Language Acquisition With Limited Input: Romanian Institution and Foster Care

Purpose: To provide the first detailed information about native language abilities of children who are or had been institutionalized.

Method: The language of ten 30-month-old children raised in Romanian orphanages was compared with that of 30 chronological-age-matched peers: 10 children who had moved recently from orphanages to foster care, 10 children in foster families for at least 1 year, and 10 children raised in their biological families. Ten language measures were obtained from communication during play and from parent/caregiver report.

Results: Children who were institutionalized and children in foster care for a brief time showed substantial language delays, with some of these children not yet producing intelligible words. Children in foster care for at least 1 year approximated the expressive output and receptive language of children who had never been institutionalized; however, they showed lower expressive grammatical abilities. Within the group of children who were institutionalized, the presence of a preferred caregiver and a measure of development, greater height, were associated with greater language output. Although children in orphanages produced fewer complex forms than children in biological families, there were no systematic qualitative differences in language structure across groups.

Conclusion: Foster care facilitated language growth after substantial language delays associated with institutionalization.

KEY WORDS: language disorders, foster children, Romanian

There is a converging research base indicating that children raised in orphanages in which there is severe deprivation are vulnerable for negative cognitive, social, behavioral, and physical outcomes (Beckett et al., 2002; Gunnar, Morison, Chisholm, & Schuder, 2001; Johnson, 2000; Kadlec & Cermak, 2002; Kaler & Freeman, 1994; Morison & Ellwood, 2000; O'Connor et al., 2003; Sigal, Perry, Rossignol, & Ouimet, 2003; Sloutsky, 1997). These negative outcomes, however, may be alleviated substantially for young children when they move to environmentally richer adopted homes (Johnson, 2002; Marcovitch et al., 1997). There is continuing investigation of the factors that predict outcomes of institutionalization, including length of orphanage stay and age at adoption. Issues of lasting neural changes, sensitive periods, and resilience

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for children who have been institutionalized have also been examined (Marshall, Fox, & the Bucharest Early Intervention Project Core Group, 2004; O'Connor et al., 2000; Parker, Nelson, & the Bucharest Early Intervention Project Core Group, 2005; Rutter, O'Connor, & the English and Romanian Adoptees Study Team, 2004).

Although a general profile of the abilities of children who are institutionalized is becoming clearer (see Maclean, 2003, for a review), communicative ability, a central facet of cognitive and social development, has received minimal attention. Children's language abilities are the focus of this study, specifically, children raised in Romanian orphanages compared to children in foster care or living with their biological families. Romanian orphanages have received particular attention by researchers and the broader public because they historically presented extreme instances of physical and social deprivation. Even when nutrition and child care have been sufficient, opportunities for social interaction have differed from child care outside institutions (Groe & Ileana, 1996; Zeanah et al., 2003).

We take the perspective that language is a domain-general cognitive ability that emerges in the context of social interaction. That is, although domain-specific characteristics may emerge as a function of maturation, overall variation and individual differences in language performance during development and in the adult state arise from a general biological processing system interacting with different language and social experiences (see MacDonald & Christiansen, 2002, and Tomasello, 2003). Children who are placed in orphanages through poverty and abandonment, as in Romania, likely will bring a range of genetic and medical histories to bear. Children may have growth delays in height, weight, and motor development as well as attachment difficulties and less effective peer relationships (Maclean, 2003). However, of particular interest here, these children also may provide an example of extreme variation in language input.

**Role of Language Input**

Exposure to and experience with language is a major environmental influence on language development. For instance, typical English-speaking children's comprehension and production of multiclauses utterances have been found to be correlated with the mean number of noun phrases per utterance in the mothers' language (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002). As another example, the frequency of consonants in the ambient language has been found to be an important predictor of consonant development for Cantonese-speaking children (Stokes & Surendran, 2005). Also, English-speaking infants appear to prefer high-versus low-probability phonetic patterns in the input; that is, they respond differentially to input characteristics of the language (Jusczyk, Luce, & Charles-Luce, 1994).

Language input has received most attention in terms of potential effects on vocabulary acquisition, especially to the extent that input co-occurs with socioeconomic status, maternal education, and child care (e.g., Arriaga, Fenson, Cronan, & Pethick, 1998; Dollaghan et al., 1999; Hart & Risley, 1995; Hoff, 2003; National Institute of Child Health and Human Development Early Child Care Research Network, 2000). In particular, Hart and Risley (1995) found that typically developing children living in poverty in the United States had substantially lower vocabulary skills at 3 years of age than peers from working-class and professional families. The driving force for the cumulative quantitative differences in the trajectory of children's vocabulary growth in the first 3 years was the amount of language (and interaction time) that primary caregivers directed to their children. Parents in all groups showed qualitatively rich language input (e.g., responsiveness, encouraging commenting and elaboration), but increased opportunities for quality arose when there was a high frequency of language input. On average, the children in welfare families heard about one third of the number of words per hour as did children in professional families. The vocabularies of children in professional families grew at about twice the rate of children in welfare families, a profound cumulative difference over time.

Hart and Risley's (1995) interpretation of a direct relationship between the amount of language input and the amount of language a child produces is consistent with other research that has investigated early vocabulary skills. Huttenlocher, Haight, Bryk, Seltzer, and Lyons (1991) found that the number of words mothers of 1- to 2-year-olds addressed to their children was highly predictive of the children's vocabulary growth rate. There is less agreement about the relation between frequency of specific words/word types in the input and specific word use in children's emerging vocabularies (Bornstein et al., 2004; Dale & Goodman, 2005).

**Language Input and the Language of Children Raised in Institutions**

The finding that amount of language input influences language output has a major implication for children in institutions where there is extreme deprivation. Hart and Risley's (1995) findings suggest that very socially depriving circumstances will affect language development, at least early vocabulary growth, because of the paucity of language input in these circumstances. However, there is minimal research describing the language of children living in orphanages and little research about the impact of environmental input on the children's language skills.

An early report by Goldfarb (1945) indicated that 9 of 15 children living in an orphanage in the United States were unable to recognize any common objects. A
later study by Provence and Lipton (1962) examined development during the first year of life of 75 children living in a U.S. orphanage. The children’s opportunities for social interaction were described as poor and infrequent, mainly occurring during diapering, bathing, and feeding. Relative to typical developmental milestones, the infants’ vocalizations were less elaborated and strikingly less frequent, with some infants being completely silent. Infants’ comprehension was also reported to be delayed. A small number of infants were followed after placement in foster care; it was reported that improvements in language were slower than in other domains.

