

Psychomotor and social development of breast-fed and bottle-fed babies during their first year of life

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Until about 30 years ago breast-feeding was the natural and common method of infant feeding. With increasing technical possibilities in food industry, transfer of birth into hospital and displacement of female activities outside the family, the frequency of breast-feeding decreased, being replaced by artificial feeding methods. This work treats the impact of the two feeding methods (breast and bottle feeding) on the psychomotor and social development of the baby in the first year of life.

The theoretical part gives a review of the mother—child interaction and the psychomotor and social development. As hypotheses have been proposed the suppositions that breast-feeding in the first three months of life leads to essential developmental advances in psychomotor and, above all, social maturity. This is due to the intensive visual and olfactorial experience and perception, the advantages of nutrients in breast-milk and, last not least, to the infant's autonomy regarding food quantity and time intervals. The quality of mother—child interaction is essentially influenced by the feeding method, because distance and proximity have an essential influence on their relation. As an important sign of intellectual maturity was regarded the fear reaction to strangers.

The empirical part examines the hypotheses by comparing the development of breast-fed and bottle-fed babies. The psychomotor and social development of breast-fed babies clearly differs from that of bottle-fed ones and leads at the age of 12 months to significant developmental advantages of the psychomotor and social capabilities.

Some suggestions are given to ensure mental health in the first year of life.

The effect of breast-feeding on the child's development has been studied. It has been observed that breast-fed children develop better than bottle-fed ones and their mothers have less worries and problems with the babies' care and nutrition. The question arose whether a connection existed between the type of baby-food and the unproblematic development of the baby. From [7] stated that the mother's love is as contagious as her anxiety because both have a deep-reaching effect on the personality of the child.

In fact, mothers of bottle-fed babies exhibit more anxiety about the composition, quantity and frequency of the meals of their children, knowing how often indigestion results.

How did it happen that breast-feeding, the only and time honoured method of feeding children, which has been used for thousands of years, is not practised any more in our modern age of progress? Several reasons can be enumerated of which the following may have had the strongest influence. Preference to deliver in hospital grew

considerably in the last 30 years; increasing technological possibilities to produce artificial food-products; and abandoning the female's household work to take a paid job outside the home. As a result, the frequency of breast-feeding decreased drastically and was replaced by artificial bottle-feeding. What consequences has this modern way of baby feeding for the present generation?

Meves [15] warned in the sixties already against the "neurotic neglect" which comprises the three symptoms of passivity, licentiousness and hostility to order. The neglect would consist of the missing body contact, the lacking nearness and loving attention during the suckling period as factors exposing these children to emotional lability. Ever since Spitz [23] and Bowlby [5], several authors have stressed the importance of the mother-child interaction during the baby's first year. Especially Spitz [23] emphasized the "eight-month-anxiety", the significance of the baby's bond to a person of long and close contact as being the decisive foundation of personality development. Specific papers on mother-child interaction and bond appeared in the sixties foremost in the English and American literature [2, 3, 12, 17, etc.] while other authors [4, 21, etc.] occupied themselves mainly with the physiological and immunological advantages of breast-feeding.

In the present study, as a specific indicator of cognitive maturity, the child's shy-acting, his fear reaction to strangers [23, 24] (Spitz's Fremdel-

verhalten) was investigated, and this has also provided information about bonding. The working hypotheses were as follows.

1st hypothesis. If babies are breast-fed at least during their first three months of life without addition of other nutrients, then they differ from the bottle-fed babies in their psychomotor and social development. This assumption is based on the finding of significant differences between bottle-fed and breast-fed eight days old babies [4]. Cron et al [1940], Ormiston [1941] and others showed in addition an increased susceptibility to infection.

2nd hypothesis. If babies are fully suckled during the first three months of life they achieve by twelve months of age a higher psychomotor and social standard of development than bottle-fed babies at the same age. This was based mainly on the finding in Ugandese babies of a faster statomotor development than in American children of the same age [1]. Interconnections between early experience during the first months of life of a baby and its later capacity to exploring have also been reported [18].

3rd hypothesis. If babies are fully suckled during the first three months of life they show shy-acting at an earlier age than do bottle-fed babies. This is based on investigations [17] showing that the younger the child, the less it reacts to strangers with rejection. A connection could be observed between the reaction to strangers in the 4th month and the later intelligence which expresses itself at two years of age with linguistic

cleverness and intellectual differentiation [11]. In addition, a correlation was found between the behaviour to strangers and the way in which the baby during its first three months was able to determine the feeding rhythm [2, 3].

4th hypothesis. Babies bottle-fed during the first three months showed a fear reaction to strangers later and over a longer period of time than did breast-fed children. This supposition was supported by the observation that the age and grade of development of an infant were decisive for the intensity of the fear reaction [17].

