Identical male triplets, one with a complete unilateral cleft, were studied developmentally from 16 to 25 months of age and tested with several cognitive-communicative developmental measures. Measures of hearing and motor and behavioral development also were obtained. The triplets did not differ from normative data or from each other on hearing, motor, behavioral, and for the most part, cognitive-mental measures. All of the children were within normal limits on receptive communication measures; however, all were delayed on expressive measures. The triplet with the cleft was more delayed than his brothers. Discussion centers on the interaction of variables that may account for this differential effect in expressive measures in relation to the structural anomaly.

A review of the major studies, summarized in Table 1, reveals that children of various ages with different types of clefts and dissimilar management histories were included as subjects. Language and communication were also defined in different ways, and multiple assessment measures were used. Most of these studies were done after substantial language and communication development had taken place.

Responding to concerns about research with the cleft lip and palate population, Spriestersbach, Moll, and Morris (1964) suggested that greater controls were needed when doing research with this heterogeneous group. With this in mind, Nation (1964, 1970a, 1970b) in a vocabulary study, exerted a variety of controls over subjects, measures, and variables that were considered determinants of language development. The resulting highly homogeneous group of preschool children with cleft lip and palate demonstrated lower scores in vocabulary comprehension and
formulation across all age groups than their siblings who did not have cleft palates and a group of normal children. The interacting variables of duration of hospitalization and hearing loss appeared to be significantly correlated to the vocabulary differences and to other aspects of language development.

Even though the approach to research on language development and language differences in children with cleft lip and palate has been variable, it appears that these children are at risk for developmental language differences affecting comprehension and formulation in the semantic, syntactic, and phonologic aspects of language. These language differences seem to affect late linguistic-cognitive development in many cleft children (Lamb et al, 1972; Pannbacker, 1975; Richman, 1980).

The reasons for these language differences are not clear. Presumably the structural anomaly and its developmental and treatment sequelae have in some way resulted in these differences. Investigators have implicated a number of interacting "causal variables": (1) type and degree of the cleft; (2) physical management of the cleft; (3) middle-ear disease and hearing loss; (4) duration of hospitalization; (5) socioeconomic status; (6) cognitive-intellectual development; (7) psychosocial factors; (8) parent-child interactions and child rearing practices; and (9) visual-perceptual abilities (Morris, 1962; Smith and McWilliams, 1968; Philips and Harrison, 1969; Nation, 1970b; Lamb et al, 1972; Brennan and Cullinan, 1974; Starr et al, 1977).

The studies that have pursued cognitive-intellectual growth and development indicate that older children with cleft lip and palate demonstrate slightly lower, but normal intelligence. Generally these children scored higher on performance than on verbal tests (Goodstein, 1961; Estes and Morris, 1970; Lamb et al, 1972; Mc-Williams and Matthews, 1979; Richman, 1980). Richman's (1980) cognitive study with older children with cleft lip and palate employed both the Wechsler Intelligence Scale for Children (WISC, 1949) and the Hiskey-Nebraska Test of Learning Aptitude (Hiskey, 1966). On the WISC which was used to select subjects, verbal scores were 15 points or more below performance scores. Performance on the Hiskey test, a nonverbal test of intelligence, led Richman (1980) to conclude that the children could be divided into two groups. One of the groups performed poorly in associative reasoning and categorization and was interpreted to have a symbolic disorder; the other group was considered to have a verbal expression deficit. Richman (1980) concluded that cleft lip and palate children to not display homogeneous patterns of cognitive abilities.

Several studies have presented information about earlier cognitive development. Using the Bayley Scale of Infant Development (Bayley, 1969), Starr et al (1977) studied 75 children with cleft lip and palate 6 months to 2 years of age. These children fell within normal limits on the motor and mental scales, although on the behavioral scale they were more passive than the children studied by Bayley. Fox et al, (1978) administered the Denver Developmental Screening Test (Frankenburg et al, 1970), the Receptive-Expressive Emergent Language Test (Bzoch and League, 1971), and the Birth to 3 Scale (Bangs and Garrett, 1973) to 24 children with cleft lip and palate and 24 normal children. The former group scored below the normal children on all language and nonlanguage dimensions. As indicated by these studies, the relationship of cognitive-intellectual development to language differences in children born with cleft lip and palate remains unresolved.

