

Babbling and first words in children with slow expressive development

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Abstract

The purpose of the present study is to study early vocal production in order to assess whether it is possible to individuate predictors of vocabulary development prior to the age point at which lexical delay is usually identified. Characteristics of babbling and first words in 12 Italian children with slow expressive development (Late Talkers - LT) are compared with those of 12 Typically Developing (TD) peers. The syllable structure and phonetic characteristics of babbling and first words produced by both groups of children at 20 months were analyzed during mother-child play sessions. The results indicate that phonetic complexity and number of consonantal types are lower in the LT group. The two groups also differed in their use of sound classes and their syllable structure. Overall, it can be said that LTs develop in a similar but slower rate than TDs, as opposed to having an atypical pattern of phonological development.

Over the last 20 years several studies have focused on the linguistic development of children defined as “Late Talkers”, i.e. children who fail to produce at least 50 words or a two-word combination of any kind by age two (Rescorla, 1989; Rescorla and Schwartz, 1990; Scarborough and Dobrich, 1990). These studies did not provide clear indications regarding deficits in hearing, intelligence or receptive language ability, although many did attempt to identify predictor variables to assist in distinguishing children who will catch up through their own efforts from those who will require special assistance. There have been studies that underlined the role of comprehension (Thal, Tobias and Morrison, 1991), of gesture ability (Fasolo and D’Odorico, 2002a), of the age of diagnosis (Paul, 1993; Rescorla and Schwartz, 1990), and of the combination of delay in comprehension and non-verbal ability (Rescorla, Roberts and Dahlsgaard, 1997). Recently, many studies have focused on prelinguistic vocal patterns and their relation to later speech development. It has often been hypothesized that the first speech-like articulation and the babbling phase, which occur at approximately 10 months of age, allow infants to develop a link between articulatory settings and the resulting auditory consequences, thus laying down the basis for the development of the phonetic inventory and adaptation to the ambient language (Westermann and Miranda, 2004). Several longitudinal studies, conducted on different populations and using different modes of analysis, indicated a continuity between prelinguistic production (babbling) and first words both in typically developing children (Bates, Benigni, Bretherton, Camaioni and Volterra, 1979; Leonard and Bortolini, 1998; Locke, 1989; Oller, Eilers, Neal and Schwartz, 1999; Vihman and McCune, 1994) and in children with language delay (D’Odorico, Bortolini, De Gasperi and Assanelli, 1999; Oller, Eilers, Neal and Cobo-Lewis, 1998; Rescorla, Dahlsgaard and Roberts, 2000; Stoel-Gammon, 1989).

Even if many studies (e.g. Paul, 1991; Rescorla, Roberts and Dahlsgaard, 1997) indicated that approximately 50% of toddlers with slow expressive speech development at age

two have good vocal output at age three, only a few have attempted to make a distinction between delayed and deviant phonological development. As Locke (1989) reported, there are both theoretical and practical reasons for investigating whether prelexical vocal behaviour is an accurate predictor of later speech and language development. On the theoretical side, the ability to predict with accuracy would contribute to making a more precise characterization of infant vocalization with regards the child's motor, perceptual, social and linguistic development. In practical terms, early recognition that an infant is unlikely to develop speech and language normally was (and still is) considered valuable, as it indicates which children are capable of catching up with their peers and those who, on the other hand, are not able to do so without assistance.

In the last 20 years two categories of studies have been conducted to investigate the phonetic characteristics of LT speech: longitudinal analyses have been carried out on children with slow expressive development, while group comparisons have been made between children with language delay and typically developing children. One of the first studies in this area was done by Stoel-Gammon (1989) on two LTs on two LTs, from age 9 to 21 months, nested in a larger sample of 34 children. Their analysis of pre-speech utterances revealed that one of the children produced only a few canonical babbles from 9 to 21 months of age, while the other displayed an unusual pattern of sound preference in his babbles. At 24 months of age they both showed a simpler syllable structure and more limited phonetic repertoires compared to the peer group. Scarborough and Dobrich (1990), in a study of four LT children conducted at 30, 36 and 42 months of age, also found a significant difference in the total number of errors on consonants in comparison with a group of twelve TD peers. In recent years Williams and Elbert (2003) collected and analyzed longitudinal data from 5 children with slow expressive development; their results indicated that, in addition to quantitative factors (limited phonetic inventories, lower percentage of correct consonants, and more sound

errors), also qualitative variables (atypical error patterns, greater sound variability and slower rate of resolution) can be potential predictors of phonological delay.