MATERIAL AND METHOD

In the frame of a study lasting one year, 20 breast-fed and 20 bottle-fed babies were compared regarding their psychomotor and social development. All babies were healthy and had been delivered vaginally after 38–40 weeks of pregnancy without obstetrical intervention and complications, in the same hospital. Their birthweight ranged from 2800 to 3500 g, they had not suffered from any prenatal disorder and were the first child of their parents. Intentionally 10 boys and 10 girls were selected for each experimental group. The parents came from the same town and were of the lower middle class, so that socioeconomic differences were almost totally eliminated. All babies received the same care during the first week of life.

All babies lived with their parents, so that the constant presence of persons of long and close contact ("Bezugspersonen") was ensured. The decisive criterion of classification to the groups was the mode of feeding: the breast-fed babies were suckled for three months after delivery, while the bottle-fed babies were fed artificial formulas ever since birth, after several attempts to suckle them had proved unsuccessful.

To study psychomotor development, the babies were examined in the third, sixth, ninth and twelfth months of their life, in the presence of their mothers, with the

Munich functional development test [10] for their ability of creeping, sitting, running, grabbing, perception, speech, speech-comprehension and social behaviour. Since, owing to the fear reaction to strangers, the test failed to offer sufficiently differentiated information, for the purposes of this study use was made of a separate sheet. By means of 11 items it was examined how the baby reacted to the examiner as a stranger. For that the baby was lying on the wrapping table and the mother stayed in the baby's area of vision. Then it was placed on the scales while the mother stepped out of the baby's view. Soon thereafter she reappeared, took up the baby and consoled it. The baby's reactions covered staring, search for the mother, crying and defensive actions with movements of escape. In this way all babies were tested 2 to 4 times every month, because some showed the shy-phase only for a very short time. At the same time, another questionnaire was given to the mother who had to give information about the shy-acting of the baby at home. With the help of 22 items it had to be established as accurately as possible whether men and women, fair or brown haired persons, people wearing sunglasses or beards, etc., were experienced by the baby to be threatening in the same measure, how strong the reactions were and in what manner it was possible to console the child. Many breast-fed babies at 12 months of age achieved a phase of development which could not be measured any more by means of the first year Munich test, thus all infants were then examined with the 2nd year Munich test.

For evaluation of data, Mann-Whitney's U-test, the chi-square method, the Two-I-Test and Fisher's Exact-Probability Test were applied, considering $p = 0.5$ as the level of significance.

RESULTS

Significant differences in psychomotor development were observed in favour of the breast-fed children. The mean values differed most in the third and sixth months, while by the ninth month the bottle-fed children gradually approximated them, and in the twelfth month the mean values of the two were more close to each other,

TABLE I
Mean scores of Munich functional developmental test in the 1st year of life

Months	Breast-fed		Bottle-fed		μ	p
	x	s	x	s		
12	12.00	0.0	11.30	1.03	20	0.001
9	14.85	2.15	9.40	2.90	20	0.001
6	14.00	1.53	6.40	3.25	8	0.001
3	13.80	1.90	6.00	3.78	11	0.001
	n = 20		n = 20			

TABLE II
Mean \pm S.D. and statistical significance in breast-fed and bottle-fed groups of reaction to strangers

Behaviour	Breast fed			Bottle fed			μ	p	
	\bar{x}	s	n	\bar{x}	s	n			
I. Wrapping table									
1. stares	A	4.95	1.18	20	9.08	1.21	15	3.00 < 0.002	
	D	1.53	0.61	20	2.28	0.89	15	77.00 < 0.01	
2. frowns	A	5.05	1.15	20	9.20	1.11	15	1.50 < 0.002	
	D	1.35	0.61	20	2.10	0.90	15	74.50 < 0.01	
3. seeks mother	A	5.14	1.21	18	9.37	1.14	13	1.00 < 0.002	
	D	1.19	0.53	18	1.83	0.65	13	48.00 < 0.01	
4. weeps	A	4.80	0.70	8	9.88	0.65	5	0.00 < 0.05	
	D	0.85	0.29	8	1.57	0.63	5	7.50 > 0.05	n.s.
II. Scales									
5. seeks mother	A	4.95	1.18	20	9.08	1.21	15	3.00 < 0.002	
	D	1.53	0.61	20	2.29	0.89	15	77.00 < 0.01	
6. cries	A	5.30	1.30	19	9.74	0.98	13	1.00 < 0.002	
	D	1.02	0.61	19	1.74	0.79	13	49.50 < 0.01	
7. turns away	A	5.80	1.15	11	10.12	0.79	11	0.00 < 0.002	
	D	0.80	0.50	11	1.48	0.68	11	25.00 < 0.05	
8. shy-phase	A	5.19	1.21	11	10.12	0.79	4	/	/
	D	0.75	0.53	11	1.48	0.68	4	/	/
III. Consolation									
9. speech	A	4.94	0.70	20	9.08	1.21	15	3.00 < 0.002	
	D	1.53	0.29	20	2.29	0.89	15	77.00 < 0.05	
10. taking up	A	5.32	1.18	18	9.74	0.98	13	1.00 < 0.002	
	D	1.07	0.61	18	1.74	0.79	13	52.50 < 0.01	
11. caressing	A	5.27	1.30	14	9.95	0.64	9	0.00 < 0.002	
	D	0.97	0.38	14	1.67	0.75	9	27.00 < 0.05	

