children's social-adaptive competence and maternal input. Even when controlling for child MLU, there were, however, some qualitative differences in the inner state lexicons used to children with Down syndrome. Results suggest that speech to children with Down syndrome that is calibrated to their MLU may underestimate their competence in domains other than grammar.

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INTRODUCTION

In order to become competent speakers and members of society, children must learn to recognize and label in themselves and in others a variety of inner states. Inner state (IS) words and the concepts they represent are important tools that allow the child to gain self understanding, as well as to appreciate what others may be thinking and feeling. There is, for instance, an obvious advantage in recognizing that one's mother, or teacher, or employer is angry; and relevant conversational exchanges are based upon presuppositions about what the conversational partner already knows. An IS vocabulary helps children to identify and to understand their own and others' inner experience, and thus serves as a guide to appropriate behavior.

Some inner states are easier to identify than others: Words referring to *perception* (*soft, dark*) are relatively easy to learn because they often have concrete external referents; *physiological states* (*hungry, sleepy*) are related to and respond to appropriate outward action, such as eating or sleeping. *Affective states* may or may not be accompanied by outward manifestations (such as looking or acting *sad* or *angry*). Inner state words referring to *cognition*, such as *know* and *think*, are more abstract and more difficult to specify or verify. Ultimately, however, children are able to adjust their interactions with others on the basis of what they perceive others to know and understand.

There is preliminary evidence that a child's early exposure to an IS vocabulary is related to subsequent social behavior: Dunn (1991) found that the amount of mothers' talk about internal states to their children is positively related to the quality of the children's social behavior with siblings. In addition, children's understanding of inner states is related to acceptance by their peers, and to teacher and peer ratings (Cassidy and Parke, 1991). Given these functions of inner state words, and their demonstrated relations to behavior, the IS lexicon is an important tool that a child with Down syndrome, like the nonhandicapped child, may use in developing interpersonal skills.

One factor that enables all children to acquire an IS lexicon is the presence of inner state words in the input vocabulary used by parents. Although little is known about the acquisition of an IS vocabulary by preschool and school-aged children with Down syndrome, prior work has documented differences in the ways mothers use inner state words in speech to toddlers with Down syndrome, as compared to speech to nonhandicapped controls (Beeghly, Bretherton, and Mervis, 1986).

In studies of nonhandicapped toddlers, Beeghly, Bretherton, and Mervis (1986), and Dunn, Bretherton, and Munn (1987) found that exposure to IS language in the speech of mothers and siblings early in the toddler period predicted the children's own use of IS words in the late toddler stage. As the children's linguistic competence grew, mothers' speech to them referred to

inner states more frequently, contained more complex inner state words, and inner states were attributed to a greater range of referents (i.e., the words referred to others as well as to the child or to the speaker). Categories of IS words in the input vocabulary were also found to change over time: Mothers of younger toddlers used more words referring to perception (e.g. *feels soft, tastes good*) than mothers of older toddlers. Conversely, mothers of the older group used more words referring to physiological states, to moral judgment, and to cognition. No differences were found in the proportion of maternal utterances about affect or volition to children of different ages (Beeghly, Bretherton, and Mervis, 1986).

These same authors also found qualitative differences in maternal use of IS language with toddlers with Down syndrome compared with the use of IS language of mothers of three control groups of nonhandicapped children matched for chronological age, for mental age, or for linguistic stage as measured by the mean length of utterance (MLU). The proportions of utterances with IS references as well as the overall range of IS words used were lower in the speech of mothers of children with Down syndrome than in the speech of the mothers in any of the control groups. Mothers of toddlers with Down syndrome also used fewer cognition words than mothers in any of the other groups. However, the range of physiological and moral obligation words to children with Down syndrome were equivalent to what was observed in speech to the children who were their chronological age matches (Beeghly, Bretherton, and Mervis, 1986).

These differences in the use of IS words are not surprising, given that many other qualitative differences have been documented in child-directed speech (CDS) to children with Down syndrome. Generally, these differences have pointed to a more controlling, or less contingent, style by mothers of children with Down syndrome than by mothers of normally developing children (Mahoney, 1988; Davis, Stroud, and Green, 1988; Tannock, 1988; Buium, Rynder and Turnure, 1974; Buckhalt, Rutherford and Goldberg, 1978). Some of these differences are mitigated when language levels are taken into account. That is, when children with Down syndrome are matched with children of similar language abilities rather than with children of comparable chronological or mental age, differences in maternal conversational style become less apparent (Cardoso-Martins and Mervis, 1985; Petersen and Sherrod, 1982). Rondal (1978; 1989) argues from this evidence that mothers of children with Down syndrome, like mothers of nonhandicapped children, fine tune their input to the linguistic level of the child and thus provide comparable and appropriate language environments for their children, based on the children's language ability.