While the number of children involved in the analyses of the studies mentioned above was limited, other studies compared large groups of LTs and TDs. Whitehurst and his colleagues (Whitehurst, Smith, Fishel, Arnold and Lonigan, 1991) analysed babble in the spontaneous speech of 37 two-year-olds, using the variables derived from this sample to predict individual differences in expressive language scores at 30 months of age. The rate of word use was positively related to language outcome, whereas the rate of vowel babble was negatively related; together, these two variables accounted for 41% of the variance in language outcome test scores. The single strongest correlate of language outcome was the proportion of consonantal to vowel babble, while the degree of social responsiveness of babble and the length of babble were not related to later language scores. Paul and Jennings (1992), instead, divided 28 toddlers into two age groups to examine phonological development in a slow expressive development scenario compared to a control group of normally developing children. The authors used three global measures of phonological development: the average level of complexity of syllable structure, the number of different consonant types produced, and the percentage of consonants correctly produced in intelligible utterances. The two groups differed significantly on all three measures; compared to the control group, the Late Talkers of both age groups produced fewer consonants correctly, had a smaller phonetic inventory and produced less complex syllable structures, displaying a delayed, rather than a deviant, pattern of phonological development. Similar results were reported by Rescorla and Ratner (1996) in a study which analysed the phonological development of 30 children with specific language impairment (SLI) and 30 TDs; the SLI group showed a delay in phonetic development; these children produced fewer vocalizations, displaying reduced phonetic inventories and syllable structure patterns. Later, Pharr, Ratner

and Rescorla (2000) conducted a longitudinal study of 20 LTs and 15 TD peers at 24 and 36 months of age, focussed on the production of syllable shapes. The authors found that the LTs produced fewer syllable shapes containing final consonants, more than one consonant type, and consonant clusters; this group vocalized less often than their TD peers. Kim Oller and his colleagues (Oller, Eilers, Neal and Cobo-Lewis, 1998) found that infants who began to babble after 10 to 12 months of age showed a greater number of developmental problems, including sensory, cognitive and linguistic disorders, than infants who babbled earlier. Late babblers had significantly lower expressive vocabulary scores at 18, 24 and 30 months of age than those who began to babble at the normal age. Receptive vocabulary scores were slightly lower at 18 months of age than those of the TD group, but had recovered at 24 months, suggesting that late babbling may be more closely related to production than to perception.

However, the relationship between poor phonological skills and slow expressive language development is not straightforward where the direction of influence is concerned. It is possible to hypothesize that children who had little experience of self-producing syllables were less sensitive to similar patterns in their ambient language. The phonemes were not well represented in the phonological memory and therefore would not be available as building blocks for the construction of lexical representations. On the other hand, a low vocabulary acquisition impeded the use of words acquired as models to attain new words, phonetics rules and contrasts (Ganger and Brent, 2004). The role of phonology in the development of other domains, such as the lexicon and bound morphology, can be only identified through analyses of the phonological characteristics of early utterances of children at the same stage of lexical development.

It should be noted that most of the research aimed at verifying the predictive value of the characteristics of phonological development on subsequent language development has been conducted on infants learning to speak the English language; one exception is the

research on the relationships between lexical immaturity and limited phonetic abilities in a sample of Cantonese children (Fletcher, Chan, Wong, Stokes, Tardif and Leung, 2004) and in two Italian Late Talkers (Bortolini, 1991).

