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The Impact of Early Intervention on Speech and Lexical Development for Toddlers With Cleft Palate: A Retrospective Look at Outcome

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Since Congress first passed the Education for All Handicapped Children Act Amendments in 1986, states have been encouraged to design and implement early intervention programs for infants and toddlers with disabilities. It has been estimated that at least one fourth of all children who qualify for early intervention and preschool special education services demonstrate some type of communication disorder (McLean & Cripe, 1997).

ABSTRACT: **Purpose:** The purpose of the present investigation was to examine the impact of early intervention on speech and lexical measures for toddlers with cleft palate.
Method: Speech measures of ten 27-month-old toddlers with cleft palate who had been referred for therapy at 17 months of age were compared to those of 10 toddlers with cleft palate who had been referred but did not receive therapy. Both groups were compared to 2 other groups of children who had never been referred for therapy.
Results: Multivariate analysis of variance revealed only 1 significant difference between the children who received therapy and those who did not receive therapy. Children who received therapy produced a significantly greater percentage of glides ($p < .001$) than did children who did not receive therapy.
Conclusion: The findings of this study indicated that early intervention as conducted by the speech-language pathologists in this study was not as effective as expected for this group of toddlers with cleft palate.

KEY WORDS: cleft palate, early intervention

Infants and toddlers with cleft palate are frequently enrolled in early intervention programs because of their increased risk of delays in speech and lexical development. According to a recent report by Hardin-Jones and Jones (2005), 68% of the 212 preschoolers they followed in their clinical population were enrolled in or had previously received speech therapy. Despite the volume of children with cleft palate who are enrolled in early intervention services, little is known about the effectiveness of this intervention.

The majority of treatment studies described in the literature have reported outcomes for older preschoolers and school-age children with cleft palate (Albery & Enderby, 1984; Chisum, Shelton, Arndt, & Elbert, 1969; Pamplona, Ysunza, & Espinosa, 1999; Pamplona & Ysunza, 2000; Shelton & Ruscello, 1979; Van Demark, 1974; Van Demark & Hardin, 1986). Despite methodological problems with participant description, measurement protocol, and experimental control, the collective findings of these studies suggest that (a) articulation therapy is effective in reducing speech sound errors for preschoolers and older children with cleft palate, (b) therapy time is significantly reduced for children with glottal/pharyngeal errors when a phonological approach is used (Pamplona, Ysunza, & Espinosa,1999), and (c) language development is better when a parent is actively involved in the therapy sessions (Pamplona & Ysunza, 2000).

Few data have been reported describing treatment outcomes for toddlers with cleft palate who are enrolled in early intervention. Blakeley and Brockman (1995) described outcomes for 41 children with cleft palate who were enrolled in a 4-year treatment project at 12–24 months of age. Speech and hearing assessments were provided every 3 to 4 months, and parents were trained to provide direct and indirect speech-language stimulation. Sixty-six percent

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of the children also received direct articulation therapy from a speech-language pathologist (SLP). The authors reported that 93% of the children demonstrated normal articulation and 88% had normal expressive language at 5 years of age. Although these results were impressive and underscore the importance of parental involvement in early intervention, the project was descriptive and thus incorporated no experimental control.

More recently, Scherer and her colleagues (Scherer, 2003; Scherer & Brothers, 2002; Scherer & McGahey, 2004) conducted a series of studies to investigate the effectiveness of parent-implemented treatment for young children with cleft palate. Scherer and Brothers examined the effectiveness of two focused stimulation language interventions carried out by parents for 4 children ages 18 to 36 months. They reported that both types of treatment increased the mothers' use of words containing stops as well as their children's stop consonant vocabulary. Additionally, both types of treatment resulted in an expansion of the children's consonant inventory and a reduction in glottal stops. Improvement in expressive language and phonetic inventory was not evident for 1 participant who did not receive the intervention. The authors reported similar findings in a follow-up study of 10 children (Scherer, 2003). In a companion study, Scherer and McGahey compared the speech and language performance of 10 children with cleft palate (ages 18–36 months) who received a naturalistic, parent-implemented vocabulary intervention to 10 language-matched noncleft children (ages 14–36 months) who did not receive intervention. The investigators reported that the cleft group significantly increased their vocabulary diversity and reduced their use of glottal stops; however, they did not achieve the level of speech and language performance of the noncleft comparison group.