At the time of these early reports, a predominant view was that the delays of orphanage-raised children were a consequence mainly of biological rather than experiential factors. Sayegh and Dennis (1965) tested the hypothesis that enriched experiences could foster children’s development by comparing the behavior of two groups of infants in a Lebanese orphanage. One group received standard care of being placed into cribs; the other group spent some time in chairs with novel objects to manipulate. The group of children who spent time outside of their cribs showed a significant increase on a measure of developmental age. Hunt, Mohandessi, Ghodssi, and Akiyama (1976) examined the sensorimotor development of infants in an Iranian orphanage. The infants received standard orphanage crib care with minimal social interaction, or they received additional auditory and visual stimulation (e.g., mobiles, taped music, and child-directed speech), additional caregiver contact through an increased caregiver-to-child ratio, or both additional auditory–visual stimulation and increased, trained caregiver contact. At age 3 years, the children who received standard care were observed to have minimal expressive language and limited language comprehension. Children with additional auditory–visual stimulation showed increased vocal imitation skills and some spontaneous naming. Children with increased caregiver contact also showed greater vocal imitation skills, and children who received increased stimulation and trained caregiver contact were reported to be skillful verbal imitators, socially responsive, and to have good receptive semantic skills.

Other early work by Tizard and colleagues (Tizard, Cooperman, Joseph, & Tizard, 1972; Tizard & Rees, 1974) with 2- to 5-year-old children living in residential nurseries within the United Kingdom suggests that quality of language input affects children’s performance more so than quantity. In this study, children’s language comprehension was correlated more highly with the frequency of caregivers’ informative and explanatory comments rather than with the overall frequency of caregiver input. However, most children were in environments in which a large amount of language input occurred. Children younger than 2 years were spoken to less by caregivers than at other ages, and these children demonstrated lower comprehension scores. As Tizard et al. (1972) suggested, it may be that quantity of language input matters most when the frequency of language input is very low.

More recently, Roy, Rutter, and Pickles (2000) and Roy and Rutter (2006) examined the emotional–behavioral and reading performance of two groups of school-age children. One group of 19 children had been placed in institutions in the United Kingdom as infants, and the other group had been placed in foster care. Children in both groups came from biological families with high rates of psychopathology. There was a higher level of hyperactivity and inattentive/disruptive behavior reported for the institution-raised group than for the foster care group, although there was within-group variability. Both groups had higher levels of these emotional–behavioral difficulties compared with the group of children who had never lived in an institution (Roy et al., 2000). Roy and Rutter showed a similar pattern of group performances for reading accuracy on a standardized test, again with high within-group variability. One third of children in the institution group were identified with a reading delay, whereas none of the children in the foster group were identified with a delay. There was a weak association between reading accuracy and inattentive behavior. Given the similar biosocial backgrounds of children in the institution and foster groups, Roy et al. (2000) and Roy and Rutter concluded that institutional placement, rather than biology, influenced the children’s outcomes.

Smyke, Dumitrescu, and Zeanah (2002) examined the attachment behavior of young children in a Romanian orphanage who received either the standard care of many caregivers and rotating caregiver shifts (20 inconsistent caregivers) or received care with a higher caregiver-to-child ratio (4 consistent caregivers). Caregivers reported a higher frequency of attachment disturbances in the standard care context than in the higher caregiver ratio context. Fewer children in standard care (44%) were reported to have sentences or “good” language than children with a higher caregiver ratio (65%), although this difference was not statistically significant. About half of the children in the standard care context, and almost all children in the higher caregiver ratio context, had a preferred or favorite caregiver; that is, there was a particular caregiver identified who had a selective attachment to a child. Thus, these children may have received greater social and language input than would occur for children for whom preferred caregivers are not identified.

Finally, it has been speculated that institutionalization is associated with atypical as well as delayed language performance. Some children who experience extreme deprivation show behaviors such as rocking, self-injury, and atypical sensory interests that are found in autism (Beckett et al., 2002; Rutter et al., 1999; Rutter, Kreppner, & O’Connor, 2001). Given the genetic basis and
stability over time of autism compared to the improvements of children when they move away from institutions, the similar performance characteristics of autism and extreme deprivation appear to have different underlying causes (Fombonne, 2003). For children raised in institutions, these behaviors may reflect a self-soothing function or adaptation to the orphanage environment (Fisher, Ames, Chisholm, & Savoie, 1997). Distinctive language features that are characteristic of autism or other pervasive developmental disorders (i.e., other than severe language delay), such as echolalia, were examined in a study of orphanage-raised children (Rutter et al., 1999). However, Rutter et al.’s (1999) questionnaire and case study information do not allow for unambiguous identification of qualitatively different language features as a frequent outcome of extreme deprivation.

**The Language of Children Adopted Internationally**

Several studies have provided information about the language of children adopted internationally, with many of these children previously raised in orphanages. Even if they do not yet have first words, internationally adopted children have transitioned from exposure to the acoustic and phonetic characteristics of one language to monolingual experience with a different language. As such, the children present a particular instance of second-language learning (Glennen, 2002). The studies have used fairly global measures of performance, often survey questionnaires and adoptee parent reports. Recent research with children adopted from eastern Europe (mainly Russia) and China (mainly girls) indicates that infants and toddlers adopted into the United States acquire English rapidly and are performing at age expectations with 1 to 2 years exposure to the second language (Geren, Snedeker, & Ax, 2005; Glennen, 2005; Pollock & Price, 2005). For example, Glennen (2005) followed 28 children adopted from eastern Europe into the United States at 11–23 months of age. Most children made immediate gains in English, although 8 children were recommended for speech-language intervention using peer-based guidelines. Children adopted at later ages, that is, with relatively less time in their adopted families and less exposure to the second language, may show language delays for a longer period than other children (Glennen & Masters, 2002; Judge 2003, 2004; Roberts et al., 2005; Tan & Yang, 2005). Overall, there appears to be broad variability in language and scholastic outcomes for children adopted internationally, with many children experiencing very positive long-term outcomes (Benigno, Hoyt, & Windsor, 2006).

Of particular interest here is that positive language outcomes also have been reported for children adopted internationally from Romanian institutions. Using retrospective adoptee parent report, Morison, Ames, and Chisholm (1995) examined a group of children adopted into Canada. The children showed substantial delays across language, motor, and social abilities at the time of adoption. By 1 year after adoption, however, the children had made substantial gains in all areas. Rutter and the English and Romanian Adoptees Study Team (1998) examined a large cohort of Romanian children adopted into the United Kingdom before 2 years of age. Retrospective report when the children were 4 years old indicated a mild developmental delay for the group as a whole at the time of entry to the United Kingdom, but with substantial individual variability, and many children had extreme delays. At 4 years of age, the children’s performance resembled that of a group of adopted children born in the United Kingdom. The same investigators (O’Connor et al., 2000) examined the performance of another, smaller group of children who had been adopted after age 2 years. At 6 years of age, about 20% of these children showed developmental delays compared with over 90% at the time of entry into the United Kingdom. Finally, again using retrospective report, Groze and Ileana (1996) found a greater likelihood of medical, physical, and learning difficulties for Romanian children adopted into the United States for children who had a prior history of institutional care than for children adopted from families. It should be noted, however, that over two thirds (72%) of the children in Groze and Ileana’s convenience sample had experienced at least some institutional care, possibly skewing the comparison of institutional and family care.