The aim of the present study is to analyze the production of babbling and first words in LTs and TDs at an early stage of language development, i.e. when the slowing down of vocabulary acquisition is not yet manifest. More specifically, a comparison will be made of the characteristics of babbling and first words in 20-month-olds with a similar vocabulary size and the value of babbling measures as a predictor for linguistic development in the following months will be verified. Given the scarcity of phonological studies conducted on non-English LTs, the data from this study will permit a comparison of the similarities and differences in early phonological development in English and Italian children, and will provide a useful contribution to the cross-linguistic perspective of language acquisition. As reported by Bortolini and Leonard (2000), Italian differs from English in several ways that are likely to influence the pattern of phonological acquisition in children. The Italian phonetic inventory contains 23 consonant sounds and, in Italian, the most frequent sounds in children's first words are stops and nasals (Bortolini, 1995). The most common words have two or three syllables (e.g. CVCV; CVCVCV, VCVCV); monosyllabic words and words with a final consonant (e.g. CVC) are uncommon. As in English, feet are usually trochaic (e.g. cane [dog]; topo [mouse]), however Italian has many words with an initial weak unfooted syllable (e.g. matita [pencil], martello [hammer]) and with an unfooted weak syllable in the final position (e.g. albero [tree], pecora [sheep]). Word initial and word final consonant clusters are uncommon (Barca, Burani and Arduino, 2002).

Data from 11 TDs reported in Majorano and D'Odorico (2006) showed that their first words were in the CVCV format (e.g. /mam:a/ /papa/, /tato/, /momo/, /mimi/, /tete/). From 18-20 months (from the 10 to 50 word point) the children began to produce words with

consonantal variations (e.g. /kadi/; /tap:o/); and longer, trisyllabic and quadrisyllabic words (e.g. /banana/, /majone/, /pikolo/, /pekolozo/) while the number of words containing a consonantal cluster increased (e.g., /bimba/, /pendi/, /ande/).

METHOD

PARTICIPANTS

The children chosen for this study were a subset of the groups who had previously participated in several epidemiological longitudinal studies on language acquisition in Italian children (corpus D'Odorico, 1996-2006; D'Odorico, 2002; D'Odorico and Carubbi, 2001, 2003; D'Odorico, Carubbi, Salerno and Calvo, 2001; D'Odorico and Fasolo, in press; D'Odorico and Jacob, 2006; D'Odorico, Salerno, Carubbi and Calvo, 2001; Fasolo and D'Odorico, 2002a; b; Salerno, Assanelli and D'Odorico, 2007). A subset of 12 children (8 males and 4 females), identified as Late Talkers (LT) at 24 months of age (i.e. failing to produce at least 50 words or any two-word combinations) were selected from the corpus. The control group was composed of 12 Typically Developing children (TD) matched for gender (see table 1). All the children participating in the study came from monolingual Italian-speaking families of average social-economic status.

Insert about here table 1

The vocabulary development of all the children participating in the study was assessed monthly on the basis of their mothers' responses to the Italian version of the MacArthur Communicative Development Inventory (Caselli and Casadio, 1995); none of the children demonstrated any deficits in hearing, intelligence or receptive language ability. When they were approximately 18/20 months old, all the children participated, with their mothers, in 30

minute play sessions which were video-recorded and subsequently transcribed. The children's spontaneous vocal production during these sessions were analyzed for the purposes of present study.

At 24 months of age the mean vocabulary size of the two groups differed dramatically (LT 32 SD 14.410; TD 230 SD 161.721), but when the spontaneous vocal production data was collected during the play sessions, vocabulary size alone would not have been sufficient to predict which children would exhibit a slowing down of vocabulary development in the following months (see table 2); namely, at that age all children had a vocabulary size less than 60 words and some children, subsequently classified as LT, had a higher vocabulary size than some TD.