Early intervention for young children with delays in speech sound development and expressive language frequently focuses on expansion of the child's lexicon. It is inferred that the early phonological delays in these children are related to a general delay in language development, and thus will improve as the child's expressive lexicon expands. Although this inference holds true for many children, it is not uncommon for toddlers with cleft palate to demonstrate restricted consonant inventories that reflect a greater impairment than that seen in their general expressive language skills (Peterson-Falzone, Trost-Cardamone, Karnell, & Hardin-Jones, 2006). For these children, small consonant repertoires can impair recognition of normal lexical growth when it occurs. Because so many toddlers with cleft palate demonstrate delays in speech sound development that appear to drive delays in expressive language, it is unclear whether therapy to enhance general language development is more productive than therapy that is specifically designed to expand consonant inventory. Because early phonological development and lexical development appear closely related to one another, therapy for young toddlers with cleft palate may be more productive when expansion of their consonant inventory is seen as a primary goal of early intervention and not as a byproduct of language intervention. Although investigations comparing these two types of intervention have not been reported, data reported by Scherer (1999) suggests that intervention that is designed to enhance general language development in these children results in improvement in their sound inventories as well. In her study, Scherer examined outcomes of a language intervention program that was administered by an SLP for young children with cleft palate. She reported that the children's sound inventories and vocabulary increased despite the fact that therapy focused on language and not speech production.

In a more recent study, Pamplona, Ysunza, and Ramirez (2004) conducted a prospective, randomized trial to determine whether children ages 3–7 years with velopharyngeal insufficiency and compensatory articulations who received naturalistic intervention required less total therapy time than did their peers with the same disorders who received phonological intervention. The authors found no significant difference between the groups in total time needed to eliminate the compensatory articulations.

Collectively, the findings reported by Scherer, Pamplona, and their colleagues indicate that naturalistic therapy that is carried out by either parents or SLPs is effective in expanding vocabulary and phonetic inventories for toddlers and older children with cleft palate. The findings reported by Pamplona et al. (2004) also suggest that, at least for older preschool children, a naturalistic approach is not associated with better results than a phonological-based intervention. Although both approaches appear effective, it is still unclear whether use of a naturalistic, language-based approach in toddlers with restricted consonant inventories results in phonetic growth that is comparable to that evident with intervention that focuses on expansion of a child's phonetic inventory.

This retrospective study was conducted to examine the impact of early intervention on speech and lexical development for toddlers with cleft palate. Specifically, we compared the performance of 27-month-old toddlers with cleft palate who had been referred for therapy at 17 months of age to that of toddlers with cleft palate who had been referred but did not receive therapy. Both groups were compared to 2 other groups of children who had never been referred for therapy.

METHOD

Participants

Forty toddlers, 30 with repaired cleft palate and 10 without cleft palate, participated in this study. The children were all 27 months of age and included 33 males and 7 females. Six children had bilateral cleft lip and palate, 20 had unilateral cleft lip and palate, 3 had cleft of the hard and soft palate, and 1 had cleft of the soft palate only. Age at time of palatal surgery for the 30 children with overt cleft palate ranged from 7 months to 17 months ($M = 12$ months). Nine of the toddlers were later judged to have velopharyngeal inadequacy and ultimately received a pharyngeal flap after 4 years of age. None of the children had been diagnosed with other congenital anomalies, sensorineural hearing impairment, cognitive deficits, or neurological involvement. See Table 1 for additional participant information.

All of the toddlers in the study had been enrolled in a larger longitudinal study of speech development at 6 to 9 months of age and were followed by regional cleft palate teams. Parental education regarding the impact of a cleft palate on speech development was provided for each child by the team SLP. Of the 30 toddlers in the cleft palate group, 10 had not been referred for therapy by 17 months of age (not referred group) and 20 had been referred for therapy (referred group) (see Table 2). Ten of the toddlers who were referred for therapy actually received it (therapy group); the remaining 10 toddlers did not (no therapy group).[1] Three of the

[1]Parents reported no local services available and an inability to take time off work.