We were able to explore some of these multiple issues in a limited yet controlled way through an unusual circumstance, the birth of identical male triplets, one with a complete left-sided unilateral cleft of the primary and secondary palates. Our purpose was to follow these children on several developmental dimensions to compare differences that might occur between the two normal children and the triplet with the cleft lip and palate.
### Table 1. Major Studies of Language

<table>
<thead>
<tr>
<th>Investigators</th>
<th>Ages of Children (years; months)</th>
<th>Language Measures Used*</th>
<th>Comprehension</th>
<th>Formulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spriestersbach, Darley, and Morris, 1958</td>
<td>3;6–8;5</td>
<td>Ammons’ Full-Range Picture Vocabulary Test (FRPVT)</td>
<td>Language sample measures</td>
<td></td>
</tr>
<tr>
<td>Morris, 1962</td>
<td>2;4–15;5</td>
<td>FRPVT</td>
<td></td>
<td>Language (connected speech) sample measures; Templin-Darley Diagnostic Test of Articulation (TD)</td>
</tr>
<tr>
<td>Nation, 1964; 1970a</td>
<td>2;10–5;10</td>
<td>Peabody’s Picture Vocabulary Test (PPVT)</td>
<td>Vocabulary Usage Test (VUT)</td>
<td></td>
</tr>
<tr>
<td>Smith and McWilliams, 1968</td>
<td>3;0–8;11</td>
<td>Illinois Test of Psycholinguistic Abilities (ITPA) Subtests</td>
<td>ITPA subtests</td>
<td></td>
</tr>
<tr>
<td>Philips and Harrison, 1969</td>
<td>1;6–6;0</td>
<td>PPVT</td>
<td>Mecham; LAT</td>
<td></td>
</tr>
<tr>
<td>Faircloth and Faircloth, 1972</td>
<td>6;0–11;0</td>
<td>PPVT: Cohen’s Verbal Comprehension Factor (VC)</td>
<td>Language sample and intelligibility measures</td>
<td></td>
</tr>
<tr>
<td>Lamb, Wilson, and Lee-per, 1972</td>
<td>5;0–15;0</td>
<td>Picture identification (visual duration threshold)</td>
<td>Object naming (latency of response)</td>
<td></td>
</tr>
<tr>
<td>Brennan and Cullinan, 1974</td>
<td>7;0–11;3</td>
<td>Reynell Developmental Scales</td>
<td>Reynell Scales</td>
<td></td>
</tr>
<tr>
<td>Edwards, 1974; 1980</td>
<td>4;0–6;0</td>
<td>PPVT</td>
<td>Spoken language sample measures; intelligibility measure</td>
<td></td>
</tr>
<tr>
<td>Pannbacker, 1975</td>
<td>19;0–26;0</td>
<td>Receptive-Expressive Emergent Language Test (REEL)</td>
<td>REEL</td>
<td></td>
</tr>
<tr>
<td>Fox, Lynch, and Brookshire, 1978</td>
<td>0;2–2;9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long and Dalston, 1982</td>
<td>1;0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Measures designed to assess some dimension of language comprehension and formulation
†Measures designed to assess other developmental dimensions that include language (verbal) items

### Method

#### The Children

Identical male triplets\(^1\), one with a unilateral cleft lip and palate, were referred to the Craniofacial Defects Team at Rainbow Babies' and Children's Hospital in Cleveland, Ohio, when they were 15 months of age. The children were the result of a full-term pregnancy and cesarean delivery with no complications. JZ, the child with the cleft palate, was born second and weighed 5 pounds 4 ounces. BZ, born first, and MZ, born third, weighed 6 pounds 1 ounce, and 6 pounds 2 ounces, respec-

\(^1\)Laboratory blood typing using 14 different methods provided a 99.9 percent assurance that the triplets were identical.
Related Measures†