Insert about here table 2

PROCEDURE

In the play sessions five different sets of toys were used to give the children the opportunity to exhibit their naming competence: a farm, a "nurturing" set (a doll with bed, mattress, and a telephone), a "food" set (plastic fruits and vegetables with dishes and cutlery) and some illustrated books. Mothers were instructed to play normally with the children but to try to draw their attention to each set of toys; the experimenter attended each play-session and could participate if directly invited to do so by the children or the mothers.

The observer transcribed each child's vocal or verbal production, noting the duration and contextual elements. These included the children's interaction with the objects, their communicative gestures and gaze direction, the mothers' verbal production immediately preceding and following that of the children. Two trained transcribers, working independently one from the other and using broad phonetic transcription in IPA (International Phonetic

Alphabet), transcribed all the vocalizations directly from the videotapes on which the mother-child play session was recorded. The first transcriber was not informed of the subject's group assignment until the transcription had been completed. Laughing and singing were not included in the transcripts. Any vocalization that could not be confidently transcribed after 4 hearings was eliminated. The guidelines for the transcription process were analogous to those used by other authors (Paul and Jennings, 1992; Pharr, Ratner and Rescorla, 2000; Stoel-Gammon, 1989; , 2002). The completed transcriptions were entered into individual CHAT files (Codes for the Human Analysis of Transcripts, MacWhinney, 1997).

Coding and data reduction

The utterances produced by the children during the play sessions were coded into two main categories: single word utterances and babbling vocalizations, the latter were identified according to Stoel-Gammon's criteria (1989):

- the vocalization was judged to be non-meaningful;
- the vocalization contained at least one voiced vocalic element or a voiced syllabic consonant;
- the vocalization was produced with an egressive airstream;
- babbled and non-interpretable utterances were bounded by one second of silence, breath, noise, or maternal speech;
- the vocalization was judged to be "speechlike".

Words were identified on the basis of Vihman's procedure (Vihman and McCune, 1994; Vihman, 1991).

The babbling utterances were then classified into the following three categories as established by Paul and Jennings (1992):

- Level I: vocalization containing a vowel (e.g.[o]) or a syllable containing a glottal stop (e.g. [ʔ]) or glide (Wulbert, Inglis, Kriegsmann and Mills, 1975);
- Level II: vocalizations containing one true consonant or a replicated true consonant (e.g. [ba], [dada]), or sounds that differed only in voicing (e.g. [data]);
- Level III: vocalization containing two or more different consonants (e.g.[bati]).

The Mean Babbling Level was also computed in reference to Stoel-Gammon's criteria (1989) and was calculated by multiplying the number of Level I utterances by 1, the number of Level II utterances by 2, the number of Level III utterances by 3, and then dividing the total by the number of babbled utterances¹.

Applying Ingram's criteria (2002), we computed the Proportion of Whole-word Correctness (PWC), i.e. a measure that determines which proportion of the child's words of his/her entire vocabulary are produced correctly.

The syllable structure of babbling and first words was analyzed, calculating the proportion of the following types of structure: a) CV; b) VC; c) CVV1; d) CVCV; e) ≥ 3 syllables with 1 consonant type; f) ≥ 2 syllables with 2 consonant types; f) other.

The mean syllabic length of babbling and word utterances was also calculated, dividing the total number of syllables produced by the total number of babblings and word utterances.

Finally, the consonant inventory for each speech sample was calculated on the basis of Stoel-Gammon's criteria (1989). The number of different consonants produced by each child during babbling and producing interpretable words was computed.

All the consonant types for each subject were grouped into classes, roughly corresponding to the developmental order of acquisition (Paul and Jennings, 1992; Stoel-Gammon and Dunn, 1985): glides and glottals ([w, j, ʔ]), front stops and nasals ([p, b, t, d, m,

n]), back stops and nasals ([k, g, ŋ]), fricatives ([f, v, s, z, ʃ, ʒ]), affricates ([tʃ, tʒ]) and liquids ([l]).

