BABBLING AS A DEVELOPMENTAL MILESTONE*

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1. INTRODUCTION

About a decade ago we started to investigate the development of speech in the first year of life from what we called a phonetic point of view. Two male infants were tape-recorded from birth until about eleven months of age, first at weekly intervals, after the age of six months biweekly. Our main question was: "what is the infant doing", since we found that literature at that time only told us "what the adult was hearing", which is the other end of the speech chain.
So we concentrated upon the infant's production of sounds and developed a transcription system noting respiratory, phonatory, and articulatory movements (Van der Stelt and Koopmans-van Beinum, 1981).
In the speech motor development of those two babies we indicated three speech motor milestones, which occurred at the ages of about six weeks, three months, and six months. We called them milestones since we suppose that they are fundamental for later speech and are universal as well.
The first milestone occurs when the infant starts to interrupt this phonation by means of glottal stops during one single expiration. The second milestone is the onset of one single articulatory movement, usually in the back of the mouth, during one expiration. The third milestone, babbling, has been subject of further research to be reported on below.

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2. METHOD

In our terminology BABBLING stands for the repetative production of an articulatory movement during one single expiration cycle with interrupted or continued phonation.
On the basis of our experiences with the two boys and several other infants (Koopmans-van Beinum and Van der Stelt, 1979) and the well known diary studies (see Lewis, 1936) we supposed that babies would start to babble at the age of about six months.
We selected fifty healthy babies of about three to four months old. The parents, willing to cooperate, were instructed about babbling. We told them what babbling sounded like by giving them examples and stressing the repetative articulatory movement in just one expiration. The parents were to report the date they recognized babbling for the first time. Furthermore we inquired about peri- and postnatal aspects, about feeding, thumbsucking, and sleeping position. Apart from babbling, parents reported about items in the gross motor development of their children such as (social) smiling, rolling, sitting, crawling and pulling to stand. Students of our Institute telephoned the parents weekly to ask about new developments of the infants and to fill in our checklists.

3. RESULTS

Figure 1 represents distributions of the percentages of boys and girls that babbled for the first time with weeks along the time axis. The ogives represent the cumulative distributions in which each week adds its part to the total of 100%. The range of onset of babbling for boys is from 18 to 48 weeks and for girls from 23 to 47 weeks.