**Summary**

Taken as a whole, the studies of orphanage care have provided global reports or test scores indicating that language development is severely compromised when children are raised in contexts with minimal language or social input. Children raised in institutions often may have marked spoken language delays relative to children who are not institutionalized. However, increased opportunities for learning or social interaction, as occurs in foster care or through adoption, may well facilitate development. The nature of the initial delay and the question of qualitative versus quantitative differences in language use are not clear.

The available data on children raised in institutions are insufficient to examine language skills in the native language and insufficient to test assumptions about how communication skills develop in the context of other cognitive and social abilities. This study focuses on Romanian language samples from 30-month-old children raised in orphanages compared with the performance of children who had moved from an orphanage to foster care and children in the same community who had never been institutionalized. It was anticipated that the children
raised in an orphanage would show pervasive delays across lexical-grammatical and phonological aspects of language but that placement in the richer language environment of foster care would promote rapid growth in language development. Associations among language measures and participant characteristics were also examined as a starting point to guide the investigation of individual variation.

Method

Participants

There were 40 participants in the study. All 40 were part of a previously identified cohort of 158 children living in Romania who were evaluated at 9, 18, 30, and 42 months of age in the Bucharest Early Intervention Project (Zeanah et al., 2003). The full cohort is described first, followed by a description of the way in which children were selected for the current study.

Full participant cohort. The Bucharest Early Intervention Project is a randomized controlled trial of institutional and foster care placements. To place children in foster care, Zeanah et al. (2003) worked with the Romanian Ministry of Health; the Directorates for Child Protection; and a nongovernmental organization, Institutul pentru Dezvoltarea Copilului (Institute of Child Development). A total of 136 children living in one of six orphanages in Bucharest originally were randomized to foster care (N = 69) or continued institutional care (N = 67), but with children being placed in family settings if these became available. Children with genetic syndromes, fetal alcohol syndrome, and microcephaly were excluded from the cohort. All children had been institutionalized for at least half of their lives. For comparison, another 72 typically developing children who had never resided in an institution and lived with their biological families in the same community also were recruited as participants, bringing the total number of participants originally followed by Zeanah et al. to 208 children. Of this number, 50 children discontinued participation in the project at some point. This included 26 children from the institutional care group who left the study because they returned to the biological family, were placed in government foster care, or were adopted and dropped out of the study. Twelve children who had been placed in foster care left the study because they returned to the biological family or were adopted and dropped out. Twelve children who had never been institutionalized also dropped out of the study, most often reporting time pressures. The remaining cohort included 158 children: 41 who remained in orphanage care throughout the project, 57 who moved from orphanages to foster care, and 60 typically developing age-matched peers who had always lived with their biological families.

There is variability in Romanian orphanage environments, and overall conditions in Romanian orphanages have improved substantially in the last decade. However, the orphanages in which the children lived shared the common characteristics of highly structured daily schedules (e.g., scheduled “hygiene” and “stimulation” periods), little overall environmental stimulation, little caregiver-child social interaction, low caregiver-child ratios, and rotating caregiver shifts (Smyke et al., 2002; Zeanah et al., 2003). For example, Smyke et al. (2002) examined attachment behavior in one large institution in Bucharest. In this institution, standard orphanage care typically consisted of 20 different caregivers, with 3 caregivers for 30 children on each shift.

About half of the foster families in the Bucharest Early Intervention Project were single-parent families, with foster mothers being an average of 48 years old. Community families tended to be dual-parent families, with a greater proportion of mothers holding university degrees than in the foster families. Average household income tended to be a little higher in the community than in foster families.

Study participants. Because the current study included detailed transcription of children’s conversations with caregivers/parents, only 40 children from the larger group of 158 were selected as participants here. Of interest was children’s lexical-grammatical and phonological performance at the 30-month testing (children ranged in age from 29 months to 31 months at this time). This age was chosen to capture early language development, with prelinguistic communicative forms such as gesture and vocalization expected to predominate at the younger age points for children raised in an orphanage.

Of the 40 children, 10 had always lived in institutional care (the institution group [IG]), and 10 were typically developing children from the comparison community group (CG). These 20 children were selected randomly from the larger cohort. For the foster care group, 10 children were selected as participants at each of two time points. Of the children in foster care at 30 months of age, there was a wide range in time spent in foster care, and many children had spent only a short amount of time in foster care. To reduce heterogeneity, children were divided into two foster care groups. Ten children in foster care for at least 12 months were selected as a maximum foster care group (Max FC). Only 11 children at 30 months in the larger cohort had been in foster care for at least 12 months, including a pair of twins. One twin was excluded randomly to bring this group size to 10 children who had been in foster care for 12 to 21 months (M = 18 months). Another 10 children were selected randomly from the larger cohort as a minimum foster care group (Min FC). These children had been in foster care for no longer than 5 months (range: 0–5 months, M = 2.3 months).
The overall random selection introduced differences in gender and ethnicity among groups. There were 4 females in the IG group, 3 in the Min FC group, 8 in the Max FC group, and 7 in the CG group. The IG group included 6 Romanian and 3 Rroma children (and 1 child of unknown ethnicity). The Min FC group included 2 Romanian and 4 Rroma children (and 4 of unknown ethnicity), and the Max FC group included 8 Romanian and 2 Rroma children. Nine of 10 children in the CG group were Romanian (1 was of unknown ethnicity).

Characteristics of the four groups are provided in Table 1. Except for birth weight, which was taken from a retrospective review of maternity charts, all physical measurements were obtained through a physical examination at 30 months. The examination was performed at the Institute of Child Development in Bucharest or was performed, using the same equipment, by social workers who traveled to visit families. The Mental Development Index (MDI) noted in Table 1 is from the Bayley Scales of Infant Development—II (Bayley, 1993), which also was administered at 30 months. The MDI evaluates several abilities, including perception, discrimination, memory, verbal communication, and abstract thinking. All personnel were trained in the administration of all measures.

Children in the institution and foster care groups varied in the length of time they spent in their biological families or in a context such as government foster care prior to or during the period of institutionalization. This difference is shown in Table 1 as mean months prior to institutionalization. However, 20 of the 30 children had been institutionalized since birth (5 IG children, 6 Min FC children, and 9 Max FC children). This distribution provided for a conservative estimate of the effects of foster care, with a greater number of Max FC children institutionalized since birth than in the IG group. There was a high incidence of otitis media in the full cohort of children, 5 Max FC children, and 1 CG child, with most measures taken at 42 months of age. Although these measures tended to be noisy, the otoacoustic emission results at 2, 3, 4, and 5 KHz indicated some bilateral difficulties across frequencies for 1 child in the IG group, 1 child in the Min FC group, and 1 child in the Max FC group.