Table 1. Participant information.

Group	N	Mother's education level	
		High school	*College*
Cleft			
Bilateral cleft lip and palate	6	3	3
Unilateral cleft lip and palate	20	8	12
Cleft of hard and soft palate	3	1	2
Cleft of soft palate Only	1		1
Noncleft	10	3	7

children in the therapy group were later diagnosed as having velopharyngeal inadequacy and received pharyngeal flap surgery. Five children in the no therapy group received this surgery.

All of the children in the study demonstrated normal receptive language functioning as estimated by the Preschool Language Scale—3 (PLS–3; Zimmerman, Steiner, & Pond, 1992). Auditory comprehension scores ranged from 90 to 132, with a mean of 111. Expressive language scores ranged from 85 to 138, with a mean of 111. No significant differences in auditory comprehension scores, expressive language scores, or PLS–3 total scores were evident between the groups (see Table 3).

Intervention

Age at onset of therapy for the toddlers in the therapy group ranged from 9 to 21 months (M = 16 months). Nine of the toddlers received therapy one time per week for 60–75 min in their home. The remaining child received therapy twice a week in his home for 30-min sessions. Six SLPs provided the early intervention services. One therapist served 5 of the children; the remaining 5 children were seen by 5 different therapists. None of the therapists had extensive experience treating children with cleft palate. Years of experience for the therapists ranged from 1 to 19 years (M = 10 years, median = 7 years). Because this was a retrospective study, experience and proficiency of the therapists was not controlled. Similarly, no experimental control was possible for the intervention provided. Treatment goals for each child were obtained from progress reports provided by the SLPs (see Table 4). None of the reports specified the amount of time devoted to each goal in the treatment sessions. Descriptions of treatment procedures in the progress reports suggested that intervention involved (a) stimulation of consonant sounds using modeling and tactile placement cues and (b) encouraging vocabulary development through natural play contexts and milieu teaching. Oral motor activities involved imitation of oral motor movements, blowing activities (e.g., bubbles, ping-pong balls, flutes, and feathers), and thermal gustatory stimulation. In addition, ongoing parental education was provided regarding speech-language stimulation activities.

Table 2. Participant information for the 30 toddlers in the cleft palate group.

Cleft type	Group		
	Not referred	*Referred*	
		Therapy	*No therapy*
Bilateral cleft lip and palate	0	3	3
Unilateral cleft lip and palate	7	7	6
Cleft of hard and soft palate	2		1
Cleft of soft palate	1		
Total	10	10	10

Table 3. Standard scores obtained by the participants on the Preschool Language Scale—3 at 17 months.

Group	*Auditory comprehension*	*Expressive communication*	*Total language*
Not referred	114.80	117.60	118.20
Therapy	108.10	105.40	107.80
No therapy	106.44	107.22	107.67
Noncleft	114.00	115.30	116.40

Procedure

All participants were audio and video recorded while interacting with their primary caregivers in their homes at 17 months and 27 months of age. Age-appropriate toys were provided by the examiners and were originally chosen to sample a variety of sounds across word positions. The recordings were obtained using a Countryman wireless microphone (MEMWF05ETS), Telex Receiver (RMR-70) and transmitter (WT 60), Marantz portable cassette recorder (Model PMD 430), and Panasonic video camera (Model AG188). The examiners eliminated obvious background noise sources (e.g., radio, TV) when possible before each recording session. Intermittent interruptions (e.g., telephone ringing, sibling walking into room and asking question) invariably created some noise on the tapes. During transcription, utterances were simply discarded when competing noise compromised transcription.

Parents were asked to complete the MacArthur Communicative Developmental Inventories (CDI; Fenson et al., 1993) at each session. The expressive vocabulary checklist of the CDI is a parent report instrument that includes lists of words that are commonly used by young children. Parents were asked to identify those words on the standard form that they had heard their child produce. Expressive vocabulary size was estimated using the score from the expressive vocabulary checklist.