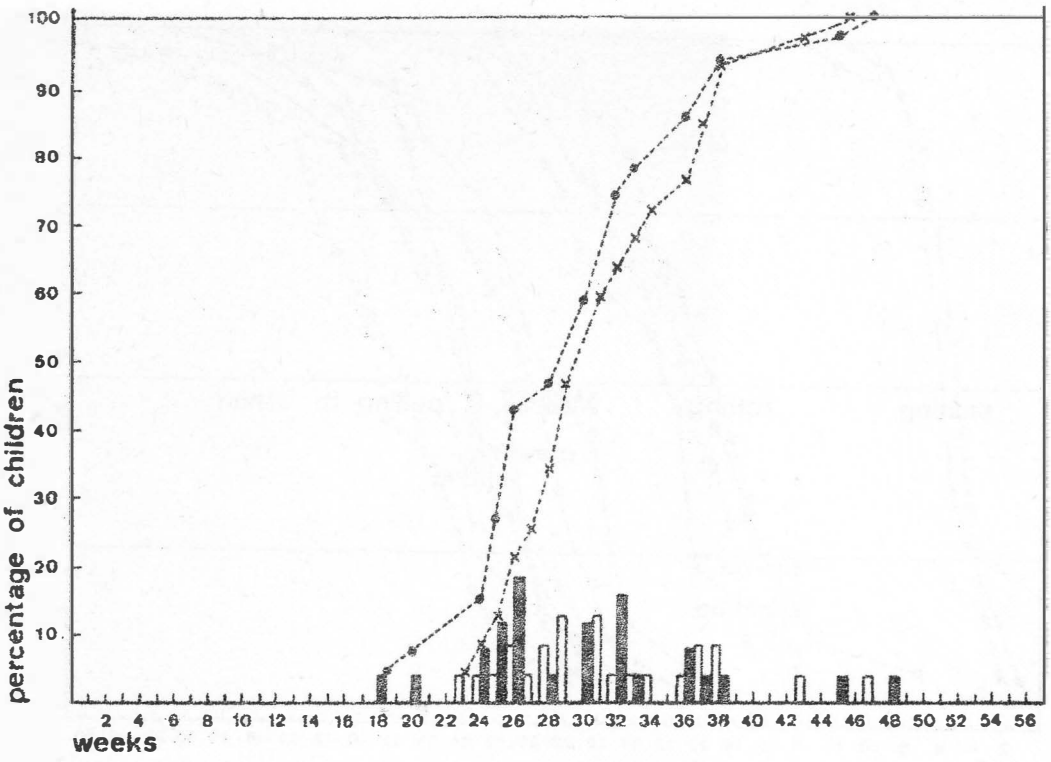

Figure 1. Distribution and cumulative distributions of the onset of BABBLING in 25 girls and 26 boys (girls are indicated by x and by blank columns, boys by • and by black columns).

Figure 2 shows from left to right the cumulative distributions of smiling, rolling from belly to back (be-ba), and from back to belly (ba-be), BABBLING, crawling, sitting, and pulling to stand for boys and girls separately. Smiling ranges from 0 to 14 weeks, but activities that have their onset later in that first year tend to have wider ranges: pulling to stand ranges from 26 to 60 weeks for girls and from 26 to 56 weeks for boys. (see next page).

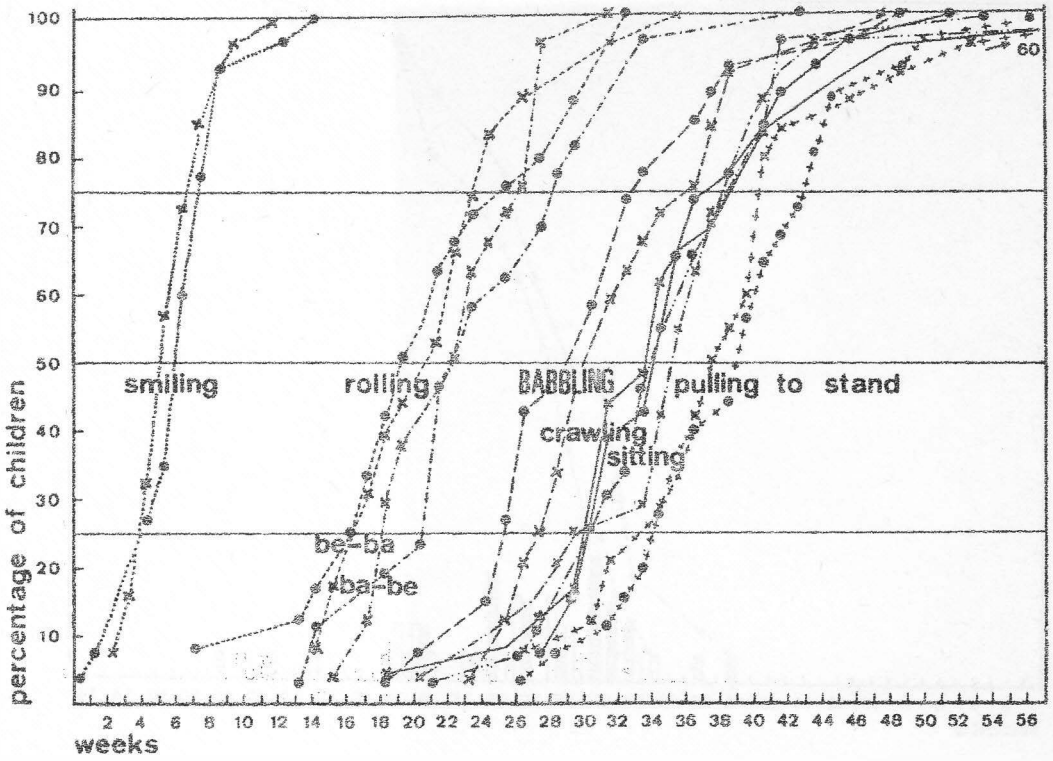

Figure 2. Cumulative distributions of the onset of smiling, rolling, from belly to back, and rolling from back to belly, BABBLING, sitting, crawling, and pulling to stand for boys and girls separately (girls are indicated by x, boys by ●).

We wondered whether early babbling in the individual infant was related to early smiling, rolling and so on: such an infant then would be a fast developing child. We checked the individual data of the children, but we did not find such infants. The boy who babbled (at) last had mastered all other items of gross motor development already. The boy who babbled as the first one of all fifty children, figured in the first, second, and fourth quartiles with regard to other items. Another girl is represented in all four quartiles: she is a fast babbler and a late smiler. Still another girl is always at the tail of the group. Yet another boy is quick in the motor development except for babbling. In the individual child the order of onset of motor items cannot be predicted from our data. With regard to the age in weeks for the onset of a certain motor function

one individual infant is always compared with the total group. For one item he may be called an early child and for another relatively late.