Reliability

Transcription reliability was calculated on 42% of the total transcriptions; 10 children, five for each group, were randomly selected for this purpose. Point-by-point consonant comparisons were made and the interjudge reliability ranged from 0,80 to 0,95. To maintain data consistency only the material produced by the first transcriber was used for the final analysis.

RESULTS

The spontaneous vocal productions of the two groups during the play sessions was similar, insofar as there were no significant differences in the total number of utterances produced (no distinction being made between babbling and single word utterances) (see table 3). Even if the TDs produced more words (phonetic tokens) and a wider variety of words (phonetic types) than the LTs, the two groups did not differ in the proportion of whole-word correctness, i.e. the LTs showed a good level of phonological accuracy in producing the words they have acquired.

Insert about here table 3

A more in-depth analysis of prelinguistic behaviour (see figure 1) revealed that babbling produced by TDs showed a higher phonetic complexity than that produced by the LT group; more specifically, the TD group produced a significantly lower proportion of Level I babbling than did the LT group ($t = 3.258$; $p = 0.004$; $d = 1.52^2$) and a higher proportion of

Level II ($t = -2.474$; $p = 0.022$; $d = 1.36$) and Level III babbling ($t = -2.858$; $p = 0.009$; $d = 1.36$); besides, 75% of the TD group produced Level III babbling at least once, compared to a mere only 25% of the LT group.

The same pattern of results is obtained considering Mean Babbling Level (LT 1.22 SD 0.187; TD 1.50 SD 0.312), which is significantly higher for the TD group than for the LT group ($t = -3.444$; $p = 0.002$; $d = 1.08$).

Insert about here figure 1

LT children produced shorter utterances than TD's (LT 1.134 SD 0.529; TD 1.546 SD 1.636) even if the difference does not reach a statistical significance ($t = -0.580$; $p = 0.568$; $d = 1.08$). Moreover the syllable structures used more frequently by the two groups were quite different too (see figure 2). The most striking differences are to be seen in the high proportion of the simplest syllable structure, i.e. CV, and in the very low proportion of syllables containing two different consonants (i.e. CVC1V) in LT production compared to TD. This result can be explained by LT's limited consonant inventory which was on average 4.42 consonants (range: 1 – 11), while that of the TD group was 10.50 (range 7 – 18); the difference is statistically significant ($t = -4.962$; $p = 0.001$; $d = 1.91$) (see table 4 for the consonants found in the phonetic inventories of 50% or more of the children in each of the two groups).

Insert about here figure 2

Insert about here table 4

As can be seen from table 5, front stops and nasals were the most prevalent class for both groups, while LT displayed a higher percentage of glides/glottals ($t = 1.95$; $p = 0.06$; $d=1.09$) and a lower percentage of fricatives ($t = 2.20$; $p = 0.03$; $d = 0.89$); affricates and liquids are less frequent for both groups, depending on the age of the participants.

Insert about here table 5

Predictive value of babbling measures on language acquisition

The last group analysis considered the value of babbling measures collected at 18-20 months of age to predict vocabulary development at 24 months. Results showed that the Mean Level of Babbling is significantly related to vocabulary size at 24 months of age, even controlling the number of words already acquired at the earlier age ($r = 0.580$; $p = 0.003$); the same predictive value has to be assigned to the percentage of babbling classified at level III ($r = 0.740$; $p = 0.001$).

DISCUSSION

The aim of the study was to compare the phonetic characteristics of babbling and early words in children showing slow expressive development at 24 months of age with those of a group of Typically Developing peers. In particular, the study focussed on identifying early differences in syllable structure and phonetic characteristics of babbling and first words between the two groups, in order to identify reliable indicators of language development. Our data, collected on a sample of Italian children, are consistent with those reported by previous studies (McCathren, Yoder and Warren, 1999; Mirak and Rescorla, 1998; Paul and Jennings, 1992; Pharr, Ratner and Rescorla, 2000; Rescorla and Ratner, 1996; Roberts, Rescorla, Giroux and Stevens, 1998; Stoel-Gammon, 1989; Thal, Oroz and McCaw, 1995): children

who show a low expressive language development at 24 months exhibited significantly different babbling patterns and syllable structures than those of their TD peers at 18-20 months of age. Many authors posited the predictive value of babbling characteristics with regard to subsequent speech and language ability (Davis and MacNeilage, 1995; Stoel-Gammon, 1989; Vihman, 1996), in so far the experience of frequent self-producing CV syllables made infants more aware of similar patterns in their ambient language, rendering these forms more salient as potential building blocks for word representations.