but a significant difference ($p = 0.001$) could still be detected. (Table I)

Regarding the Fremdelverhalten, significant differences emerged in the duration of this behaviour and also in the space of time within which it arose. Breast-fed infants began to show it at 4.8 months of age and on the average lost it at latest when 6.6 months old. Bottle-fed infants, on the other hand, began to display it at the earliest when 9.08 months

old and ceased to show it at 11.6 months of age. In addition these ages are means and 8 of the bottle-fed infants had not yet ceased shy-acting when the investigation was closed in the twelfth month. Moreover, it was surprising that all the breast-fed babies showed this behaviour in the course of the first year of their life while 5 bottle-fed children had shown no reaction at all during the first year (Fig. 1).

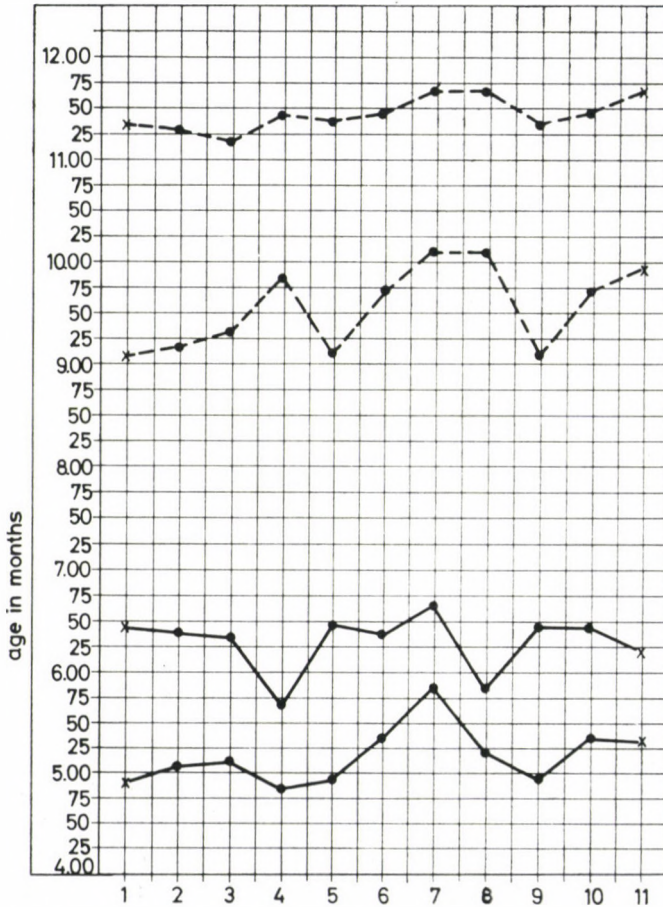


FIG. 1. Beginning, duration and termination of fear reaction to strangers. — breast-fed infants, $n = 20$, - - - - bottle-fed infants, $n = 20$

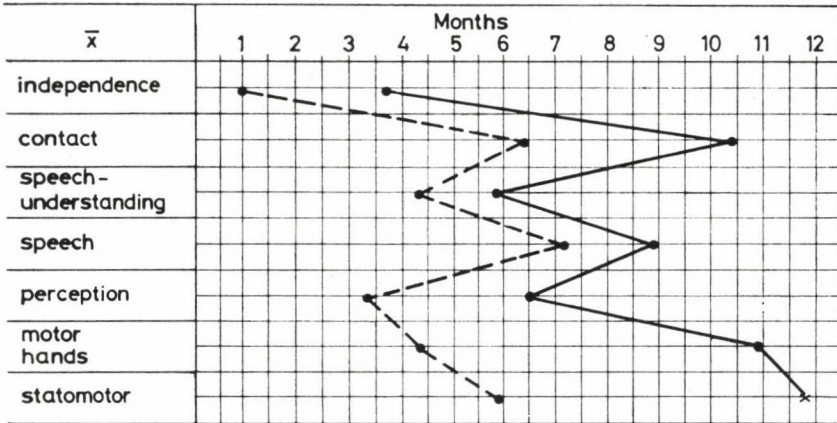


FIG. 2. Achievement profile on basis of mean scores of Munich functional developmental test, in the 7 function areas. — breast-fed infants, n = 20, - - - - bottle-fed infants n = 20

Comparison of the groups at the conclusion of the investigation revealed significant differences between the breast and the bottle fed babies. In the functional areas of perception, statomotor, dexterity and contact behaviour and independence, the breast-fed infants achieved higher marks. An exception was the comprehension of language where the difference was just noticeable ($p = 0.05$) (Fig. 2).