Finally, it was determined whether children in the IG group had a preferred caregiver in the institution. As noted earlier, caregivers in the orphanages typically rotated shifts during the day and cared for many different children. In this context, some caregivers formed selective attachments to particular children. Children’s access to a specific preferred caregiver was determined through a series of caregiver interviews and observation at the times the children came to the Institute of Child Development. The caregiver interview was performed with each of the caregivers who accompanied children at the time of the assessment, that is, with caregivers who may or not have been the preferred caregiver but could provide information about another preferred caregiver at the same institution. Six of the 10 children in the IG group (4 females) were identified as having a preferred caregiver. In all but one instance, the preferred caregiver was the adult interactant in the language sample procedure outlined below.

**Procedure**

*Language sample transcription.* A language sample was obtained from each child in Romanian. Romanian, the official language of Romania, is a Romance language that retains some features of Latin and borrows heavily from Slavic languages. The phonology resembles Italian. There are 20 consonants, 7 core vowels, and numerous diphthongs and triphthongs. Written Romanian is orthographically transparent, with direct phoneme–letter correspondences. Romanian grammar is marked by a rich inflectional system. Nouns are marked by gender, number, and case; articles and most pronouns and

<table>
<thead>
<tr>
<th>Group</th>
<th>Birth weight (kg)</th>
<th>Weight (kg)</th>
<th>Height (cm)</th>
<th>Occipitofrontal circumference (pctl)</th>
<th>MDI</th>
<th>Months prior to institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution (IG)</td>
<td>3.1 (0.7)</td>
<td>12.2 (1.6)</td>
<td>87.7 (3.4)</td>
<td>20.7 (13.1)</td>
<td>75.0 (11.5)</td>
<td>4.6 (0–14)</td>
</tr>
<tr>
<td>Min FC (foster ≤ 5 months)</td>
<td>2.9 (0.6)</td>
<td>12.6 (1.2)</td>
<td>88.3 (3.2)</td>
<td>39.1 (25.8)</td>
<td>75.2 (9.3)</td>
<td>1.0 (0–10)</td>
</tr>
<tr>
<td>Max FC (foster ≥ 12 months)</td>
<td>2.7 (0.5)</td>
<td>12.9 (1.3)</td>
<td>91.9 (4.2)</td>
<td>31.6 (19.4)</td>
<td>91.1 (7.6)</td>
<td>1.0 (0–10)</td>
</tr>
<tr>
<td>Community (CG)</td>
<td>3.5 (0.3)</td>
<td>13.6 (0.7)</td>
<td>92.1 (2.1)</td>
<td>48.8 (27.0)</td>
<td>102.6 (13.0)</td>
<td>—</td>
</tr>
</tbody>
</table>

*Note.* Values are group means; numbers in parentheses are ranges. Months prior to institutionalization for the institution group (IG), minimum foster care (Min FC) group, and maximum foster care (Max FC) group is the number of months that children spent either with their biological families or in another context (e.g., governmental foster care) before or during the period of institutionalization. All measurements except birth weight were obtained at 30 months of age. MDI = Mental Development Index (derived from the Bayley Scales of Infant Development—II); pctl = percentile.
adjectives agree in gender with the noun they mark. Verbs are marked by person and mood. There are four main regular verb conjugations according to the final vowel in the infinitive form of the verb (Hoffman, 2004; Mirou, 2002).

The language samples were taken from an unstructured play episode with the child and a female caregiver/mother using a standard set of toys. The episode was part of a larger series of play interactions and problem solving (following Crowell & Feldman, 1988). All play episodes took place in a quiet room at the Institute of Child Development and were audio- and videotaped using high-quality digital recordings. The episodes were 10 min long across children because samples this long have been found to be useful in clinical decision making (Leadholm & Miller, 1992). Child and adult utterances were transcribed orthographically by an English-speaking investigator and one of two native Romanian speakers who also spoke English fluently. A phonological transcription was obtained for child utterances. Each utterance was listened to repeatedly by the pair of listeners until there was agreement about the transcription of each word. Words and utterances that were difficult to understand were listened to a minimum of three times before being transcribed as unintelligible. Words and phrases that contained speech sound errors but had a clear referent were considered intelligible (e.g., suc [juice], pălă instead of pară [pear], cană lu bebe instead of cană lui bebe [baby’s cup]). Some speechlike vocalizations occurred in a small proportion of the children’s samples. These were coded as unintelligible utterances. Nonlinguistic productions (e.g., cries) were not counted as utterances.

Language sample measures. Eight measures of the children’s language were obtained from each sample. Calculation of measures was performed by an independent investigator who did not transcribe the videotaped data. The first four measures targeted lexical–grammatical skills and previously have been found useful in the characterization of language disorder (Scott & Windsor, 2000; Watkins, Kelly, Harbers, & Hollis, 1995). These four measures included two measures of overall amount or productivity: (a) total number of intelligible utterances (TNU) and (b) total number of words in intelligible utterances (TNC). To be counted as an intelligible utterance, each word in the utterance had to be intelligible; that is, unintelligible utterances included utterances that were both partially and fully unintelligible, but those words were excluded from TNC.

We used one measure of lexical or vocabulary diversity: number of different words in intelligible utterances (NDW). Because the sample sizes were relatively small and limited by time rather than number of utterances, NDW was expected to be associated with TNU; that is, this measure mainly served as a measure of vocabulary output rather than a refined measure of semantic diversity. The fourth measure was an index of sentence length, mean length of utterance in words (MLUw). As a measure of grammatical complexity, MLU could be calculated using morphemes, content words, or total words (Devescovi et al., 2005). Aspects of Romanian grammar lend themselves to counting morphemes (e.g., the plural marking of the feminine noun trenuri [trains] vs. tren [train] is phonologically transparent). However, other markings involve less phonological change (e.g., the plural of the masculine noun leu [lion] is lei). Because there is minimal information about children’s acquisition of Romanian, and because the children might make speech sound errors that would influence morphological coding, we used the simplest measure of MLUw. Also, it was expected that many IG children might produce only uninflected single words at this age, making sentence length in words a robust and conservative measure of group differences.

The other four measures that we used targeted speech sound production. As a measure of intelligibility, the percentage of fully intelligible utterances (PIU) in total utterances was calculated. The other measures used total utterances in the sample and focused on consonant use. Consonants rather than vowels were of interest because consonants develop more slowly over time (Ingram, 1999), presumably providing a sensitive index of any group differences. These measures included total number of consonants (TNC), number of different consonants (NDC), and mean length of utterance in consonants (MLUc). These three measures are correlated with the quantity and diversity of words produced by the children; however, they provide complementary information about speech sound development and are again useful clinical measures that may predict toddlers’ later development (Carson, Klee, Carson, & Hime, 2003; Rescorla & Ratner, 1996; Roberts, Rescorla, Giroux, & Stevens, 1998). TNC provides an estimate of the child’s overall output, and NDC provides an estimate of the child’s consonant repertoire in the particular sample. For the expected short utterances, MLUc also can provide information about the syllable shape of words and presence of consonant clusters. For example, words that are consonant–vowel syllables (e.g., ce [what], nu [no], da [yes]) and reduplicated consonant–vowel syllables (e.g., bebe [baby], mamă [mommy], papa [eat]) are likely to be early words not only because they have familiar referents but also because they are easier to produce than more complex syllable shapes (e.g., lapte [milk], vorbesc [talk], căpșună [strawberry]). As these examples illustrate, more complex syllable shapes contribute to higher TNC, NDC, and MLUc values.