<table>
<thead>
<tr>
<th>Measure</th>
<th>General Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wechsler Intelligence Scale for Children (WISC); Vineland Social Maturity Scale</td>
<td>Superior vocabulary recognition; reduced verbal output; length of response, vocabulary usage; no differences in structural complexity (syntax)</td>
</tr>
<tr>
<td>ITPA subtests</td>
<td>Retarded communication skills; reduced vocabulary comprehension and usage; general retardation of language output measures: structural complexity scores; decreased language spontaneity with age; relationship between articulation and verbal output Comprehension and usage developed more slowly across all ages.</td>
</tr>
<tr>
<td>Cohen's Perceptual Organization Factor (PO)</td>
<td>General language depression; weaknesses in vocal expression, gestural output; visual memory weaknesses</td>
</tr>
<tr>
<td>PPVT for subject selection</td>
<td>Retardation in language reception and expression across all ages; acceleration with age</td>
</tr>
<tr>
<td>WAIS vocabulary subtest</td>
<td>Inverse relationship between intelligibility and structural complexity</td>
</tr>
<tr>
<td>Denver Developmental Screening Test (DDST); Birth–3 Scale</td>
<td>Reduction of vocabulary comprehension and verbal comprehension factor</td>
</tr>
<tr>
<td>Gestural communication through child play and parent-child interaction</td>
<td>Normal children had higher thresholds for picture identification and shorter latency responses for object naming than the matched cleft lip and palate children. High range of variability on both comprehension and expression Differences in response length; shorter responses and fewer words used; no difference in syntax and vocabulary measures; relationship between intelligibility and language Below but parallel to normal children on all measures; expressive language revealed greatest differences</td>
</tr>
</tbody>
</table>

Identical triplets provide natural controls on several environmental and biologic variables of interest in developmental language studies. For example, sex, age, socioeconomic status, parental and family backgrounds, child-rearing and nutritional practices, amount and type of communicative stimulation and interaction, intelligence, and physical growth and development all were controlled.

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tively. JZ’s hospitalization history included one day at the age of two weeks for prosthesis placement, six days at the age of 6 weeks for lip closure, and five days at the age of 12 months for primary palaooplasty. An anterior palatal fistula remained throughout the assessment period; however, it was closed by the prosthesis. There was no other significant medical history for the three children.
This family falls within the middle-class category on the Index of Status Characteristics (Warner et al, 1960). The parents both attended two years of college; the father is self-employed, and they live in an average six-room house in a residential neighborhood comprising blue and white collar workers and a substantial number of professionals. There is a daughter five years old.

Even though multiple-birth investigations provide certain controls, caution is necessary when interpreting results obtained (Mitler, 1970). Children of multiple births constitute a special population and often present different developmental histories than singletons. For example, research on the speech, language, and intellectual development of children of multiple births, mostly twin studies, indicates a tendency toward delayed development (Day, 1932; Davis, 1938; Koch, 1966; Mitler, 1970; Lytton et al, 1977).

Developmental Measures and Variables

The Ordinal Scales of Psychological Development (Uzgiris and Hunt, 1975) were used to assess cognitive development. These scales are based on Piaget's (1936, 1937, 1945) concepts of cognitive development throughout the sensorimotor period that ends around 18 to 24 months of age. Seven sensorimotor domains are assessed in an ordinal (hierarchical) manner, and performance in each domain is considered relatively independent of the other domains. Thus, an estimated developmental age (EDA) can be determined for each of the seven domains: (1) visual pursuit and the permanence of objects; (2) development of means for obtaining desired environmental events; (3) development of vocal imitation; (4) development of gestural imitation; (5) development of operational causality; (6) construction of objects in space; and (7) development of schemes for relating to objects. The manual and scoring forms provided by Dunst (1980) were used for administration of the scales.

The Bayley scales were used to assess motor, mental, and behavioral development. The scores for each scale yield developmental indices with a mean (X) of 100 and a standard deviation (sd) of 16.

Pure-tone screening audiometry using a Maico MA-20 portable audiometer and impedance screening using a Grason-Stadler GS 11725 middle-ear analyzer were used to assess hearing sensitivity and middle-ear status. As well, JZ's hearing and middle-ear status were examined at Craniofacial Team visits and by an otolaryngologist.

Communication Measures

The Sequenced Inventory of Communication Development (SICD) (Hedrick, Prather, and Tobin, 1975) provides a receptive communication age (RCA) and an expressive communication age (ECA) for children from 4 months to 4 years of age. The receptive scale incorporates items that require motor responses to demonstrate awareness, discrimination, and understanding; the expressive scale includes items designed to elicit motor, vocal, and verbal responses through imitation, initiation, and responding. Examiner observation, parent report, or both are used to assess the child's abilities.