Data Analysis

Audio recordings obtained for each participant at 17 months and 27 months of age were transcribed by the two authors using the International Phonetic Alphabet (International Phonetic Association, 1999) and supplemental diacritics described by Shriberg and Kent (1995). On average, 100 utterances/words were transcribed for each participant at 17 months and 200 utterances/words were transcribed at 27 months. The transcribed samples were entered on a computer and analyzed using the Logical International Phonetic Program (LIPP; Oller 1990). Information regarding the size of the consonant inventory as well as the place and manner of articulation was obtained.

Table 4. Treatment goals for children in the therapy group.

	Participants									
Frequency of therapy	*P1 1/wk 60 min*	*P2 1/wk 60 min*	*P3 1/wk 60 min*	*P4 1/wk 60 min*	*P5 1/wk 60 min*	*P6 1/wk 75 min*	*P7 1/wk 60 min*	*P8 2/wk 30 min*	*P9 1/wk 60 min*	*P10 1/wk 60 min*
Increase sound production in babble/words	X	X	X	X	X	X	X	X	X	X
Increase oral motor awareness and strength	X	X	X	X	X		X		X	
Increase expressive language (lexicon)								X		X

The two authors independently transcribed six randomly selected transcripts containing a total of 553 utterances in order to obtain a measure of interjudge reliability. Only those consonants that were transcribed identically for place, manner, and voicing were considered agreements. Interjudge reliability for the five transcriptions ranged from 75% to 91% (M = 86%).

For the 17-month comparisons, the groups were compared on one measure of expressive vocabulary (CDI expressive vocabulary score) and 11 consonant characteristics, including the size of the consonant inventory and the percentage of consonants produced according to place (e.g., labial, alveolar, palatal, velar, and glottal) and manner (e.g., stop, fricative, nasal, glide, liquid, and glottal) characteristics. For the 27-month comparisons, the groups were compared on one measure of expressive vocabulary (CDI expressive vocabulary score) and 11 consonant characteristics, including the percentage of consonants correctly produced according to place and manner characteristics. Finally, group comparisons were also performed for the percentage of glottal stops produced and the number of stable consonants produced. This latter variable was defined as the number of consonants that were correctly produced a minimum of 70% of the time.

A multivariate analysis of variance (MANOVA) was performed using SPSS (2001) to determine if significant differences in speech production were evident among the 4 groups (i.e., noncleft, not referred, therapy, no therapy). Follow-up comparisons were performed using a Bonferroni adjustment. A separate t test was performed to assess differences across groups in CDI scores. This separate analysis was deemed necessary because missing scores for this variable would have resulted in elimination of all data in the MANOVA for 5 participants. Effect sizes were calculated using Cohen's d statistic (Thalheimer & Cook, 2002) and are reported for all comparisons.

RESULTS

Comparisons at 17 Months

The results of the MANOVA revealed a significant overall difference between the groups at 17 months of age, $F(3, 36) = 2.20$, $p < .003$. Univariate analyses revealed significant differences between the groups for two variables: number of different consonants in inventory, $F(3, 36) = 7.81$, $p < .001$; and percentage of oral stop consonants, $F(3, 36) = 7.25$, $p < .001$. Differences in the percentage of nasal consonants approached significance, $F(3, 36) = 4.17$, $p < .012$. Table 5 shows the mean values for the CDI expressive score and each speech variable across each of the 4 groups.

No significant differences were found between the noncleft and not referred groups. Nor were differences evident between the therapy and no therapy groups. For the latter 2 groups, the difference in percentage of nasal consonants approached significance, and a large effect size of .88 was obtained. The no therapy group demonstrated a significantly smaller consonant inventory than both the not referred group ($p < .006$) and the noncleft group ($p < .004$). Large effect sizes of 1.79 and 2.18, respectively, were obtained using Cohen's d. In addition, the therapy group produced a significantly smaller percentage of oral stops than did the noncleft ($p < .001$) and not referred ($p < .010$) groups. Large effect sizes were obtained for both comparisons (d = 2.67 and 2.31, respectively).