In the next section of our conclusions we have interpreted the data as a description of the development of motor functions in a group of children. In doing so no conclusions may be drawn about individual children. We hope to find some developmental process, maturational and/or social, underlying the early development.

In order to compare babbling to other items of motor development we calculated regression lines in the second and third quartiles, where the ogives are more or less lineair. The slopes of the regression lines may be taken as an indication for the rate of development of a certain item in the motor development of these fifty children. Mean and standard deviation are of course an indication for the moment at which a certain function develops.

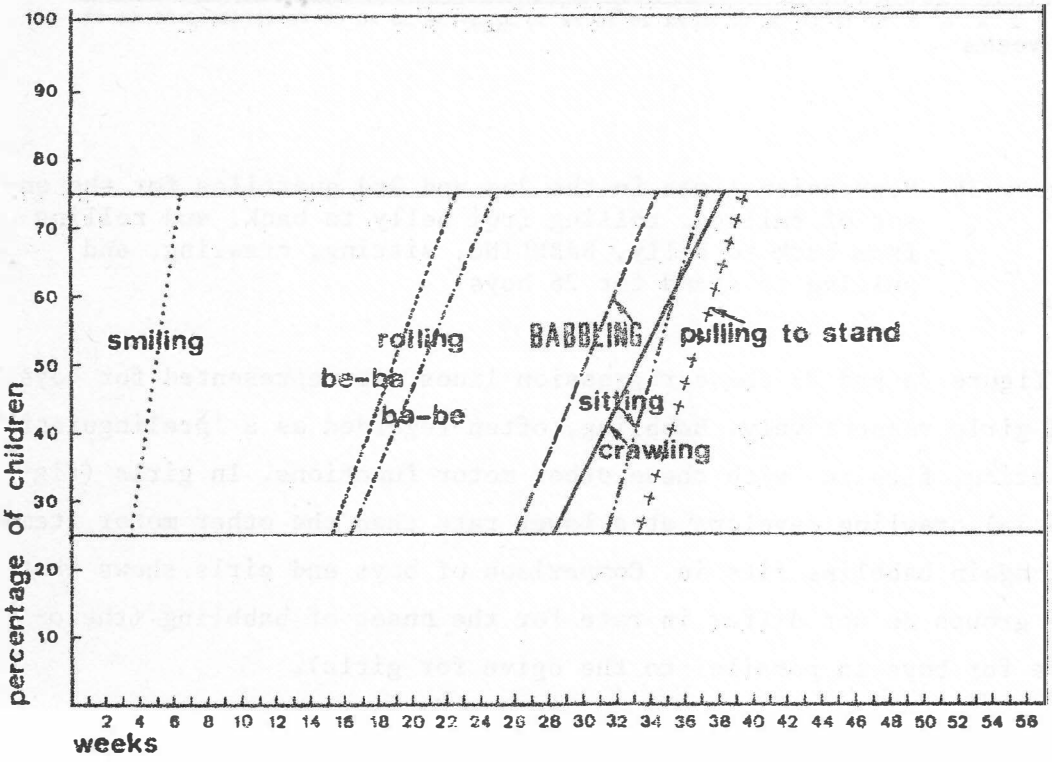

Figure 3a. Regression lines in the 2nd and 3rd quartiles for the onset of smiling, rolling from belly to back, and rolling from back to belly, BABBLING, sitting, crawling, and pulling to stand for 25 girls.