Moreover, children who produce a lower number of sound variegations (as our LT children), are not in a position to use these as a filter for lexical acquisition (Vihman, 1993), while some studies have demonstrated that TD appear to learn words that are consistent with phonotactic constraints observed in their babbling and first words (e.g. Velleman and Vihman, 2002).

According to some authors, these results could be explained considering the relationship existing between phonology and lexicon: several longitudinal studies evidenced how children tend to use the same favourite sounds in prelinguistic production and in their first words (Bortolini, 1991; Fletcher, Chan, Wong, Stokes *et al.*, 2004; Vihman, 1992) and to acquire words containing sounds which are already present in their phonetic inventory with greater ease (Schwartz and Leonard, 1982). On the other hand, lexical development can influence phonological development by allowing children to experience new articulatory schemata. As suggested by Paul and Jennings (1992) it is often difficult to establish if a slowing down in the linguistic production is to be attributed to scarce phonological abilities or if the cause is to be found in the paucity of lexical items acquired which negatively influences the possibility to develop a rich phonological inventory.

Our results, derived from data collected when the two groups of children had similar vocabulary sizes, can be interpreted as evidence of the influence of phonological capacity on the process of word acquisition.

Our data are consistent with the literature which reports that children who suffer from slow expressive development have a limited phonetic inventory, prefer to use glides and glottals in substitution of true consonants and use vocalization as a form of expression in substitution for words (Rescorla and Ratner, 1996; Stoel-Gammon, 1987; Williams and Elbert, 2003). However, the use of stops and nasals is not different from that of typically developing peers. According to some authors (e.g. Vihman, 1996) the fact that stops and nasals are the earliest true consonants to be produced by all children may be related to the natural perceptual salience of syllables with a stop onset. Stops present the sharpest possible contrast with vowels and provide the most obtrusive break in the acoustic stream of speech sounds. In particular, children not only hear, but “see” bilabial stops in adult speech, and so produce such sounds themselves and engage in repetitive vocal production or sound play, recreating their impressions of adult speech.

In conclusion, the data we have collected and analyzed on early phonological development in children acquiring Italian shows that it is possible to individuate valuable predictors of lexical development predictors before the age of 24 months, the age-point at which lexical delay is usually identified.

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	LT		TD	
	male	female	male	Female
Parity				
First-born	2	1	3	0
Second-born	5	3	5	4
Third-born	1	0	0	0
Mothers' education³				
18 years of education	2	0	4	1
13 years of education	4	3	3	2
8 years of education	2	1	1	1

Table 1: Parity and education of mothers of Late Talkers (LT) and Typically Developing children (TD).

	Subjects	Video-recorded play session	
		Age	Vocabulary
LT	B.G.	20;07	4
	C.S.	22;03	13
	C.M.	20;24	27
	D.M.F.	19;14	13
	F.S.	20;06	14
	G.G.	18;10	2
	G.A.	20;05	33
	R.J.	20;07	26
	S.L.	20;08	11
	S.A.I	21;29	10
	S.A.II	20;08	14
V.N.	18;01	12	
TD	A.S.	18;02	57
	A.A.	20;07	26
	B.M.	19;29	30
	B.E.	20;05	14
	F.T.	20;02	22
	F.G.	20;07	51
	F.C.	20;21	42
	N.M.	20;02	26

P.A.	20;26	58
S.S.	20;02	26
T.M.M.	19;22	48
V.M.	20;10	31

LT Mean (SD)	20;05	14.92 (9.239)
TD Mean (SD)	20;04	35.92 (14.681)

Table 2: Vocabulary size and age at the time of the play-sessions; mean and (standard deviation).

