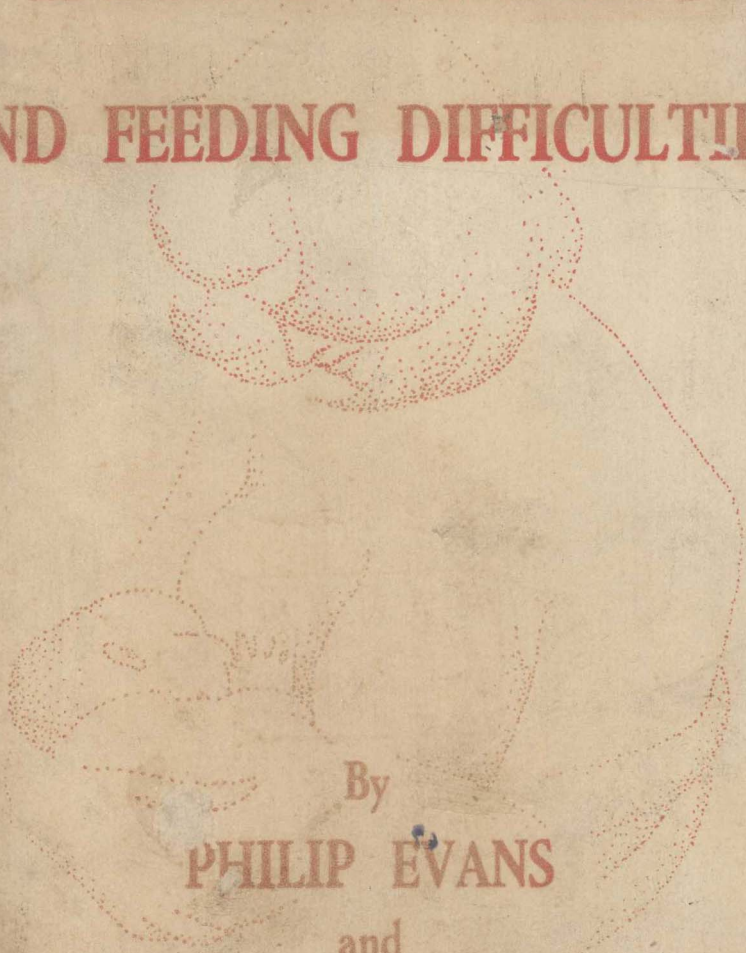
THIRD EDITION

INFANT FEEDING

AND FEEDING DIFFICULTIES



By

PHILIP EVANS

and

RONALD MAC KEITH

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AND
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By
PHILIP RAINSFORD EVANS
M.D., M.SC., F.R.C.P.
Director, Department of Child Health and Children's Physician, Guy's Hospital: Physician, The Hospital for Sick Children, Great Ormond Street

and

RONALD MAC KEITH
M.A., D.M., F.R.C.P., D.C.H.
Assistant Children's Physician, Guy's Hospital

THIRD EDITION

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including 2 Coloured Plates

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To
HECTOR CHARLES CAMERON
AND
WILFRID SHELDON

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PREFACE TO THE THIRD EDITION

It has been surprising to find how much new work with important implications in the theory of lactation and practice of infant feeding has appeared in the four years since the last edition was published. The section on the physiology of lactation has been considerably revised, the chapter on Practical Manœuvres has been rewritten and there has been much revision elsewhere.

Diets for phenyl pyruvic oligophrenia and for galactosæmia have been added to the appendices which now also include a low lactose milk (Galactomin), a low calcium milk (Locasol), a low sodium milk (Edosol) and a gluten-free infant food (Liga gluten-free).

A belief in the greater efficiency of persuasion rather than command is reflected in the less didactic wording now used in many places.

Once again thanks are due for helpful suggestions from reviewers; the kindly remarks from overseas have been especially appreciated.

Pressure of affairs made it impossible for Dr. Philip Evans to share in this revision, so the responsibility for changes falls on his co-author. Miss A. Crump, S.R.N., Miss K. Davies, S.R.N., S.C.M., and Dr. M. C. Joseph have given much help which I am glad to acknowledge.