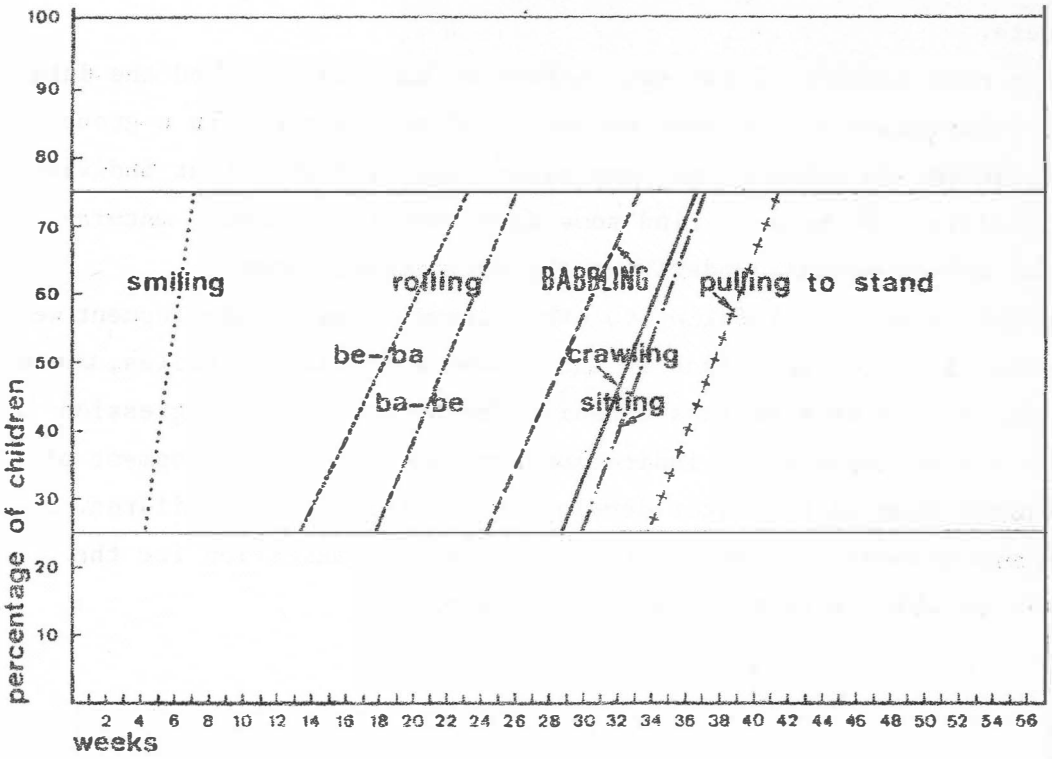

Figure 3b. Regression lines in the 2nd and 3rd quartiles for the onset of smiling, rolling from belly to back, and rolling from back to belly, BABBLING, sitting, crawling, and pulling to stand for 26 boys.

In figure 3a and 3b these regression lines are represented for boys and girls respectively. Babbling, often regarded as a 'prelinguistic' function, fits in with these other motor functions. In girls (figure 3a) crawling develops at a lower rate than the other motor items, but again babbling fits in. Comparison of boys and girls shows that the groups do not differ in rate for the onset of babbling (the ogive for boys is parallel to the ogive for girls).