Caregiver report. As another measure of children’s overall expressive language performance, and to include an index of language comprehension, parents and caregivers completed the Receptive–Expressive Emergent
Language Scale (REEL; Bzoch & League, 1971) in Romanian at the 30-month testing point. This questionnaire checklist includes 132 items that represent different speech-language abilities from birth to 3 years, such as following simple directions, recognizing common names, babbling, and producing new words. The REEL yielded an additional two language measures: (a) receptive and (b) expressive language quotients.

The REEL does not have an English-speaking standardization sample, although it has been used in research describing young children’s language performance (e.g., Ward, 1999). Although the REEL also has not been standardized on Romanian children, it has a long tradition of use in clinical practice in Romania (Zeanah et al., 2003) and was used here to complement the language samples measures. Inspection of the REEL Expressive scale (REEL-E) items indicates that a small number of items may be of limited value for Romanian children because they rely on developmental speech-language milestones specific to English and/or behaviors specific to Western cultural expectations (e.g., producing particular consonant–vowel combinations, playing pat-a-cake games). This may contribute to lower Expressive scale scores for this sample of Romanian children; however, any effect was expected to be equivalent across groups. A few items in the REEL Receptive scale (REEL-R; e.g., knowledge of family names) arguably might underestimate the performance of children in the IG group; however, this potential effect on overall scores was expected to be very small.

**Results**

The children’s group mean performance on each of the 10 measures is shown in Table 2. The lexical–grammatical and phonological measures from the language samples are discussed first. This is followed by the REEL caregiver report measures and a discussion of correlations among selected language and physical measures.

**Lexical–Grammatical Measures**

Table 2 shows that there were clear differences at the group level in lexical–grammatical performance, most obviously in the amount of language produced in the 10-min samples. Children in the IG group produced about one half the number of utterances as children in the CG group and produced about one third of the number of words. Children in the Min FC group closely resembled the IG group on all measures. These two groups of children showed substantial language delays, chiefly using single-word utterances. On the other hand, children in the Max FC group approximated the performance of the CG group on all measures except the grammatical measure (MLUw).

Although several language sample measures were expected to be highly correlated (e.g., TNU and TNW), group comparisons using multivariate analysis of variance were not considered robust because of the small sample sizes. Thus, separate analyses of variance (ANOVA) were used for selected comparisons, with the conventional significance level of $p = .05$ divided by the total number of comparisons to correct for Type I error. Three of the four phonological measures—TNC, NDC, and MLUc—were associated directly with the parallel TNW, NDW, and MLUw. Thus, these phonological measures were excluded from statistical analyses so as not to increase Type II error by setting an inappropriately conservative $p$ value. This left five ANOVAs (TNU, TNW, NDW, MLUw, and PIU) with $p$ set at .01 in each comparison ($p = .05$ divided by 5). An overview of the statistical results for these five group comparisons is presented in Table 3. The IG and

![Table 2. Group mean results from language sample and caregiver report measures.](https://i.imgur.com/5.png)

**Note.** Standard deviations are in parentheses. NDW (number of different words), MLUw (mean length of utterance in words), PIU (percentage of intelligible utterances), NDC (number of different consonants), and MLUc (mean length of utterance in consonants) exclude the 3 children in the IG group and 1 child in the Min FC group who produced zero or one intelligible word. REEL-R and REEL-E = Receptive and Expressive quotients from the Receptive–Expressive Emergent Language Scale, administered at 30 months; TNU = total number of intelligible utterances; TNW = total number of words; TNC = total number of consonants.
Min FC groups showed equivalent performance on all four lexical–grammatical measures of TNU, TNW, NDW, and MLUw. Both groups were outperformed by the Max FC and CG groups on these measures, although the difference was not significant at \( p = .01 \) \( (p = .02, d = 1.17) \). The only lexical–grammatical measures in which the Max FC group resembled the IG and Min FC groups was MLUw. The CG group had significantly higher MLUw than all groups on this measure, indicating greater grammatical performance. Table 3 shows that the effect size \( (d) \) was large in all comparisons.

**Individual variability in lexical–grammatical performance.** These group comparisons mask some variability in performance within each group. The high variability in the IG group shown in Table 2 was primarily due to 1 boy who produced a large number of intelligible utterances (104) and words (199) and had a high number of different words (69). His performance was well above the mean performance of the CG group. When this child was excluded, the IG group mean TNU was 11.6 \( (SD = 12.6) \), mean TNW was 17.6 \( (SD = 17.6) \), and mean NDW was 8.6 \( (SD = 7.1) \). These mean values were comparable to the means for the Min FC group. Although this child had strong lexical skills, and his utterances were longer than some children in the CG group, his MLUw of 1.69 words was not such an outlier in the IG group. The mean MLUw changed from 1.41 to 1.37 \( (SD = 0.30) \) when this child was excluded.

Compared with this child, 3 children in the IG group produced either one or no intelligible words. These 3 children were very quiet during the language sample and produced few utterances, including nonspeech sounds and unintelligible vocalizations, some of which appeared to have a consistent communicative intent. One child in the Min FC group also produced only one intelligible word. None of the 4 children without intelligible language were children who had been identified with a possible bilateral hearing difficulty. Across all groups, none of the children produced echolalic utterances characteristic of children with autism.

It is notable that the CG group was the only group in which the average sentence length was above two words. Five children in the CG group had an MLUw of 2.0 or above. By comparison, no child in the IG or Min FC groups had an MLUw of 2.0 or above. Three children in the Max FC group had an MLUw of 2.0 or above. However, there was broad variability in children’s utterance length in this group, with most of the other 7 children showing an MLUw that was close to 1.0.

**Example utterances.** To illustrate the language samples across groups, examples of the children’s utterances are provided in Table 4. The examples represent the longest utterance of each of the 37 children who produced more than one intelligible word. Grammatical errors occurred very infrequently in the children’s language samples, with only five utterances produced by children in the CG group containing unambiguous errors. Given that many children mainly produced one- and two-word utterances, this small number of errors was not unexpected. The five clear instances of grammatical errors included incorrect assignment of feminine gender in *două telefonuri* instead of the correct neutral gender (*două telefoane* [two telephones]) and article omission (*mamă, uite cuculița* for *mamă, uite te la furculița* [mommy, look at the fork], *dă-i papușa* for *dă-i la papușă* [you give the doll], and *e copil* for *e un copil* [it’s a child]). The other error was incorrect use of a reflexive form, *se danzează cu ea* for *danzează cu ea* [He is dancing with her]. Several two-word semantic relations (e.g., *uite biberon* [look baby-bottle], *mamă pa* [mommy bye-bye]) also were evident across groups. Although little is known about Romanian language acquisition, these types of errors and two-word utterances are not unusual for young children learning other languages. These errors also were considered typical for young children by the Romanian speakers who transcribed the language samples.