Significant differences were also evident between 2 of the groups for the CDI score. The CDI score for the no therapy group was significantly lower than that for the not referred group ($p < .006$;

Table 5. Comparison of group performance at 17 months of age. Comparisons reflect the percentage of consonants produced in the sample.

	Cleft			
			Referred	
	Noncleft	*Not referred*	*Therapy*	*No therapy*
# different consonants in inventory	14.10	13.90	9.90	9.20
% true consonants	67.32	65.21	41.58	43.08
% labials	33.37	37.47	28.65	21.64
% alveolars	29.69	23.07	14.32	15.42
% palatals	4.10	7.87	8.96	7.18
% velars	8.18	16.38	8.21	12.23
% oral stops	46.63	40.72	11.41	21.86
% fricatives[a]	13.68	5.35	2.30	1.45
% nasals	9.37	15.13	24.90	15.52
% glides	10.64	17.46	19.00	13.57
% liquids	2.34	2.45	2.79	4.33
% glottal stops	8.53	6.88	17.03	23.22
# words on CDI	52.11	33.71	13.00	22.88

Note. CDI = MacArthur Communicative Development Inventories (Fenson et al., 1993).

[a]excluding /h/.

d = .69, medium effect). The difference between the CDI scores for the no therapy and noncleft groups approached significance at $p < .016$ (d = .80, large effect).

Comparisons at 27 Months

Comparisons at 27 months were based on 35 of the 40 participants. Five participants (3 in the no therapy group and 2 in the therapy group) had 22 intelligible words or fewer in their 200 utterance/word transcription. Therefore, relational analyses (correct/incorrect) could not be performed.

The results of the MANOVA revealed a significant overall difference between the groups, $F(3, 31) = 2.75$, $p < .001$. Univariate analyses revealed significant differences between the groups for 10 of the 12 variables: number of stable consonants, $F(3, 31) = 11.31$, $p < .001$; percentage of total consonants correct, $F(3, 31) = 15.40$, $p < .000$; percentage of oral stop consonants correct, $F(3, 31) = 14.90$, $p < .000$; percentage of oral fricatives correct, $F(3, 31) = 6.31$; $p < .002$; percentage of liquids correct, $F(3, 31) = 6.24$, $p < .002$; percentage of glides correct, $F(3, 31) = 10.58$, $p < .001$; percentage of labials correct, $F(3, 31) = 12.30$, $p < .000$; percentage of alveolars correct, $F(3, 31) = 3.78$, $p < .001$; percentage of palatals correctly produced, $F(3, 31) = 4.48$, $p < .010$; and percentage of glottal stops, $F(3, 31) = 4.48$, $p < .010$.

The mean values for the CDI expressive score and each consonant variable are shown in Table 6 for each of the 4 groups. As expected, the group of children with cleft palate who were not referred for therapy continued to demonstrate speech production performance similar to that of the noncleft group. Both groups produced a significantly larger number of stable consonants ($p < .001$) and correctly produced a larger percentage of total consonants ($p < .001$), oral stops ($p < .001$), oral fricatives ($p < .005$), glides ($p < .001$), and labials ($p < .001$) than the no therapy group. A very large effect size was obtained for the oral fricative comparisons (d = 1.19). Large effect sizes ranging from 1.80 to 2.93 were obtained for the remainder of the comparisons. The not referred and noncleft groups also produced a larger percentage of total consonants ($p < .007$) and oral stops ($p < .001$) than the therapy group. Finally, the noncleft group correctly produced a larger percentage of liquids ($p < .001$) and alveolars ($p < .001$) than the no therapy group.

The only significant difference found between the therapy and no therapy groups was the percentage of glides that were correctly produced. Children who received therapy produced a significantly greater percentage of glides ($p < .001$) than did children who did not receive therapy. A Cohen's d of 1.66 was obtained, indicating a large effect size. Although no other statistically significant differences were evident between the therapy and no therapy groups, large effect sizes of greater than .80 were obtained for comparisons involving the number of stable consonants and the percentage of fricatives, labials, alveolars, and velars that were produced correctly.

Significant differences for CDI scores were not evident between the groups, although the difference between the not referred and therapy groups approached significance at $p < .012$, d = 1.07, large effect.