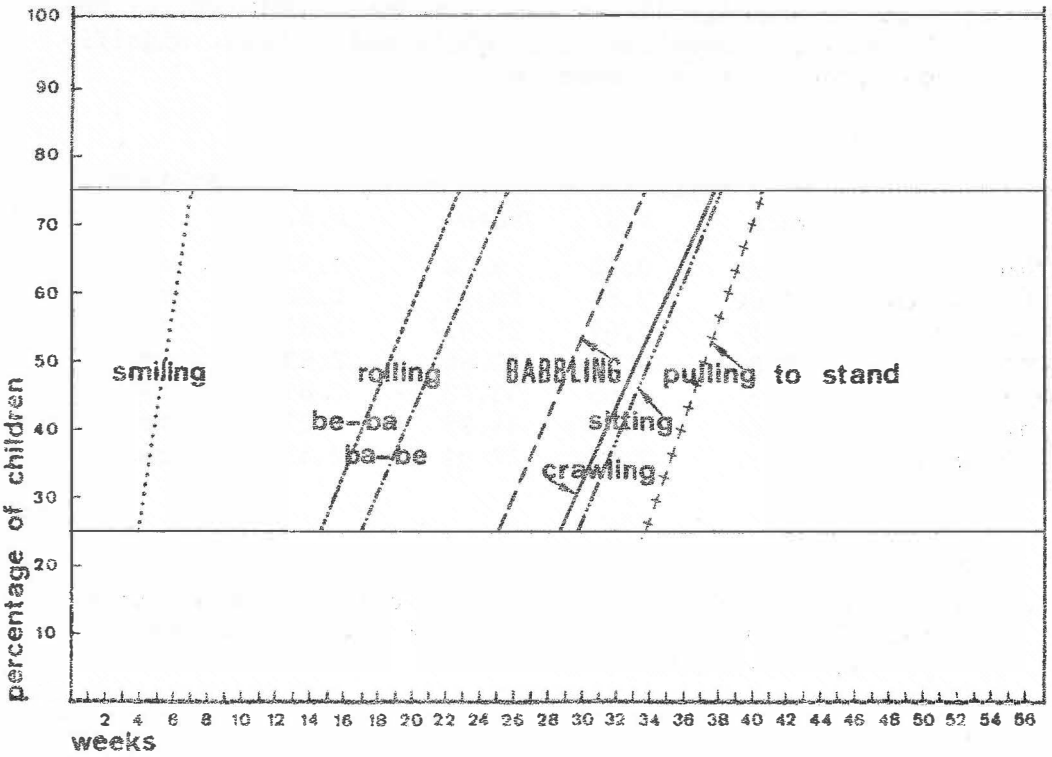

Figure 4. Regression lines in the 2nd and 3rd quartiles for the onset of smiling, rolling from belly to back, and rolling from back to belly, BABBLING, sitting, crawling, and pulling to stand for 51 infants.

In figure 4, all regression lines for boys and girls together have about the same slope, indicating that the developmental process underlying the onset of babbling does not necessarily differs from the process underlying other items of motor development.

Table 1a. Mean and standard deviation in weeks calculated for the 2nd and 3rd quartiles of 25 girls and 26 boys. Significance by means of Student's t.

	boys		girls		5%-level
	Mean	s.d.	Mean	s.d.	
smiling	6.85	0.98	6.18	0.72	ns
rolling be-ba	19.69	2.63	20.25	2.30	ns
rolling ba-be	23.15	2.67	21.69	2.62	ns
BABBLING	28.85	2.76	30.66	2.63	ns
crawling	33.54	1.95	33.17	2.65	ns
sitting	34.00	2.16	34.85	2.27	ns
pulling to stand	38.17	2.58	37.31	2.43	ns

Table 1b. Mean and standard deviation in weeks calculated for all four quartiles of 25 girls and 26 boys. Significance by means of Student's t.

	boys		girls		5%-level
	Mean	s.d.	Mean	s.d.	
smiling	6.15	2.71	5.52	2.21	ns
rolling be-ba	18.58	7.82	20.26	5.47	ns
rolling ba-be	22.62	6.44	21.25	4.14	ns
BABBLING	29.73	6.77	31.21	5.75	ns
crawling	33.92	5.62	33.91	8.75	ns
sitting	33.77	6.05	34.04	7.89	ns
pulling to stand	38.00	6.73	37.04	7.47	ns

Comparison of mean and standard deviation for the second and third quartiles of the groups of boys and girls by means of Student's t does not show significant differences between boys and girls (Table 1a). Nevertheless, the mean age for the onset of babbling is a week and a half earlier in boys although girls are said to be 'verbally gifted'. Comparison of the two groups in all four quartiles with regard to mean and standard deviation (Table 1b) does not show significant differences either. The means in table 1b are about the same as in table 1a, but the standard deviations become much larger.

4. CONCLUSIONS AND DISCUSSIONS

Babbling, defined in speech motor terms instead of linguistic terms has its place between other items of motor development. In our view the first occurrence of babbling should be an item on a checklist for speech motor development, just as rolling, crawling and sitting have since long been measures for the total development of children in the first year of life. In babbling as we defined it, coordination of respiration, phonation, and articulatory movements starts to develop and this coordination is supposed to be basic for the production of speech. This motor function in young infants has to be developed into a communicative function in cooperation with the adult caretaker for whom babbling already has an important communicative component.

Early occurrence of babbling is not necessarily related to early occurrence of other items of motor development, nor is a relatively late occurrence of babbling related to late occurrence in the other items of motor development. This development, babbling included, may be influenced by interactional patterns between caretaker and infant.

Sex differences are not (yet) found in this group of children with regard to the moments (ages) they develop items in their motor development.

Our results show that the relation of early babbling to later speech has to be investigated longitudinally in the individual infant.

In view of the ranges found for the total group of infants it is clear that infants of about the same age may differ considerably with regard to the sounds they produce. The influence of the 'mother's tongue' upon the sound production of infants, from different cultural backgrounds, can be studied in a interactional longitudinal study, comparing several stages in the development. One infant may, for example already produce babbling sounds, while another infant of the same age is still in an earlier phase, producing complex intonational patterns (Koopmans-van Beinum and Van der Stelt, 1979). The differences between the infants must not be subscribed to e.g. Chinese or English influences. The differences are probably 'only' developmental.

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