DISCUSSION

Judging from the empirical data, all four working hypotheses can be accepted, be it with regard to the psychomotor development as well as to the earlier appearance of shy-acting in the breast-fed children. Besides the nutritional-physiological advantages of mother's milk, breast-feeding guarantees in an ideal way the optimum communication of the mother with her baby, and simultane-

ously a close contact is established by touch, sight and hearing. The intensive and (owing to the more frequent and longer feeding periods) longer stimulation by touch advances perception through this kind of contact which is phylogenetically the oldest [9, 16].

The suckling baby perceives predominantly with the senses of nearness, taste, smell and kinesthetic sensations. This also affects the mother positively in the sense of prolactin stimulation which supposedly has an influence on maternal behaviour [19].

The ideal facing posture of the suckling baby during breast-feeding is about 20 cm from the mother's face and in this way mother and child communicate in the closest way. Moreover, the human face is the most powerful stimulus for the 2-4 months old child [20]. An additional advantage of breast-feeding consists in the fact that the baby is an active partner from the beginning, determining

the quantity, duration and number of feedings on the basis of his nutritional needs. At the same time, the bottle-fed baby has to be satisfied with the quantity which is given to him and, moreover, most of the time he is not able to satisfy his need for suckling because bottle-suckling does not demand enough effort. In this way the baby frequently experiences the end of the feeding as a frustration [15].

From all this it may be concluded that the interaction between mother and child is shaped on the basis of the activity initiated by the baby. With bottle-feeding the baby cannot be considered an independent partner because the mother has to follow the directives given by the paediatrician when composing the meals. Several authors [6, 12, 19] stressed the significance of the effect of the feeding experience during the first months on the baby's later development. For instance, statomotor development is enhanced [1, 18], and this we could confirm since 65% of our breast-fed infants were already able to walk when one year old, while among the bottle-fed ones only 15% were able to do so. Moreover, especially notable was their greater independence and their better perception and social behaviour. This seems to be in close connection with the earlier shy-acting of breast-fed babies who after the 9th month were no longer impeded by fear of strangers during exploration and in their movements and locomotion. On the other hand, just during this period the bottle-fed children were held back by their fear from

strangers. This was shown by eight of the bottle-fed children who were still in this phase when one year old. We know little of the duration of this phase in bottle-fed children except that it lasts considerably longer than in breast-fed babies [1, 3, 11, 17]. From the point of view of depth psychology, the fear from strangers is considered essential for the early relation to an object and for binding to it [5, 24]. The intentional phase between the 3rd and 6th months of age has its significance for the emotional experience [22]. The close symbiosis begins to dissolve itself in favour of individualization and for the later Ego-Integration [13, 14]. For this development, recognition and distinguishing of the Ego-Self and the Non-Self are absolutely indispensable, and precisely this is closely expressed by shy-acting, the baby's reaction to strangers.

CONCLUSIONS

Breast-feeding may therefore be considered a preventive measure of the child's untroubled emotional development. Harmony, trust and emotional balance arise from the primary trust during the first months of life, and an active conquest of the world is being expressed and exercised in the baby's effort to suck the mother's milk. Psychomotor development in itself is not the main purpose if not for the fact that it ensures better perception, speech, conception, independence and social contact. All this

seems to be an expression of processes which the bottle-fed baby is not able to manifest at the same age. In this way they have a less fortunate start in life, and this has to be emphasized especially in our times when psychophysiological stresses play such an important role. Therefore, the following suggestions may seem appropriate.

In hospital

Pregnancy care including care of emotional health;
 smooth delivery to ensure for the mother and her baby to experience birth as a positive happening;
 early placing of the baby on the breast with the purpose of establishing immediate contact between mother and child and to secure the immunological advantages of colostrum immediately post-partum;
 feeding rhythm in intervals of 3 hours instead of 4 hour or irregular feedings;
 information of nursing personnel regarding the right feeding technique;
 rooming of mother and child in such a way that the biological unity is reestablished

In family and school

Delivery preparation by psychoprophylaxis where information is offered and relaxation techniques are taught;
 consultation and care of young mothers by experienced and practical-minded personnel in maternity centres;

reduction of advertisements of artificial baby foods, in accordance with the 1981 WHO rules;
 in intermediate and higher schools preparation for parenthood.

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