However, whether speech to children with Down syndrome is optimal for them is a matter of some debate, especially if it is tuned to the children's MLU, which may not provide the best index of their overall capacity. The

literature suggests that expressive language may be the most delayed aspect of the development of children with Down syndrome, with MLU and other measures of expressive language competence lagging behind receptive language, mental age, and pragmatic conversational skill (Beeghly, Weiss-Perry, and Cicchetti, 1990; Rondal, 1988; Fischer, 1988; Fischer, 1987; Preuss, Vadasy, and Fewell, 1987; Beeghly and Cicchetti, 1987; Leifer and Lewis, 1984). Fowler's (1990) review of language development in children with Down syndrome suggests that their expressive delay is primarily in syntactic development. The lexicons of children with Down syndrome actually tend to be more advanced than in MLU-matched comparison groups, and to some degree more advanced than mental-age matched comparison groups as well. Given these findings, CDS which is fine tuned to child MLU may not be entirely appropriate with children with Down syndrome: MLU is basically a measure of syntactic development, and reliance on it alone would lead mothers and others to underestimate the child's lexical, pragmatic, and other abilities.

It is also important to emphasize that even when child language levels are controlled, other differences in CDS to children with Down syndrome have been noted. For instance, the vocabulary addressed to children with DS as measured by type token ratio is smaller than the vocabulary used to nonhandicapped children with comparable MLUs (Davis, Stroud, and Green, 1988; Matey and Kretschmer, 1985). This is consistent with the finding indicated above that mothers' use of internal state vocabulary with toddler-aged children with DS is more restricted in range than mothers' use of IS language with nonhandicapped children matched for MLU. Thus, CDS to children with Down syndrome may include a limited lexicon with restricted use of inner state words that does not seem to be fine tuned to the children's language abilities.

There is little research on mothers' use of internal state words with either normally developing or children with Down syndrome who are beyond the toddler stage. It is possible that at somewhat older ages mothers or other caregivers provide children with Down syndrome an appropriate internal state vocabulary. It may also be that caregivers continue to limit the range of internal state words used with children with Down syndrome.

This paper will describe differences in the ways mothers of Down syndrome and of nonhandicapped children use inner state words relating to perception physiological states, affect, and cognition when conversing with their preschool and school-aged children at mealtime.

METHOD

Analyses of transcripts of mothers' speech to nonhandicapped children and children with Down syndrome during dinner were undertaken. Data were

drawn from the archives of the Child Language Data Exchange System (CHILDES) (MacWhinney and Snow, 1990) and analyzed using lexical search procedures available through the Child Language Analysis (CLAN) programs of CHILDES.

Material Analyzed

Transcripts of mealtime conversations of 37 white, middle class families were obtained from two separate studies (Gleason, 1987; Hooshyar 1988). In both studies the meals were child centered and of variable duration; typically, one or two others (siblings, grandparents, fathers) were present at the meal, and it was not always possible to determine the addressee of utterances. Utterances that may not have been directed to the target child, were all, however, produced as part of conversations in which the child was participating. Mothers' utterances were comparable in number in both corpora: 5579 in the Gleason corpus, and 6480 in the Hooshyar corpus. Other characteristics of the samples follow:

Hooshyar Corpus. Fifteen families with a child with Down Syndrome were selected. Mothers all had at least some college education. The children ranged in age from 3 to 8 years, with a mean age of 62 months. The adaptive functioning of the children with Down syndrome as measured by the Vineland Scale of Social Maturity (Sparrow, Balla, and Cicchetti, 1984) averaged 43 months, with a standard deviation of 15 months and a range from 28 to 67 months. Mean expressive language score on the Vineland was 33 months, with a standard deviation of 13.13 months and a range between 17 and 62 months. Mean receptive language score on the Vineland was 52.60 months, with a standard deviation of 26.66 months and a range between 30 and 94 months.