	LT		TD		t-value	p
	M	SD	M	SD		
Total utterances	100.42	89.838	152.25	74.614	-1.538	0.138
Babbling utterances (%)	73.99	26.277	44.11	20.640	3.106	0.005
Word utterances (%)	26.01	26.277	55.89	20.640	-3.106	0.005
Phonetic Tokens	30.33	32.267	81.17	41.111	-3.369	0.003
Phonetic Types	5.33	4.735	20.75	10.270	-4.722	0.001
Phonetic correct production (%)	23.50	28.257	34.58	13.494	-1.226	0.233

Table 3: Utterance production of Late Talkers and Typically Developing children.

LT	p, b, t, k, m, n, w
TD	p, b, t, d, k, m, n, ŋ, l, w, j

Table 4: Consonant sound inventory of Late Talkers and Typically Developing children.

	Glides and Glottals	Front stops and Nasals	Back stops and Nasals	Fricatives	Affricates	Liquids
LT	17.82 (20.75)	57.34 (29.24)	17.08 (24.53)	0.32 (0.79)	0.98 (2.45)	6.46 (16.35)
TD	05.81 (04.95)	65.06 (16.85)	19.98 (10.66)	3.70 (5.26)	1.47 (2.04)	3.98 (6.66)

Table 5: Percentages of different consonant types used by Late Talkers and Typically Developing children; mean and (standard deviation).

Figure 1: Percentages of different babbling levels of Late Talkers and Typically Developing children.