Table 6. Comparison of group performance at 27 months of age. Comparisons reflect the percentage of consonants correctly produced in the sample by place and manner of production.

		Cleft		
	Noncleft	*Not referred*	*Therapy*	*No therapy*
% consonant correct	56.46	55.48	40.17	31.32
% stops correct	62.55	60.58	35.63	27.94
% fricatives correct	44.53	46.15	32.70	21.11
% nasals correct	67.23	70.47	58.60	51.48
% glides correct	79.72	82.67	81.05	46.38
% liquids correct	28.97	17.46	12.31	3.95
% labials correct	83.06	84.43	66.28	55.12
% alveolars correct	48.47	40.96	28.74	17.99
% palatals correct	44.91	40.30	29.88	18.85
% velars correct	56.57	61.42	43.25	26.99
% glottal stops produced	3.57	1.25	10.36	15.30
# stable consonants	8.90	8.70	5.38	2.00
# words on CDI	369.88	426.89	264.78	176.33

DISCUSSION

Prediction of speech and language outcomes in young children with cleft palate is often a difficult task. Early speech sound development may appear significantly impaired before palatal surgery, yet for many of these children, catch-up growth will be evident following surgery (Jones, Chapman, & Hardin-Jones, 2003). A primary problem encountered in early intervention is in deciding who needs the service and who will develop appropriately without it. Clinicians who have written about early intervention for these children typically recommend that it be considered when oral stops do not emerge within 2–3 months following palatal surgery (Hardin-Jones, Chapman, & Scherer, 2006; Peterson-Falzone et al., 2006). In the current study, information about oral stops appeared related to early management decisions. The toddlers with cleft palate who were referred for therapy had a smaller consonant inventory and a smaller percentage of oral stops than did their peers with clefts who were not referred for therapy. Post-hoc analyses performed for the total group of children revealed that the percentage of oral stops produced at 17 months of age was moderately correlated (Pearson) with two variables at 27 months of age: number of stable consonants (r = .40; $p < .01$) and percentage of total consonants produced correctly (r = –.47; $p < .01$). Differences in oral stop production continued to be evident at 27 months of age between the toddlers who were not referred for therapy and those who received it. Follow-up assessment of the children at 39 months of age revealed that none of the children in the not referred group had subsequently been referred for treatment, and all of the children who had originally been referred for therapy at 17 months but had not received it by 27 months (no therapy group) were receiving therapy by 39 months. These findings underscore the importance of early assessment and argue for intervention when stop consonants do not emerge in a timely fashion following palatal surgery. These findings also lend credibility to early diagnoses. Despite reports of catch-up performance following palatal repair for these children that can presumably impact the validity of early prognostic indicators, the referring SLPs in this study successfully identified those toddlers who ultimately needed therapy.

Research has demonstrated that the presence of stop consonants following surgery is a strong predictor of later success for

children with cleft palate. Chapman, Hardin-Jones, and Halter (2003) examined the early speech and lexical development of 30 toddlers with cleft palate. Those children who demonstrated greater oral stop production before surgery and in the immediate postsurgery period also demonstrated better speech and lexical development at 21 months. In addition, those children who demonstrated an increase in the size of consonant inventory immediately following surgery also tended to have better speech and lexical development at 21 months of age. Finally, Chapman (2004) examined postpalatal surgery outcomes for 15 children with cleft lip and palate and reported that greater stop production following surgery was associated with better language at 39 months. The findings of Chapman and her colleagues are not surprising because children who do not develop oral stops following surgery frequently demonstrate poor consonant development, persistent nasal substitutions, and glottal stop productions.