Gleason Corpus. Twenty-two families with a normally developing preschool-age child were selected. Mothers all had some college education, and several had advanced degrees. The children ranged in age from 26 to 62 months, with a mean age of 42.7 months with a standard deviation of 10.79 months.

Samples were matched on the basis of the nonhandicapped children's ages and the children with Down syndrome's overall adaptive and communicative functioning as assessed by the Vineland Scales of Adaptive Behavior. Since these data were drawn from already existing sources and additional information was not available (i.e. IQ scores, or other measures) the decision was made to choose from a larger set of children with Down syndrome a subgroup whose available Vineland scores matched the ages of the nonhandicapped children. There is a longstanding controversy in the literature on

what criteria provide the best match when comparing Down syndrome and normally developing children; one can match by chronological age, which has obvious drawbacks, or by such criteria as mental age, MLU and other linguistic measures, or by adaptive functioning. Some of the disadvantages of matching by MLU have been noted earlier. The Vineland scales, designed to assess the functioning of mentally retarded individuals, correlate with mental age and are a measure of social functioning (Anastasi, 1982; Sparrow, Balla, and Cicchetti, 1984). They measure such things as daily living skills as well as communicative competence. The adaptive functioning and chronological age match in this sample is comparable, given that the mean chronological age of the normally developing children was 42.71 months and the children with Down syndrome's average adaptive functioning age of 42.67 months on the Vineland Scale.

Analysis Procedure

The computerized transcripts were searched for three categories of inner state words: affect, cognition, and physiology perception. These categories were drawn from the work of Bretherton and her colleagues (Dunn, Munn, and Bretherton; 1987; Beeghly, Bretherton, and Mervis; 1986) as well as elsewhere in the literature. A specific list of target words belonging to each category was compiled from prior work on inner state language and from an examination of the frequency lists of all words spoken by the mothers in both samples during the dinner conversations. Words that sometimes denote inner states, (e.g., *mean, like, good*), were examined in context and categorized according to how they were actually used in the transcript.

CHILDES automated procedures also generated basic measures of children's and mothers' speech, including mean length of utterance (MLU), total number of mothers' words (tokens) and word types, number of utterances, and type token ratios.

One way analyses of variance were performed on basic language measures and on amount and kind of inner state words (types and tokens). Although we have argued that child MLU may not be the most appropriate gauge for mothers to use when speaking to children with Down syndrome, the associations between IS variables in maternal speech and child MLU were also tested. Pearson r correlations between child MLU and all inner state variables in maternal speech were obtained separately for each group. In addition, where significant group differences were found on any IS variable, a second set of analyses were conducted, testing the covariate child MLU and the interaction of child MLU and handicap status. Two additional correlational analyses were performed. Pearson r correlations between children with Down syndrome's scores on three subscales of the Vineland Social Maturity Scale and amount and kind of mothers' inner state speech were obtained.

Pearson *r* correlations between children's chronological age and amount and kind of mothers' inner state speech were also obtained.

RESULTS

Basic Language Measures

Transcripts were first analyzed for group differences on basic measures of speech volume and complexity. Means, standard deviations, and *F* ratios for child MLU, mother MLU, total mother words (tokens), and total mother word types (different words) are shown in Table 1.

Mothers' speech differed significantly between the two sets of transcripts on two basic measures of complexity and output: mean length of utterance and total number of different words (types). Both were greater in the speech of mothers of nonhandicapped children. The total number of maternal words and the total number of maternal utterances were comparable in each sample. Child MLU was also longer in the nonhandicapped group.

Mean Length of Utterance

The next analyses concerned the relationship of inner state word use to mother and child MLU in the two groups. Pearson *r* correlations for total number of inner state types and proportion of inner state word types and tokens in each category used by mothers in each group are shown in Table 2.

In the nonhandicapped group, significant negative correlations were observed between both mother and child MLU and the proportion of inner state types that referred to perception: perception was thus a frequent topic for children with low MLU. No such association was observed in the group with Down syndrome. There was also a significant negative correlation between the frequency of mothers' use of physiological state words and mother MLU in the nonhandicapped group. Again, in the nonhandicapped group, there was a positive correlation between mother MLU and proportion of cognitive IS tokens and a negative correlation between child MLU and this same variable. These associations were not observed in the nonhandicapped sample. One additional analysis was performed, the correlation of mother and child MLU. In the Down syndrome sample, mother MLU and child MLU were not correlated ($r = .09$, ns) while in the nonhandicapped sample, mother and child MLU tended to be associated ($r = .41$, $p = .06$). Overall, there were more associations noted between mother and child MLU in the sample of nonhandicapped children and their mothers than in the sample of children with Down syndrome and their mothers.