**Phonological Measures**

Table 2 shows a pattern of group differences for all four phonological measures (PIU, TNC, NDC, and MLUc) comparable to that found for the lexical–grammatical measures. As noted above, only PIU was included in the statistical comparisons (see Table 3). The IG and Min FC groups showed an equivalent performance on PIU. Both groups were outperformed by the Max FC and CG groups; however, this difference was not significant at \( p = .01 \) \( (p = .03, d = 0.53) \). Many of the children in the IG and Min FC groups used only simple syllable shapes in one-word utterances (MLUc means of 1.38 and 1.69, respectively). Although the CG group had a significantly longer MLUw than the
Max FC group, there was greater similarity in MLUc for these two groups (Ms = 2.34 and 2.57, respectively).

Developmental phonological patterns were more apparent in the children’s samples than were grammatical errors. All of the children’s speech sound productions that differed from the adult productions are shown in Table 5. There was a total of 133 different word productions across groups (IG = 35, Min FC = 21, Max FC = 41, CG = 36). Only one instance of a word that was mispronounced in a particular way was counted for each group (i.e., if 2 or more children in the same group mispronounced a word in the same way, only one instance was counted here). The 133 productions were classified in one of eight general patterns based on common analysis procedures (Paden & Moss, 1985), including initial consonant deletion, cluster reduction, other consonant substitution or omission, and vowel/diphthong substitution. Syllable simplification processes, including unstressed syllable deletion, initial syllable duplication, and other syllable simplifications, were present, with two instances of syllable addition. Given that we collapsed across many children who made only two or three mispronunciations, we used a broad classification of patterns rather than ascribe more specific phonological processes. With this caveat, these general patterns were sufficient to describe all mispronunciations across the four groups. The overall similarity among groups in these phonological patterns suggests that the mispronunciations were developmental in nature.

**REEL Caregiver Report**

Table 2 shows that the REEL–R and REEL–E quotients also discriminated among the four groups in a way parallel to the lexical–grammatical and phonological measures. A two-way ANOVA indicated a significant difference among groups, $F(3, 39) = 16.32, p < .001$, with no significant quotient or Group × Quotient interaction. Post hoc paired comparisons showed that the IG and Min FC groups were outperformed equivalently by the Max FC and CG groups for both REEL quotients.

**Correlates of Language Performance in the Institution and Min FC Groups**

Physical and language measures. To examine possible relationships among the language measures and child characteristics, we examined the IG and Min FC groups ($N = 20$). So that extremes of performance across all four groups would not artificially inflate the extent of

<table>
<thead>
<tr>
<th>Table 4. Examples of children’s longest utterances.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institution group</strong></td>
</tr>
<tr>
<td>ham (woof)</td>
</tr>
<tr>
<td>ce? (what?)</td>
</tr>
<tr>
<td>nu bebe (no baby)</td>
</tr>
<tr>
<td>nu pot (I can’t)</td>
</tr>
<tr>
<td>ci cu iia (but with those)</td>
</tr>
<tr>
<td>da, bea apa (yes, he’s drinking water)</td>
</tr>
<tr>
<td>asta ce este? (what is this?)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

| **Maximum foster care group**                  | **Community**                |
| acolo nimic (nothing there)                   | tanti, iia caca (aunty, those poop) |
| alta seringii (another syringe)               | si eu m-am scutul dimineat[ii] (I woke up early this morning too) |
| ciipientsi (strawberry)                       | unde e una ca asta? (where is one like this?) |
| nu merge (doesn’t go)                         | asta e a lui bebe (this is the baby’s) |
| de la mamü (from mommy)                      | bebe pipi (baby peeppee)       |
| se scoate ([it] comes off)                    | unde, mai e furculița (look, there’s another fork) |
| cu drilul (with the drill)                   | da, e frig afa?i (yes, it’s cold outside) |
| unde e “buzz”$^{\text{ph}}$ (where is “buzz”?)| îmbrec-o tu [you dress her]     |
| la bancü aici (at the bench here)             | asta e un nene si astra un tanti (this is an uncle and this is an aunty) |
| e aici (it’s here)                            | de ce a pus scuineulul ilaa ocola si dulapul ilaa ocola? (why did she put that little chair over there and that cabinet over there?) |

Note. Three children in the institution group and 1 child in the minimum foster care group who did not produce more than one intelligible word are excluded here.

$^{\text{a}}$The conventional adult form is canî lui bebe. $^{\text{b}}$Sound of toy.
Table 5. Children’s phonological patterns.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Institution</th>
<th>Minimum foster</th>
<th>Maximum foster</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial consonant deletion</td>
<td>ata [asta] (this)</td>
<td>abatu [albastru] (blue)</td>
<td>ataa [alta] (another)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ete [este] (it is)</td>
<td>buzii [bluza] (blouse)</td>
<td>ata [asta] (this)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ласт [plastic] (plastic)</td>
<td>pica [piţca] (to sting)</td>
<td>a tică [a trecut] (past)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>potocal [portocală] (orange)</td>
<td>bond [blond] (blonde)</td>
<td>dom [domn] (gentleman)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at a [asta] (this)</td>
<td>câsluni [căslunţă] (strawberry)</td>
<td>pitâu [piţau] (gun)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ate [spate] (back)</td>
<td>gaben [galben] (yellow)</td>
<td>dîco [dîcu] (doctor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>potocalu [portocală] (orange)</td>
<td>fatua [farfurie] (the plate)</td>
<td>făuia [farfuria] (the plate)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bâine [pâine] (bread)</td>
<td>ghiodor [ghiozdan] (backpack)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>miam [miel] (lamb)</td>
<td>mocov [morcov] (carrot)</td>
<td>bâine [pâine] (bread)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mal [mar] (apple)</td>
<td>moro [morcov] (carrot)</td>
<td>cartos [cartof] (potato)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pali [pară] (pear)</td>
<td>potocali [portocală] (orange)</td>
<td>pală [pară] (pear)</td>
<td></td>
</tr>
<tr>
<td>Vowel/diphthong substitution</td>
<td>apo [apo] (water)</td>
<td>pilul [copilul] (the child)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mamuţă [mainuţă] (monkey)</td>
<td>minte [cuminte] (quiet)</td>
<td>limâie [lumîie] (lemon)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mial [miel] (lamb)</td>
<td>tită [ferăţa] (little girl)</td>
<td>pane [pâine] (bread)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ma [măl] (more)</td>
<td>miţe [mîţe] (lemon)</td>
<td>pix [pe] (on)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pane [pâine] (bread)</td>
<td>bila [mobilo] (mobile phone)</td>
<td>arde [arde] (pepper)</td>
<td></td>
</tr>
<tr>
<td>Unstressed syllable deletion</td>
<td>nana [banană] (banana)</td>
<td>na [cană] (the cup)</td>
<td>papene [papene] (melon)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cinelu [ciocîneelu] (little hammer)</td>
<td>tia [cutia] (the box)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td></td>
<td>jecție [injecție] (injection)</td>
<td>beronul [biberonul] (the baby-bottle)</td>
<td>furiu [farfurie] (the plate)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pica [paînica] (bread)</td>
<td>ete [cziete] (notebooks)</td>
<td>canul [ciocanul] (the hammer)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pina [paînica] (bread)</td>
<td>furiu [farfurie] (the plate)</td>
<td>titu [cutitul] (the knife)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>pocali [portocală] (orange)</td>
<td>tîță [cițitul] (the knife)</td>
<td>titul [cutitul] (the knife)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cali [portocală] (orange)</td>
<td>pară [repara] (fixes)</td>
<td>pară [repara] (fixes)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>uta [lingurii] (teaspoon)</td>
<td>singi [seringi] (syringe)</td>
<td>singi [seringi] (syringe)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>linguta [lingurii] (teaspoon)</td>
<td>catrave [castravete] (cucumber)</td>
<td>catrave [castravete] (cucumber)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pum [porumb] (corn)</td>
<td>pum [porumb] (corn)</td>
<td></td>
</tr>
</tbody>
</table>