R. C. Mac Keith.

Guy's Hospital, London, S.E.1

PREFACE TO THE FIRST EDITION

Infant feeding has changed greatly in recent years, because of advances in our knowledge of nutrition, lactation and the importance of emotions as factors in the growth of the child. Pædiatricians have taken greater personal interest in the principles

and the details of the feeding of their own and other babies and this has led to an earlier application of the discoveries of the last few years.

There have been advances in simplicity to lighten the mother's lot. Attitudes have become more permissive. There are now more efficient ways of dealing with some of the problems of infant feeding and minor ailments. With a fresh evaluation of the advantages of breast feeding have come improvements in its practice.

Some of these changes have been incorporated in existing books on infant feeding, others are so far only to be found in the original papers or in books on special aspects of infant feeding or on disease in infancy.

Here we present our practice of infant feeding and the reasons for it so that students may comprehend the subject and physicians in practice away from the schools may understand the changes which have taken place. It is hoped that nurses, health visitors and others who have the care of babies will also find the book helpful.

All aspects of normal feeding from birth to the end of the first year are dealt with in the sections on breast feeding, to which the chapters on artificial feeding and feeding difficulties are supplementary and complementary.

The methods described are, in general, those of which we have experience. Without sacrificing the detail which is often important, a dogmatic manner has been used for the sake of simplicity.

We acknowledge our debts to many teachers and colleagues and ask them to accept our thanks without our naming them any more than we name the mothers and babies we have watched and essayed to help.

*.....

P. R. Evans.
R. C. Mac Keith.

* The sources of the illustrations are acknowledged in the Preface as printed in the first and second editions.

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CHAPTER 1

AIMS

" Now good digestion wait on appetite
and health on both."

Shakespeare. MACBETH.

THE AIM of infant feeding is a happy growing child. The success of a chosen method of feeding an infant in his first year is to be judged by the child's good progress in that period and by his coming into the later years with a good appetite and an unobtrusively efficient digestive system. Feeding difficulties, poor appetite, and other digestive problems in otherwise healthy toddlers seem to be commoner than they were. Some are unreal problems, arising from the mother's mistaken expectation that a child of two years old will eat as greedily as he did at nine months of age. But many are real, and of these it is likely that many have their origins in some error in the management of the child's feeding in his infancy, an error either in what or in how the child was fed.

The successfully fed child is one who sleeps well, wakes and eats with appetite, is satisfied and then lies awake for a while and goes to sleep again. He looks alert, has a good colour in his mucous membranes, and has a silky skin that is a pleasure to feel. His trunk and limbs are well covered with a firm and elastic layer of fat. The presence of efficient muscles is shown by his lively kicking and waving and by the tone of the muscles. Most of his bones are deeply covered, but those of his skull can be felt to be firm. His skin is warm, he breathes easily, he sucks and bites on anything introduced into his mouth, his abdomen is prominent but not distended, he passes his urine and stools without discomfort. He cries for hunger, loneliness, discomfort or for other obscurer reasons at intervals, but not for long, and not for more than some 60 or 120 minutes in the twenty-four

hours (Aldrich *et al.*, 1945). He goes to sleep easily and sleeps peacefully, waking at intervals and settling down again.

This happy, lively, contented or easily comforted child, good to look on and sleeping well, eats with appetite. Furthermore, he is gaining weight ; on an average nearly an ounce a day (" an ounce a day except on Sundays ") for the first four months, then two-thirds of an ounce a day for the second four months and about half an ounce a day at the end of the first year.

Regular weighing during the first year is customary and is a wise safeguard, but scales (like clocks) are better servants than masters in infant feeding. At the mother's periodic visit to doctor, nurse or infant welfare centre, the child's weight should be only one of the items considered in assessing its progress. A healthy baby's weekly or fortnightly gain in weight will vary widely. Some mothers, not understanding this, may be disturbed to find the gain in one period has been small, and they may rush into an unnecessary and disturbing change of feed. A failure to gain during one week calls for action only if the child cries because of hunger or indigestion, or has other symptoms.