Table 1. Means, Standard Deviations and F Ratios for Basic Language Measures of the Down Syndrome and Nonhandicapped Groups

	DS	NH	*F* Ratios		
Language Variables	M (SD)	M (SD)	Group	Sex	G X S
Child MLU			33.76[a]	.04	.43
Full sample	1.6	3.5			
	(.42)	(.82)			
Boys only	1.5	3.5			
	(.26)	(.70)			
Girls only	1.7	3.5			
	(.50)	(.99)			
Mother MLU			12.85[a]	.20	.33
Full sample	4.5	5.7			
	(.88)	(.94)			
Boys only	4.2	5.8			
	(.84)	(1.03)			
Girls only	4.6	5.5			
	(1.0)	(.86)			
Total mother words			.98	.85	.21
Full sample	1192.7	1356.2			
	(367.61)	(588.80)			
Boys only	1217.6	1457.0			
	(418.00)	(637.00)			
Girls only	1155.3	1234.6			
	(307.90)	(531.00)			
Total mother word types			9.25[a]	1.10	.40
Full sample	297	396.6			
	(75.1)	(114.83)			
Boys only	300.7	422.7			
	(87.56)	(122.65)			
Girls only	291.5	369.8			
	(58.92)	(103.38)			
Total mother utterances			1.65	.43	.01
Full sample	297.2	253.6			
	(76.70)	(107.61)			
Boys only	304.4	264.4			
	(86.5)	(104.5)			
Girls only	286.39	240.4			
	(65.18)	(104.5)			

[a] $p < .01$.

Table 2. Correlations between Mother and Child MLU and the Total Number of Inner State Types and Tokens in the Affect, Cognition and Physiological Categories in Maternal Speech

	Down Syndrome		NonHandicapped	
	MLU		MLU	
Type	Mother	Child	Mother	Child
Total IS types	.27	.17	.36[a]	−.22
Affect types/Total IS types	−.40	.27	.29	.23
Cognition types/Total IS types	.39	−.27	.32	.42[a]
Physiology types/Total IS types	−.14	.10	−.51[a]	−.56[a]
Affect tokens/Total IS tokens	−.32	−.11	−.29	−.29
Physiology tokens/Total IS tokens	.23	−.01	−.66[b]	−.49[a]
Cognition tokens/Total IS tokens	.16	−.08	.54[a]	−.46[a]

[a] $p < .05$.
[b] $p < .01$.

Amount of IS Speech

These analyses concerned the amount of inner state language used by the two samples. Total number of words (tokens) referring to inner states was higher in maternal speech to nonhandicapped children ($m = 48.8$) than in maternal speech to children with Down syndrome ($m = 38.1$), ($F = 5.95$, $p < .05$). A check for the effects of child MLU revealed no association between number of IS tokens used by mothers and child MLU ($F = .03$, ns). The mean proportion of total number of words that were inner state words in the Down Syndrome group (3%) and in the nonhandicapped group (4%) were similar ($F = 2.10$, ns) However, examination of the proportion of maternal utterances containing an inner state term suggested differences between the groups. On average, 19% of the utterances by mothers of nonhandicapped children contained an inner state word, while on average only 13% of the utterances by mothers of children with Down syndrome contained any inner state term ($F = 10.099$, $p < .01$). The subsequent analysis of covariance indicated that child MLU was related to the proportion of utterances containing an IS word ($F = 5.50$, $p = .03$) but the effect for group differences remained significant after accounting for the variance due to child MLU ($F = 5.70$, $p = .02$). There was no interaction between child MLU and group ($F = .16$, ns).

Lexical Diversity

Of the total number of different words (word types), 5% referred to inner states in the Down syndrome sample and 4% in the nonhandicapped sample

(F = .97, ns). On average, maternal speech to a child with Down syndrome contained 13.80 different inner state words, whereas maternal speech to a nonhandicapped child contained 17.55 different inner state words. This difference tended toward significance (F = 4.00, p = .053). Diversity of IS word types also tended to be related to child MLU (F = 3.44, p = .08) but not to group membership, after the effects for child MLU were accounted for (F = 1.87, ns).