Speech and Language Processing Model Categories

The three developmental measures used in this study were designed originally to assess different developmental constructs: The Bayley scales assess mental, motor, and behavioral development, the Uzgiris and Hunt scales assess cognitive (psychological) development, and the SICD assesses communication. However, a review of these scales reveals that many similar items appear across the three scales. For example, item 106 on the Bayley scales is "imitates words", item 5b on the Uzgiris and Hunt scale vocal imitation domain is "imitate familiar words", and item 23 on the SICD expressive scale is "imitate two words". Other examples of similarity can be drawn across these three developmental measures.

Each appropriate item from these three developmental measures was placed into one or more of five processing categories based on the constructs used for deriving the Speech and Language Processing
Model (SLPM) (Nation and Aram, 1977, 1984). This procedure, used previously for the Bayley scales and other intelligence tests by Aram and Nation (1971), provided us with a set of items pooled across measures for (1) auditory reception—nonlinguistic responses to nonlinguistic auditory stimuli; (2) language comprehension—responses to linguistically meaningful auditory stimuli; (3) speech and language repetition—verbal imitation of an auditory stimulus; (4) language formulation—creation, selection, and organization of linguistic units for expression; and (5) speech production—actualization of a motor speech response. Besides providing a large number of items within receptive and expressive categories, these pooled items allowed us to view and interpret “communication” development from a processing orientation. The number of items within each category and examples of items from the three developmental measures are presented in Table 2.

The children were tested individually on the same day by the same examiner at 16, 19, 22, and 25 months of age. The order of testing procedures was the same for each child at each test age, but the measures were randomized across test ages.

RESULTS

Developmental Measures and Variables

Uzgiris and Hunt Ordinal Scales of Psychological Development. The overall developmental results for the triplets on the Uz-
TABLE 3. Stages of Development Reached by the Triplets at Each Age Level Assessed Using the Uzgiris and Hunt Scales Across the Seven Sensorimotor Domains.

<table>
<thead>
<tr>
<th>Sensorimotor Domains</th>
<th>Assessment Ages (months)</th>
<th>Ceiling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>BZ</td>
<td>JZ</td>
</tr>
<tr>
<td>Object permanence</td>
<td>VI*</td>
<td>VI</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Means-end abilities</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>E10</td>
</tr>
<tr>
<td>Vocal imitation</td>
<td>IV</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>4c</td>
</tr>
<tr>
<td>Gestural imitation</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Operational causality</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Spatial relationships</td>
<td>VI*</td>
<td>VI*</td>
</tr>
<tr>
<td></td>
<td>11b</td>
<td>11b</td>
</tr>
<tr>
<td>Scheme actions</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

*Indicates ceiling items reached
†The Roman numeral represents the developmental stage. The first number below the Roman numeral is the scale step achieved within that stage. The third number is the estimated developmental age (EDA).

giris and Hunt scales are presented in Table 3. Developmental trends for each sensorimotor domain at each assessment age are shown as the developmental stage, the scale step achieved within that stage, and the estimated developmental age (EDA). The triplets progressed developmentally through the sensorimotor period. All three reached the ceiling items either before or by 25 months of age for the object permanence, means-end abilities, gestural limitation, and spatial relationships domains. JZ and MZ reached the ceiling items on the operational causality domain, but BZ reached only an 18-month EDA. For the scheme actions domain, BZ and JZ reached the ceiling, but MZ remained at a 19-month EDA at the end of the testing period.

The finding of major interest on these scales was the developmental trend noted within the vocal imitation domain. This trend reported in Table 3 is displayed graphically in Figure 1. Throughout the developmental period the triplets did not achieve the expected EDA at each age tested, and although they were 25 months of age when last tested, they did not pass the ceiling of scale step item 9—imitating at least four novel words. Moreover, JZ, the cleft lip and palate child, scored below his siblings throughout the period, except at 16 months when JZ and MZ performed equally well.

Viewing the scale steps reached at each age tested, we see that at 16 months JZ and MZ achieved scale step 4c—vocalizing in response to familiar words—placing them at an EDA of 9 months. BZ performed at scale step 6—vocalizing in response to unfamiliar sound patterns (an EDA of 12 months).

At 19 months of age, JZ remained at scale step 4c; BZ remained at scale step 6; however, MZ progressed to scale step 8—imitating unfamiliar sound patterns (an EDA of 17 months).