Of particular interest in this study was the lack of significant differences between the therapy and no therapy groups at 27 months of age. Because both groups demonstrated a similar phonetic and lexical profile at 17 months, one would expect the group of children who received therapy to demonstrate better speech at 27 months. Although the therapy group did correctly produce more total consonants than the no therapy group, the majority of differences between the groups at 27 months were not significant, suggesting that the therapy group did not benefit as much as expected from the early intervention they received. It should be noted, however, that large effect sizes were obtained for many comparisons that were not statistically significant and might be interpreted to suggest that significant differences might have been achieved had the group sizes been substantially larger. Given the retrospective nature of this investigation and the lack of detailed treatment notes available, it is not possible to explain the limited growth that was evident over time in this group of toddlers. However, three factors that should be considered when any early intervention program is not as successful as anticipated include the type and frequency of intervention as well as the goals that are addressed. Research has demonstrated that naturalistic interventions such as milieu teaching and focused stimulation are very effective in producing changes in functional language for young children with and without clefts not only during clinician-directed intervention but parent-directed intervention as well (e.g., Girolametto, Pearce, & Weitzman, 1996, 1997; Scherer, 1999; Scherer & Brothers, 2002; Scherer & McGahey, 2004). Although therapy records for the participants in this study indicated that intervention was provided for at least 60 min per week for all of the children, information regarding the amount of training provided to the parents and the extent to which they incorporated treatment goals and strategies in the child's daily routine was not provided. Because we know from the work of Scherer and her associates that parents of children with cleft palate can effectively carry out naturalistic intervention, intervention for these toddlers should always incorporate parent training and support. Without parental involvement, it is highly unlikely that the goals of intervention will be incorporated into the child's daily routine, and his or her rate of progress will not be as rapid as desired. The benefit achieved by any child in therapy likely will be impacted by the goals of intervention as well. In the current study, although *increasing sound production* was identified as a treatment goal for all children in the therapy group, therapy for 7 of the 10 toddlers also focused on *increasing oral motor awareness and strength* (see Table 4). Only two of the children's goals included *increasing expressive lexicon*. Scherer and her colleagues (Scherer, 1999, 2003; Scherer & Brothers, 2002; Scherer & McGahey, 2004) have demonstrated that language-based intervention designed to increase a child's vocabulary typically is successful in increasing phonetic inventory as well. It is tempting to speculate that the treatment outcomes in this study might have been better had intervention focused on expansion of the toddler's lexicon as well as his or her phonetic inventory, instead of devoting time to oral motor activities. Unfortunately, the retrospective nature of this study precluded our ability to obtain detailed information on both active parental involvement and time spent on each treatment goal. Without such information, it is not possible to fully appreciate and interpret these findings.

It was surprising that so many of the children's SLPs identified increasing oral motor awareness and strength as an appropriate goal for these toddlers. Examination of the toddlers' consonant inventory revealed that all of the children in this group were producing bilabial consonants, and all but 2 were producing lingua-alveolar and lingua-velar consonants. Because all of the toddlers demonstrated the ability to produce oral constrictions for stops and other age-appropriate consonants, it is unclear what the intended outcome of the oral motor exercises was supposed to be.

Our clinical experience suggests that clinicians often assume that an absence of expected consonants in the vocalizations of toddlers with cleft lip and palate is directly related to decreased muscle strength. In fact, an oral motor deficit is only one of many reasons why a toddler might avoid production of specific consonant types. This type of deficit has never been identified as a typical causal factor associated with early speech sound delays in toddlers with cleft palate (Hardin-Jones et al., 2006). Indeed, there is no reason to believe that the tongue would be impaired in a typical child with cleft lip and palate, and rarely is the repaired cleft lip problematic for speech. In those rare instances when lip rounding or bilabial closure seems impaired in young children with a cleft, the etiology of the problem generally is related to either inadequate repair of the obicularis oris muscle during lip repair or a severe dental malocclusion. Neither problem can be treated adequately using oral motor exercises. The lack of data demonstrating efficacy of oral motor exercises (for children with speech sound disorders in general and those with cleft palate specifically) suggests that clinicians should focus on facilitating sound production through babbling games and/or conventional articulation/phonological strategies. For some children, it may also be appropriate to focus on expansion of their expressive lexicon. Instead of using oral motor exercises to "warm up" the mechanism before initiation of babbling games, time might be better spent engaging in simple airflow activities (when indicated) that teach awareness of oral versus nasal airflow and that also incorporate speech (e.g., say *puh* to move the cotton ball across a table).