A total of 112 different inner state words (types) was found in the 37 transcripts. Sixty-four inner state types were used in both samples by at least one mother; 42 were used only by the mothers of nonhandicapped children and 6 were used only by the mothers of children with Down syndrome. Word types by category used by each group of mothers are shown in Table 3.

Categories of Inner State Words

These analyses concerned the distribution of inner state word types by category. One-way analyses of variance were performed on the proportion of affect, cognition and physiological perception word types in the pool of total inner state word types used by mothers. The handicapped group served as the between subjects factor. Means, standard deviations, and F ratios for group effects for the proportion of inner state word types in each category are shown in Table 4.

Affect. Results indicate that mothers of nonhandicapped children used a greater variety of inner state words referring to affect or feeling than mothers of children with Down syndrome. The subsequent analysis of covariance indicated that child MLU was related to proportion of IS types referring to affect in mothers' speech (F = 10.97, p = .002). After accounting for the variance due to child MLU, differences between the groups were no longer significant (F = .42, ns).

Physical States and Perception. Mothers of children with Down syndrome used more inner state word types referring to physical states or perceptions than did mothers of nonhandicapped children. The subsequent analysis of covariance indicated that child MLU was related to range of physiological perception words in maternal speech (F = 35.82, $p < .001$), but there tended to be an interaction effect of group and child MLU (F = 2.50 p = .10). Inspection of the correlation coefficients for child MLU and proportion of physiological perception state words separately for each group indicated that mothers' speech to nonhandicapped children contained a *smaller* range of these word types in conversation with children with higher MLUs. Conversely, mothers of children with Down syndrome used a somewhat

Table 3. Inner State Words Used by Mothers of Down Syndrome and Nonhandicapped Children at Dinner

Category	Words used by both groups		Nonhandicapped only	Down syndrome only
Affect	afraid	hope	angry	amazing
	cry	laugh	anxious	upset
	excited	like	bad	
	favorite	mean	bothers	
	feel	nice	bugging	
	fun	scared	contented	
	funny	smile	delightful	
	glad	sorry	desperate	
	good		excite	
	happy		frown	
			jealous	
			kind	
			lonely	
			mad	
			sad	
			surprised	
			thrilled	
			wonderful	
Physiology/ Perception	awake	ow	bitter	nummy
	booboo	pain	chewy	spicy
	burn	see	cramp	watch
	cold	sick	crunchy	yum
	cool	spicy	dark	
	delicious	sticky	exhausted	
	dry	sure	sore	
	feel	sweet	sour	
	good	taste	tastee	
	hard	thirsty		
	hear	tired		
	hot	warm		
	hungry	wet		
	hurt	yummy		
	listen			
	look			
	loud			
	ouch			

(*continued*)

Table 3. *Continued*

Category	Words used by both groups		Nonhandicapped only	Down syndrome only
Cognition	certain	idea	agree	
	don't/think	interesting	approves	
	don't/know	know	choose	
	don't/understand	remember	concern	
	figure	sure	confused	
	forget	think	curious	
	guess	understand	decide	
		wonder	don't/ remember	
			ignore	
			imagine	
			not sure	
			notice	
			rather	
			suspect	
			undecided	

larger range of physiological perception word types in conversation with children with higher MLUs.

Cognition. Results indicate that children in the nonhandicapped group tended to be exposed to more IS word types referring to states of knowing, remembering, understanding and so forth than children in the Down syndrome group. The subsequent analysis of covariance revealed a significant effect for child MLU ($F = 5.46$, $p < .05$) and group differences did not remain after controlling for child MLU ($F = .03$, ns).

Thus, these data indicate that mothers in the two groups expose their children to different kinds of inner state language. Although mothers in both

Table 4. Means, Standard Deviations, F Ratios, and Significance Levels for the Mean Proportion of Total Inner State Types By Category Used by Mothers

Type	DS M	DS (SD)	NH M	NH (SD)	F	sig
Affect types/ Total IS types	0.28	(.10)	0.36	(.07)	7.36	.01
Cognition types/ Total IS types	0.27	(.12)	0.36	(.10)	3.51	.07
Physiological types/Total IS types	0.38	(.08)	0.22	(.11)	24.18	.00

Table 5. Means, Standard Deviations, F ratios and Significance levels for Mean Proportion of Total Number of Inner State Words (Tokens) by Category of Inner State Words