(Continued on the following page)
Table 5 Continued. Children’s phonological patterns.

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Institution</th>
<th>Minimum foster</th>
<th>Maximum foster</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial syllable</td>
<td>bibi [biberon] (bottle)</td>
<td>cucuteiu [curit] (knife)</td>
<td>—</td>
<td>bibilonul [biberonul] (the baby-bottle)</td>
</tr>
<tr>
<td>duplication</td>
<td>pipici [pisica] (cat)</td>
<td>dodo [doctor] (doctor)</td>
<td>—</td>
<td>cuceriti [fucurici] (fork)</td>
</tr>
<tr>
<td></td>
<td>pipisici [pisica] (cat)</td>
<td>popac [capac] (lid)</td>
<td>—</td>
<td>papuru [porahul] (the glass)</td>
</tr>
<tr>
<td>Other syllable</td>
<td>caia [cani] (cup)</td>
<td>baia [banana] (banana)</td>
<td>vete [castravete] (cucumber)</td>
<td>caia [cani] (cup)</td>
</tr>
<tr>
<td>simplification</td>
<td>fuciu [furculi] (fork)</td>
<td>chilita [cudiia] (small knife)</td>
<td>ria [farknii] (the plate)</td>
<td>mumu [maimuit] (monkey)</td>
</tr>
<tr>
<td></td>
<td>linghicaia [linguria] (teaspoon)</td>
<td>fuciu [furculi] (fork)</td>
<td>ita [linguria] (the teaspoon)</td>
<td>mamos [frumus] (nice)</td>
</tr>
<tr>
<td>Syllable addition</td>
<td>—</td>
<td>—</td>
<td>jucacirii [jucitriri] (toys)</td>
<td>—</td>
</tr>
</tbody>
</table>

Note. Romanian orthography is used in the table, with the adult form shown in italics in the square brackets. Dashes indicate that no examples were found for a given group. Other consonant substitution or omission includes /l/ for /r/ substitution (e.g., lo for ro). Other consonant substitution or omission and vowel/diphthong substitution are underlined. The category is used here to describe reduction spanning syllables (e.g., bond for blond).

associations, only the children who were currently living or had recently been living in an institution were included in this analysis. Preliminary analyses showed expected correlations among children’s performances on the physical and cognitive measures shown in Table 1. For children in the IG and Min FC groups, birth weight was correlated with weight, height, and occipitofrontal circumference at 30 months (rs = .41, .43, and .37, respectively), weight and height were strongly associated (r = .87), and occipitofrontal circumference and height also were correlated (r = .53). MDI also was correlated with height (r = .55). Months prior to institutionalization had a weaker correlation with height (r = .29) and was not correlated with other physical variables or the MDI. Gender was correlated only with birth weight (r = .46) and ethnicity (r = .26). On the basis of these preliminary associations, the number of physical variables selected for further analysis was reduced to two: (a) height as a general measure of development and (b) months prior to institutionalization. As a general cognitive measure, the MDI might be expected to correlate with the language measures; however, the MDI addressed some aspects of language and, given its association with height, the MDI also was excluded from analysis. A correlation matrix for the two child characteristics and five language measures (TNU, NDW, MLUw, PIU, and REEL–R) is provided in Table 6. As expected, the other four measures from the language samples (TNW, TNC, NDC, and MLUc) covaried with the language measures shown in the correlation matrix. The REEL–R was included as a comprehension measure, was highly correlated with the REEL–E (r = .79), and showed the same general pattern of association with other measures as the REEL–E. Although not included in the correlation matrix, the MDI also was moderately correlated with both REEL–R (r = .53) and REEL–E scores (r = .46).

Although this sample of IG and Min FC children is too small to make very robust predictions, Table 6 shows there were notable correlates of performance within these groups of children with pronounced language delays. First, the general developmental measure of height was

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Height</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Months prior</td>
<td>.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. TNU</td>
<td>.47*</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. NDW</td>
<td>.46*</td>
<td>.15</td>
<td>.92*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. MLUw</td>
<td>.00</td>
<td>.68*</td>
<td>.31</td>
<td>.49*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PIU</td>
<td>.42</td>
<td>.39</td>
<td>.32</td>
<td>.45</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. REEL–R</td>
<td>.46</td>
<td>.13</td>
<td>.30</td>
<td>.26</td>
<td>.07</td>
<td>.00</td>
<td>—</td>
</tr>
</tbody>
</table>

Note. N = 20. Numbers marked with an asterisk are significant at a false discovery rate of q* = .05. Months prior = months prior to institutionalization.
correlated with all language measures except MLUw, where there was zero correlation. Using the false discovery rate method to control for Type I error (Benjamini & Hochberg, 1995), the correlation between height and TNU (r = .47) and height and NDW (r = .46) were significant at q* = .05. On the other hand, there was a high correlation between the grammatical index of MLUw and the number of months children had spent outside the institution (r = .68, q* < .05). The 1 child in the IG group who was an outlier had spent some time outside the institutional context. Second, the vocabulary skills of the IG and Min FC groups as measured by NDW were correlated moderately with the grammatical measure of MLUw (r = .49, q* < .05). Within the larger group of 40 children, 8 showed some grammatical mastery, with an MLUw of 2.0 or higher. These 8 children, all from the Max FC and CG groups, also had the largest vocabulary sizes. All had an NDW of at least 45 words. The one exception to this was the child in the IG group whose vocabulary was above average for the CG group but whose MLU was lower than 2.0. Finally, the high correlation shown in Table 6 between NDW and TNU (r = .92) supports the idea that NDW was heavily influenced by sample size in these samples.