At 22 months of age, JZ still remained...
FIGURE 1. Development of the vocal imitation sensorimotor domain of each triplet as measured by the Uzgiris and Hunt scales.

at scale step 4c (EDA of 9 months). MZ remained at scale step 8 but BZ advanced to scale step 7a—imitates unfamiliar sound patterns by gradual approximation (an EDA of 14 months).

At the last age tested, 25 months, MZ and BZ progressed to scale step E25—imitates two novel words (an EDA of 20 months). JZ finally advanced to scale step 8 (an EDA of 17 months). JZ was now imitating unfamiliar sound patterns, but had not begun to imitate novel words.

Bayley Scales of Infant Development. The mental development indices (MDI) obtained for each child at the ages measured are displayed in Figure 2. Although each child scored within normal limits at each age ($X = 100$, $sd = 16$), JZ's score was consistently lower and decreased markedly to 87 at age 25 months of age. This shift most likely reflects an increase in the number of items which required the children to use language. For example, the following items were expected on the Bayley test at 20 to 25 months of age: naming three objects, using sentences of two words, and naming three to five pictures. The Uzgiris and Hunt scales showed that JZ had not achieved this level of functioning; he was still not imitating single novel words.

Motor, Behavioral, and Hearing Development. The psychomotor development indices (PDI) and the infant behavior record from the Bayley scales revealed that the triplets all exhibited similar motor and behavioral development and performed comparably to Bayley's normative group. The results of pure-tone screening and impedance measures indicated that the triplets had normal hearing and middle-ear function at each age tested. JZ's clinical examinations at 6, 15, and 21 months of age revealed normal hearing and middle-ear function, as did his 3-month otolaryngology visits. Thus, unlike most cleft lip and palate children, JZ presented no signs of middle-ear pathology.

Communication Measures

Sequenced Inventory of Communication Development. The receptive communication ages (RCA) and expressive communication ages (ECA) obtained on the SICD across all assessment ages are displayed in Figure 3. At 16, 19, and 22 months of age all three children had age-level RCAs. At 25 months BZ and MZ, who obtained identical scores at each age level, scored one month below age level, whereas JZ scored three months above age level. ECAs obtained were generally below the RCAs.
at each level, with the exception of the 16- and 25-month results, where BZ and MZ obtained identical ECAs and RCAs. JZ obtained lower ECAs than his brothers at all age levels, except at 19 months when all three children obtained an ECA of 16 months. Therefore, overall results from the SICD indicated that the triplets were developing receptive abilities at normal age levels whereas expressive abilities were reduced, with JZ, the child with the cleft palate, scoring approximately 4 months below his brothers.

Speech and Language Processing Model Categories. The results of viewing and comparing “language-communication” development of the triplets arrived at by pooling the items within the five processing categories of the SLPM are seen in Figures 4 and 5. The results of testing the items for the two processing categories of auditory reception (sensation-perception) and comprehension are displayed in Figure 4. Although some variability exists in raw scores with JZ scoring below BZ and MZ at 19 and 22 months of age, the overall results for the triplets, particularly at the 25-month test age, appear comparable.

Figure 5 contrasts the results obtained within the repetition, formulation, and speech-production processing categories. They are presented together graphically because they each require vocalized responses from the children, and at times include items coded in all three categories. While JZ scored below his brothers in the repetition category at 16, 19, and 22 months of age, by 25 months of age his performance on these items was comparable. Speech production results also show a gap between JZ and his brothers at 16, 19, and 22 months with the gap closing at 25 months of age. The formulation category shows a more dramatic difference among the triplets. JZ was making no correct responses at 16 and 19 months of age, and only one at 22 months of age. BZ and MZ were making substantially more (9 and 11, respectively) correct responses. The gap between JZ and his brothers was closing at 25 months, yet JZ made only 8 correct responses to formulation items while BZ made 14 and MZ, 17.
FIGURE 4. Development of auditory reception (sensation-perception) and language comprehension for each triplet as assessed by pooled items

**DISCUSSION**

Comparisons were made among the triplets and with available normative data for several cognitive-communicative measures. We studied these children in order to contribute to the knowledge of developmental differences in language and communication that have been documented in the cleft palate population, and to look for reasons for their occurrence.

First, on all items categorized as measures of sensation-perception-comprehension (receptive communication measure), it was documented that the triplets developed similarly, and their RCAs were within normal expectations. Second, on items categorized as repetition-formulation-speech production (expressive communication measure) all three children presented developmental lags based on normative comparisons. This may be due to the multiple-birth effect discussed earlier by Day (1932) and later by Koch (1966) and Lytton et al. (1977). Third, JZ, the child with the cleft palate, developed more slowly on these expressive measures than his brothers, especially on language formulation items—those defined as requiring creation, selection, and organization of linguistic units for expression.