	DS		NH			
Category	M	(SD)	M	(SD)	F	sig
Affect tokens/Total IS tokens	.21	.16	.23	.07	.28	.60
Cognitive tokens/Total IS tokens	.30	.13	.44	.12	10.83	.002
Physiological tokens/Total IS tokens	.38	.08	.25	.08	5.86	.02

groups used proportionally the same amount of inner state word types, nonhandicapped children tended to be exposed to a greater range of inner state words. And, within the pool of inner state word types used in each group, the proportions by categories were different in each group. These effects are tempered by the associations between types of word use and child MLU, given that most differences between the groups did not remain after controlling for child MLU. The one exception concerns the range of word types referring to physiological states and perceptions. Here an interaction effect was observed, indicating that mothers' use of these word types are related differently to child MLU to children with Down syndrome and to nonhandicapped children.

Quantity of Inner State Words

The next set of analyses concerned the distribution of inner state words (tokens) in each inner state category used by mothers to their Down Syndrome or nonhandicapped children. One-way analyses of variance were performed on the proportion of affect, cognition and physiological perception tokens in the pool of total number of words used by mothers. Handicap status or group served as the between subjects factor. Means, standard deviations and F ratios for group effects for the proportion of inner state words (tokens) in each category are shown in Table 5.

Results indicate that the utterances of mothers of children with Down syndrome were more likely to contain references to physiological perception states than were the utterances of mothers of nonhandicapped children. Mothers of children with Down syndrome talked about physical sensations like hunger, fatigue, and pain more often than did mothers of nonhandicapped children. The subsequent analysis of covariance revealed that the frequency of physiological words in mothers' speech was related to child MLU ($F = 8.93$, $p = .005$). The difference between the nonhandicapped group and the group with Down syndrome did not remain after accounting

for the effects due to child MLU ($F = .16$, ns) nor was there an interaction effect of MLU and group ($F = .30$, ns).

Interestingly, even though mothers of Down syndrome and nonhandicapped children used proportionally the same range of words referring to cognitive states, mothers of the nonhandicapped children talked about states like knowing, understanding, and remembering more frequently than mothers of the children with Down syndrome. However, in the subsequent analysis of covariance, the group differences did not remain significant ($F = .08$, ns), after controlling for the effects due to child MLU ($F = 14.95$, $p < .001$).

Mothers of the nonhandicapped children and mothers of the children with Down syndrome used affective words like happy, made, and liking, with equal frequency. There were no effects seen for the covariate child MLU ($F = .09$, ns) or for the interaction of child MLU and group membership when the analysis of covariance was performed.

Analyses of Specific Words

The word *good*, in the sense of "feels good" and "tastes good" constituted 14% of the total inner state words in the speech of mothers of children with Down syndrome and only 3% of the total IS words in the speech of mothers of nonhandicapped children. This represents as significant group differences ($F = 9.04$, $p = .005$). However, further analysis revealed a significant relation of child MLU to mothers' use of *good* ($F = 6.87$, $p = .02$) and the differences between the groups did not remain significant after controlling for variance due to child MLU ($F = 2.04$, ns).

Examination of the proportion of cognition word tokens that referred to uncertain or negative cognitive states (i.e. confused, not sure, don't remember, don't know, and don't understand) indicated that these tended to make up a higher proportion of the cognition words used by mothers of the nonhandicapped children (7%) than those used by the mothers of the children with Down syndrome (4%) ($F = 3.70$, $p = .06$). The subsequent analysis of covariance found that again the group differences did not remain after controlling for child MLU.

Relation to Vineland Scores

The next set of results concerned the association between the children with Down syndrome's Adaptive Behavior, Expressive Communication and Receptive Communication Vineland Scores and the inner state word types and tokens used by their mothers. Results are shown in Table 6.