Preferred caregiver status and language. The relevance of an identified preferred caregiver in the IG group for the children’s total expressive output (i.e., including intelligible and unintelligible utterances) is illustrated in Figure 1. The 3 children (all boys) who produced only one or two utterances did not have an identified preferred caregiver; the fourth child without an identified preferred caregiver (also a boy) also produced only a small number of utterances. By contrast, children with a known preferred caregiver (2 boys, 4 girls) tended to produce a larger number of utterances. Although gender and absence of a preferred caregiver are confounded in this sample, the 2 children with a preferred caregiver who produced the most utterances were boys. This suggests that it is the presence of a preferred caregiver and not gender that is the important correlate of language output.

Discussion

The findings indicate that young children who are raised in a severely depriving environment show substantially lower language skills than other children living in the same communities. When children are placed in the environmentally richer context of foster care, their expressive and receptive language skills move much closer to the skills of community peers. However, these language gains are not obvious when children have been in foster care for only a short period (an average of 2 months in this sample). Moreover, even when children had been in foster care for at least 12 months, their utterances were shorter than those of their community peers.
These results are in line with research on the effects of institutionalization in other areas of cognition and behavior (e.g., Johnson, 2000). They also parallel findings for language growth for children who are adopted internationally at a young age (e.g., Glennen & Masters, 2002). Overall, although early institutionalization is associated with substantial delays, much of the delay appears to resolve when the environmental circumstances change. Within this global profile, however, not all language areas may be affected equally by placement in a richer environment. The largest expressive language difference among children in the Max FC group and CG group was in the longer sentence length of the CG group.

Using the conservative measure of MLUw, most of the children in the Max FC group were using single-word utterances. Half of the children in the CG group were using at least two-word utterances. It has been argued that children must acquire a sufficient mass of words for productive word combinations and grammatical relations to emerge (Bates & Goodman, 1997; Fenson et al., 1994). It may be that the children did not have sufficiently large vocabularies at age 30 months for there to be a sensitive analysis of grammatical skills. Although the time-limited measure of NDW in this sample served as only an estimate of vocabulary size, the children used a small number of different words in the language samples and may not yet have been at a point where grammar could be expected to develop. Certainly, the children in the Max FC and CG groups who had the largest NDW were the children with a MLUw of 2.0 or higher.

Lexical and syntactic growth in the same language are highly related during development (Devescovi et al., 2005; Marchman, Martinez-Sussmann, & Dale, 2004). Although nonshared environmental factors appear to outweigh genetic contributions to language overall, it may be that early lexical development is influenced slightly more strongly by the ambient language input and environmental factors than is grammar (Dale, Dionne, Eley, & Plomin, 2000). If this is the case, it could be that the children made greater gains in vocabulary when the language and social environment was enriched than in grammar. Examination of the same children’s language at the 42-month evaluation point should be very informative to determine whether grammatical delays truly resolve in the same way as overall expressive output when children are placed in foster care.

In the same way that not all aspects of language may be affected equally, it also is clear that individual children are more or less at risk for delay in an institutional setting. Given the random assignment of children to the IG and FC groups, it is a compelling finding that 3 children in the IG group and 1 child in the Min FC group did not produce more than one intelligible word at 30 months of age. The sample size is not sufficient to represent the proportion of children who may be nonspeaking in the larger cohort. Moreover, our sampling method does not allow us to conclude that these 4 children did not use more than one or two words in other contexts. What is striking is that the 3 children in the IG group who did not speak were the same children for whom a preferred or favorite caregiver in the institution was not identified (see Figure 1). The direction of this association is unclear; it may be that because the children were nonspeaking, they did not attract a preferred caregiver. It also may be that the presence of a preferred caregiver provided greater social and language interaction that facilitated language use.

For the children in the IG and Min FC groups there were two other correlates of performance. Height, a conventional physical correlate of development, was significantly associated with TNU and NDW but not with MLUw (see Table 6). Thus, at a global level, language skill was associated with another marker of the children’s development. On the other hand, MLUw was associated strongly with the time the IG and Min FC children spent outside the institution. For a few children, this time (months prior to institutionalization) occurred during the period of institutionalization, mainly through a brief change in placement to governmental foster care. For other children, this time represented time in the biological family prior to institutionalization. Thus, one could speculate that grammatical development was facilitated by early exposure to a richer environment prior to institutionalization. However, the sample clearly is insufficient to draw conclusions. Finally, the sample included many children with otitis media. Otitis media and language development have been linked (Feldman et al., 2003), and it is unclear what role hearing status played in the children’s language performance.

For children in the IG and Min FC groups who produced intelligible utterances at 30 months, the concept of language “delay” appears to be appropriate. The phonological patterns of children in all four groups were similar, and there were no unusual utterance errors that distinguished the children raised in institutional care; that is, there was no evidence of qualitative differences among groups in spite of the quantitative differences. Although consonants were of particular interest, it is notable that the children in all groups made several vowel/diphthong errors. Although a larger data set is necessary to explore these errors in more detail, it may be that the rich vowel/diphthong structure of Romanian lends itself to more frequent errors of this type during typical development. Additional examination of children in the community group could be useful to increase knowledge of typical Romanian language development.

We do not know the exact amount of language input these particular children received in the orphanage contexts. Also, the role of language experience for the
children is intertwined with structured caretaking and limited social opportunities that conflate frequency of language input with other aspects of social interaction. That said, there were substantive language delays for children who were assigned randomly to continued orphanage care and for children assigned randomly to foster care who had been in foster care for a very limited time. In conjunction with the marked language improvements found for children in foster care for a longer time, these findings indicate a strong role for environmental influences in the children’s language.

Acknowledgments

The Bucharest Early Intervention Project was funded by the John D. and Catherine T. MacArthur Foundation Research Network on Early Experience and Brain Development (Charles A. Nelson, network chair). The research reported here also was funded by a grant from the University of Minnesota to Jennifer Windsor and Leslie E. Glaze.

We are very grateful to Nicoletta Corlan and Octavian Cornea for their expertise in transcribing the children’s language samples; to Gwen Gordon, Erika Hoyt, Cornelia Iucha, and Lacey Thomas for their help in data management; and to Ben Munson for his comments on an earlier version of this article. Portions of this research were presented at the 2005 Biennial Meeting of the Society for Research in Child Development, Atlanta, Georgia, and the 2006 Symposium for Research on Child Language Disorders, Madison, Wisconsin.

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Received July 24, 2006
Revision received December 1, 2006
Accepted February 26, 2007
DOI: 10.1044/1092-4388(2007/095)

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