Comparing these receptive-expressive findings for JZ with those reported in the literature, it is apparent that he did not present the receptive delay (comprehension) generally reported for children with clefts (Nation, 1964, 1970a; Philips and Harrison, 1969). Our study documents that the expressive delays reported in their studies exist as early as 16 months of age and persist at 25 months of age. It is important to recall that for JZ the items representing this expressive delay are prelinguistic vocal responses that precede word production. JZ's expressive difficulties occurred even though his receptive development was within normal expectations.

What do these results suggest about the reasons for this early delay? First, it is important to reiterate our belief that we were studying normal, healthy children from a supportive, communicative, middle class family with adequate resources. As well, based on the Bayley scales the triplets were not different from normal children on motor and behavioral development. JZ's cleft and its treatment sequelae were the only major differences apparent among the children.

JZ's lack of middle-ear pathology and hearing loss has implications for other studies that have found receptive (comprehension) differences in children with cleft lip and palate. Most, if not all of these studies included children with significant and expected histories of middle-ear pathology and temporary but recurring hearing loss. Using JZ's negative auditory findings and lack of receptive deficits, we could infer that the reported comprehen-
sion problems of children with cleft palate may stem from their middle-ear difficulties. If true, this case study supports early, aggressive management approaches and regular monitoring of middle-ear problems in these children.

The issue of cognitive-intellectual development in children with cleft lip and palate and its relationship to developmental language differences is clarified somewhat by this study. JZ's differences on the cognitive measures appear to result from items requiring vocal/verbal output demands, a domain of sensorimotor development considered "communicative" in tests such as the SICD. Our study confirms that whenever verbal/vocal output responses are used to assess cognitive-linguistic development at early ages, there may be a reduction in score, a finding consistently seen in intelligence studies with older children who have cleft lip and palate (Goodstein, 1961; Lamb et al., 1972), and also seen in the Fox, Lynch, and Brookshire (1978) study with younger children.

It seems that we cannot explain the difference in JZ's expressive development based on familial factors, psychosocial factors, communicative input factors, hearing loss, or cognitive development. Why then does JZ exhibit this difference? Perhaps the best way to address this problem is to conjecture and pose questions that will require further investigation and theoretical insight.

First, we could continue to ask if there was some subtle difference inherent in the family interactions with the child with cleft palate that was not seen. Did the two normal siblings, the sister, the parents, and other family members act in some consis-
tent way that could account for the expressive differences? For example, could the family have created in JZ a self-awareness, a focus on the mouth as an abnormal body part, thereby reducing his attempts to vocalize? This cannot be ruled out, but we observed neither adverse reactions nor attitudes of overprotection to JZ based on his cleft condition.

The major differences for JZ were the presence of his cleft lip and palate, the treatment procedures, hospitalization, and clinic visits that he experienced. Can we assume that the difference in JZ's expressive development is somehow intrinsically related to the impact of these conditions? Prior to our investigation, JZ was hospitalized for 12 days within the first 13 months of life, and the expressive difference was first documented there. Is this duration of time, along with other psychological reactions to surgical-hospitalization procedures, sufficient to explain JZ's reduction of early vocal responses? If so, at 16 months we would expect the reduction we found and perhaps its persistence in the absence of any treatment program.

Is there some inherent (biologic-psychological) interaction between a defective speech-producing mechanism and the development of expressive language? It is relevant to note here that JZ's gestural communication, in support of Long and Dalston (1982), was appropriate, but when his brothers were transferring more communicative functions to spoken language, JZ was not. Does the language-processing system somehow "know" that the producing system is defective, and thereby inhibit linguistic processing? This is suggestive of sensorimotor or auditory feedback interaction with peripheral and central mechanisms, a type of "back-up" effect. We know that place and manner of articulation are affected, and that a variety of adaptation (compensatory) effects occur when velopharyngeal incompetence exists. We do not know how the defective mechanism affects phonologic production, nor are we aware of the complex interactions this linguistic level has on the total speech output system. The relationship between the speech-mechanism abnormality and delayed language formulation remains elusive and warrants further investigation.

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