No significant associations were observed between Vineland scores of the children with Down syndrome and the range or kind of IS word types or

Table 6. Pearson Correlations between Down Syndrome Group Vineland Scores and Total Number of Inner State Types and Proportion Types in the Affect, Cognition, and Physiological Categories in Maternal Speech

Types	Vineland scores		
	Overall adaptive behavior	Receptive communication	Expressive communication
Total IS types	.22	.32	.09
IS tokens/utterance	−.08	−.21	−.23
Affect types/Total IS types	.12	.21	.13
Cognition types/Total IS types	−.33	−.23	−.23
Physiology types/Total IS types	.37	.12	.20
Affect tokens/Total IS tokens	.02	.02	−.08
Cognition tokens/Total IS tokens	.06	.09	.09
Physiology tokens/Total IS tokens	−.15	−.12	−.02

tokens used by their mothers during dinner conversation. The negative association between the frequency of maternal use of *good* (e.g. "feels good" or "tastes good") and the children with Down syndrome's overall score tended towards significance. Vineland scores were not available for the NH children.

Relation to Chronological Age

The last set of results concerned the relation of the children's chronological age to mothers' use of IS words. Pearson *r* correlations for the IS variables and child age for each group separately are shown in Table 7. There were no significant relations between any IS variable and child age in the nonhandicapped group.

DISCUSSION

Overall these findings indicate that qualitative differences persist beyond the toddler stage in the ways mothers speaking to children with Down syndrome use inner state language. Older children with Down syndrome during a dinner conversation are exposed to a less varied inner state lexicon than are nonhandicapped children whose age matches the age equivalent adaptive functioning scores of the children with Down syndrome. Mothers of nonhandicapped children used a greater range of IS words referring to affective states, while mothers of children with Down syndrome used more physiological perception word types. In general, mothers of children with Down syndrome discuss inner states less frequently than mothers of nonhandi-

Table 7. Pearson *R* correlations between Categories of Types/Tokens of Inner state words and Child Age for the Group with Down Syndrome and the Nonhandicapped Group

Types	DS	NH
Total IS types	.29	−.42
IS tokens/Utterance	−.30	−.29
Affect types/Total IS types	−.04	.27
Physiological types/Total IS types	.13	−.28
Cognition types/Total IS types	.05	.09
Affect tokens/Total IS tokens	−.31	−.05
Physiological tokens/Total IS tokens	.00	−.04
Cognition tokens/Total IS tokens	.29	.10

[a] $p \leq .05$.

capped children. Specifically, cognitive states are discussed less frequently with children with Down syndrome than with nonhandicapped children at dinner. In addition, cognitive states of uncertainty were discussed less with children with Down syndrome than with nonhandicapped children. In contrast, physiological and perceptual states were discussed more frequently with children with Down syndrome than with nonhandicapped children. This was also true of the use of the word *good* as a label of inner states.

In large measure, however, these differences could be accounted for by differences in the expressive language capacities (as measured by MLU) of the two groups of children. This is consistent with prior research on maternal speech to children with Down syndrome suggesting that mothers fine tune their input to the linguistic (syntactic) abilities of their children (See Rondal, 1980 for a review). However, as we have argued above, it may be that child MLU is not an accurate index of children with Down syndrome's communicative competence. The literature clearly shows that children with Down syndrome typically have greater delays in expressive language than in receptive and pragmatic skills or in mental age (Beeghly, Weiss-Perry, and Cicchetti, 1990; Fischer, 1988; Fischer, 1987; Preuss, Vadasy, and Fewell, 1987; Beeghly and Cicchetti, 1987; Leifer and Lewis, 1984). The expressive language delay itself may very well be primarily a delay in syntactic development, (which is essentially what MLU measures). For instance, children with Down syndrome tend to have larger lexicons than nonhandicapped children with equivalent MLUs (Fowler, 1990).

In fact, the sample described here exhibits just such a gap. Only two of the children with Down syndrome have MLUs between 2.00 and 2.50 (Brown's stage II); the rest have MLUs below 2. Most nonhandicapped children reach stage II by the chronological age of 30 months; but the average adaptive age (Vineland Scores) of the children with Down syndrome was much higher (43 months). The mean receptive language score were even higher (mean age =

53 months), suggesting comprehension by these children at a much more sophisticated level than their MLU would predict. These findings indicate, however, no association between Vineland measures of communicative competence and the maternal IS lexicon, so there is a potential mismatch between the children's ability to comprehend and the speech addressed to them, which is geared to their relatively low MLU.