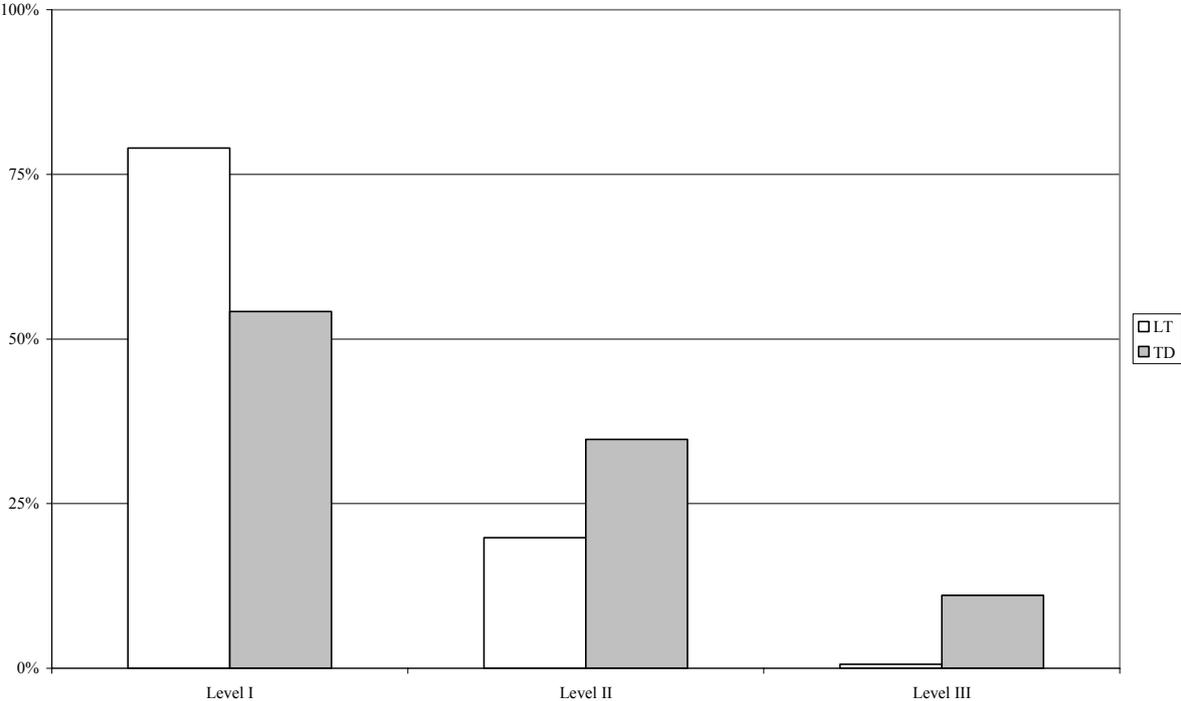
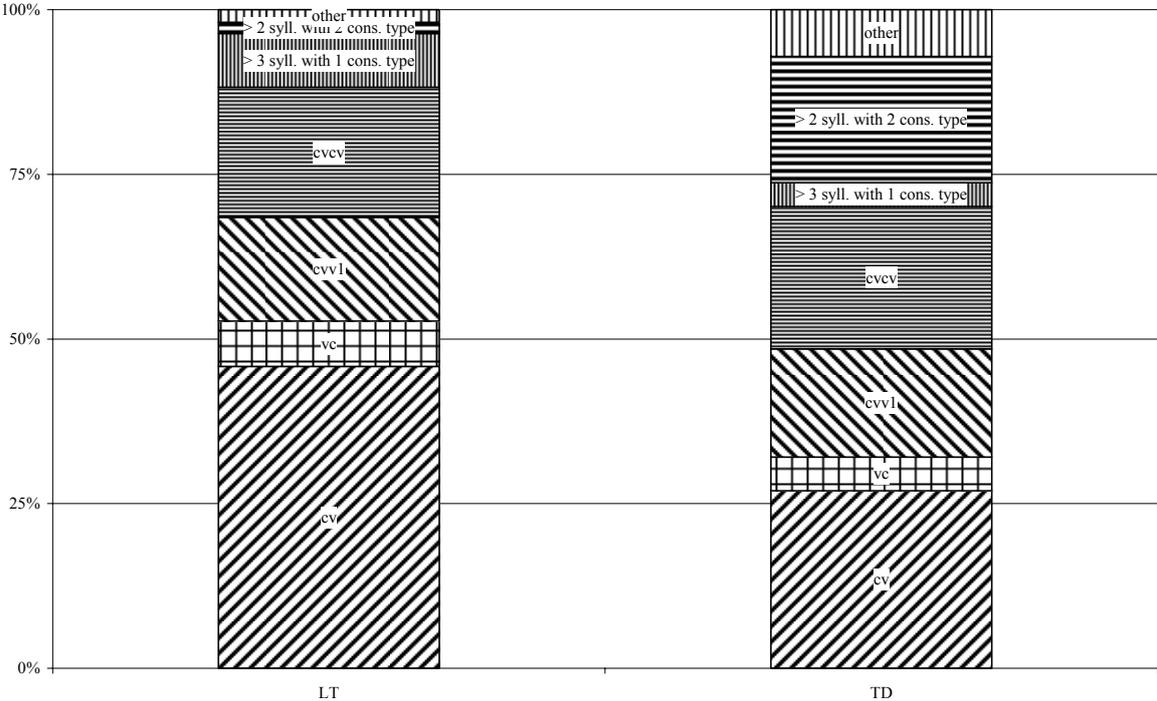


Figure 2: Percentage of different syllable structures produced by Late Talkers and Typically Developing children.



¹ For example: Level I: 35 utterances \times 1 = 35 syllables; Level II: 21 utterances \times 2 syllables = 42; Level III: 6 utterances \times 3 = 18 syllables; total number of utterances = 62; total number of syllables = 95; Mean Babbling Level = $95 / 62 = 1,532$.

² We calculated effect size following Kramer & Rosenthal (1999). They suggest that considering effect size is possible to uncover potentially interesting relationships, even when the statistical analysis of differences between groups does not reach the conventional level of significance.

³ 18 years of education corresponds to graduate school; 13 years of education corresponds to high school; 8 years of education corresponds to elementary and junior school.