In the current study, differences in CDI scores for the therapy and no therapy groups approached significance at 27 months of age. It seems possible that significance would have been reached had data been available for all of the children. Scrutiny of scores for children in both groups revealed a much larger growth in expressive vocabulary for the therapy group (average increase of 273 words) than the no therapy group (average increase of 165 words). This difference in vocabulary growth was interesting because only 2 children in the therapy group reportedly addressed this goal. Perhaps expansion of the phonetic inventory stimulated expressive language growth for some children.

Limitations of the Study

The retrospective nature of the current study and lack of experimental control imposed serious limitations on our ability to interpret some of the most interesting findings of this study. A major weakness of the study was our inability to control for therapist experience and proficiency or the amount of time each therapist devoted to each treatment goal. We have no way of knowing, therefore, whether children who engaged in oral motor activities did so for 5 min or 45 min of each session. Another potential limitation was the lack of information regarding parental training and involvement in the early intervention program. Most SLPs who participate in early intervention model speech and language strategies for parents during the face-to-face therapy encounters. It is expected that parents will incorporate these strategies into daily routines as they interact with their child. It may be the case that limited parental training could have minimized the effectiveness of intervention.

All of the participants in this study were followed by cleft palate teams, and it is possible that the suggestions provided by the team SLP were considered adequate by those parents who did not seek out therapy.

Clinical Implications

The findings of this study indicate that SLPs can appropriately identify toddlers with cleft palate who are at risk for later delays in speech-language development. The presence or absence of oral stop consonants is a key clinical finding that can assist SLPs in identifying children who will need early intervention services. Although toddlers with cleft palate may avoid production of oral (as opposed to glottal) stop consonants during babbling before palatal surgery, these productions should begin to emerge in the child's phonetic inventory following surgery. If oral stops do not begin to emerge within 6–8 weeks following surgical management, the child's phonetic inventory in babble and early words should be examined carefully. Absence of oral stops in the presence of nasal substitutions, glottal stops, and/or a limited phonetic repertoire should be seen as a red flag and early intervention should be considered (Hardin-Jones et al., 2006).

Clinically, the findings of this study support previous observations of the authors that early intervention SLPs often identify oral motor goals for children who do not have oral motor problems. Despite the lack of oral motor problems evident in children with cleft palate, many clinicians persist in using nonspeech, oral motor blowing tasks to facilitate consonant development. This problem is probably compounded by the fact that the majority of early intervention assessments that are on the market target receptive and expressive language and thus do not assist clinicians in making appropriate judgments about a child's oral motor development. Before assuming that a toddler who is not talking (or one who has palatal anomalies) has an oral motor problem, efforts should be made to study the child's babbling repertoire. If the child is producing consonants in babble that require appropriate lingual and labial constrictions, then it is unlikely that oral motor delays are responsible for the child's expressive language delay. In such cases, it would be more appropriate to initiate naturalistic intervention carried out in partnership with both the SLP and parents to expand the child's expressive vocabulary and phonetic inventory.

Future Research

Additional prospective research is needed to document the benefits of different types of early intervention strategies used for children with cleft palate. Although findings reported by Scherer (1999) and Scherer and McGahey (2004) suggest that naturalistic vocabulary intervention is effective in increasing vocabulary diversity and consonant inventory for these children, we do not know whether vocabulary-based intervention yields outcomes that are comparable to or better than phonological-based intervention for those toddlers with cleft palate who demonstrate severely restricted phonetic inventories.

Further, we would add our voice to others who have criticized the use of oral motor therapy for children with garden-variety speech sound delays (Bowen, 2005; Clark, 2005; Forrest, 2002; Lof, 2003) and call for prospective, clinical outcome research. Research is also needed to examine normal, developmental oral motor performance in typically developing toddlers. Although we do not believe that blowing horns will improve speech production, the judicious use of low-resistance blowing toys can be useful in teaching a toddler with a cleft palate the difference in oral versus nasal airflow. At present, we know very little about the age at which typically developing toddlers can engage in such tasks effectively.

In conclusion, the findings of this study emphasize the need for additional research documenting the effectiveness of early intervention programs for children with cleft palate. Because early intervention can be costly in terms of both time and money, we must do all we can to ensure that our services result in an efficient as well as an effective product.

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