It could be that there are factors other than children's communicative competence that influence these mothers' use of an IS vocabulary. One such factor can perhaps be inferred from the differences in the frequent use of *good*, and in the infrequent use of cognitive words denoting states of cognitive uncertainty with children with Down syndrome. In one sense, the frequent use of *good* can be interpreted as a kind of "directiveness" previously noted in the speech of mothers to children with Down syndrome. (See Marfo, 1990, for discussion of directiveness in interactions between parents and children with Down syndrome.) That is, mothers are defining the quality of their children's perceptions for them. Rather than asking, "How does that feel?" or "How does that taste?", mothers of children with Down syndrome seem to be interpreting their children's experience for them: "That tastes good. You like it."

It is possible that this is an extension of processes in parent-infant interaction described by Sorce and Emde (1982), whereby caregivers of infants with Down syndrome tune in and respond to less overt, nonverbal, cues than do caregivers of nonhandicapped infants. Emde and Sorce argued that this is necessitated by the diminished expressiveness of infants with Down syndrome. Perhaps the mothers of the children with Down syndrome in this study are responding to nonverbal behavior at a higher rate than mothers of the nonhandicapped children, and accurately labelling inner states for their children. However, the question still arises why positive affective and physiological states are labelled more frequently than negative affective and physiological states. One explanation is that mothers' of children with Down syndrome may be choosing to emphasize and, perhaps, prescribe positive inner states for their children.

It is of interest that states reflecting cognitive uncertainty are described less often with children with Down syndrome than with nonhandicapped children. Here again, one possible explanation for this finding is that mothers are choosing not to challenge their children by focusing on what is not known. In addition mothers' of children with Down syndrome refer to cognition in general less often than mothers of nonhandicapped children, again perhaps choosing not to focus on areas of less strength for their children.

If we are to point to attitudes such as these as potentially underlying mothers' use of IS language to children with Down syndrome, it is important to recognize these attitudes as adaptations. Parents' reasons for emphasizing

the positive, and focusing on the concrete (on physiological states and not on states of uncertainty) are clear, given the challenges, stresses and uncertainties parents face in rearing a handicapped child.

Whatever underlies these differences in mothers' inner state vocabulary, the question of the effects on children with DS of these patterns of inner state words used by their caregivers must be raised. Given the reduced rate and range of inner state words in the input lexicon, children with Down syndrome are given fewer labels for their own and others' inner experience. This has the potential to impede their understanding of inner states and their appropriate behavior in response to inner states. At the very least, children with Down syndrome are being socialized to think and to understand themselves in different ways than nonhandicapped children.

Our results show that affective state words are used less often with children with Down syndrome than with nonhandicapped children. Thus, affective states are possibly less shared between caregivers and children. Prior research has shown the importance of affective sharing in early relationships (Stern, 1985). Without adequate labels for their feelings, children's communication about their inner lives may be less than accurate or full.

If we view language as a tool to aid in understanding concepts, the infrequent use of cognitive words may limit the ability of children with Down syndrome to reflect on their own cognitive processes, and thus hamper their cognitive development.

With the frequent use of *good* by their mothers, children with Down syndrome find the quality of their experiences labelled for them. There are two different kinds of potential effects from this finding. Rather than being faced with open ended inquiries as to their inner states, children with Down syndrome have them supplied for them, thus preempting away the opportunity for self reflection and self expression. In addition, when mothers label children's feelings for them, they may or may not do so accurately: Children with Down syndrome's perception of their inner experience may be in conflict with the interpretation offered to them by their mothers. This conflict has the potential to distort or change the ways children with Down syndrome think about themselves.

Finally, an alternative view might be that the way mothers of children with Down syndrome use internal state language reflects an intuitive awareness of, and thus an appropriate adaptation to their children's capacities for self reflection. The kinds of inner state labels employed by mothers of preschool-age and school-age children with Down syndrome might indeed be calibrated to some aspect of the children's functioning other than linguistic competence, age, or adaptive functioning, that is not measured in this research. Further understanding of the causal mechanisms and effects of qualitatively different exposure to IS language awaits further research.

Some possible intervention strategies do emerge, however, from these

findings. Parents of children with Down syndrome could be sensitized to the functions of inner state words, so that a conscious effort could be made to include these in talk to their children. Parents of children with Down syndrome could also be made aware of the general tendency for their children's cognitive functioning to be underrepresented by their syntactic ability; this could lead them to modify the tendency to continue to talk to their children about physiological inner states in the ways that mothers of nonhandicapped children talk to children of equivalent MLU. Finally, parents of children with Down syndrome could be encouraged to talk to their children about knowing, remembering and understanding as a way to aid their children's cognitive development.

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