The common weight charts show a line purporting to represent the normal curve of gain in weight. This is misleading because, just as healthy new-born babies may be small or large, so at later periods, there is scope for variety in size. It is wiser to consider ranges of normality. Thus at birth normal children may be from 5 to 12½ lb. weight, at three months 10–16 lb., at six months 14–20 lb., at nine months 16–22 lb., and at a year 18–24 lb.

Even so these ranges only mean that the large majority of healthy babies have weights inside these limits. Occasionally healthy infants will have weights outside these weight ranges, but if a child's weight is below or above these limits, he should be overhauled to make sure he is well. Of course, even if an infant's weight is within the range of normal for his age, it is not necessarily satisfactory, for he might have lost weight and still be in the range. A child who is steadily growing (not from day to day, but from month to month) is usually better off than one whose weight remains stationary for a long time.

The oft-heard generalisation that a baby should weigh 7 lb. at birth, 14 lb. at six months, 21 lb. at a year and 28 lb. at two years old does reveal that a child may be expected to double his weight in five or six months, treble it in twelve, and be four times his birth weight at two years, and if it is remembered that

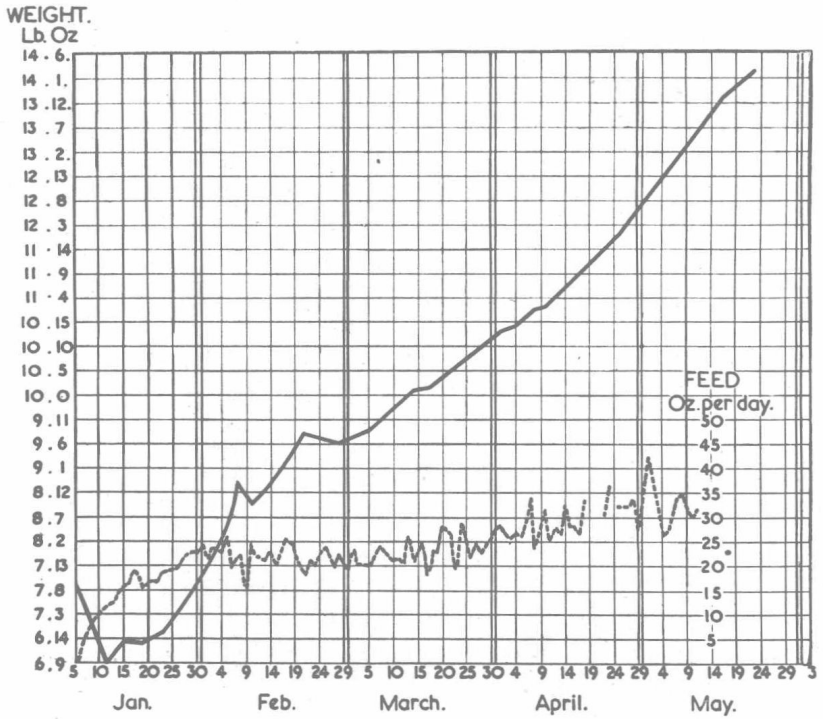


FIG. 1. Weight increase (——) and daily intake of milk (- - - -) of a breast-fed infant in first five months of life.

a healthy infant's weight may show 15 per cent. variation from these "normals," this rule may be accepted as a convenience. It is also roughly true that whatever their birth weight, babies gain, on an average, the same amount, about 14 lb., during their first twelve months. This is useful in considering babies whose birth weight has been unusually high or low.

Fig. 1 shows an actual weight chart of an infant. It illustrates

that the gain is irregular from week to week, but steady over longer periods. Included in the chart is a record of the child's intake of food from his mother. It is evident that the intake varies from day to day.

Furthermore, the intake on which an adequate gain of weight is made varies considerably from child to child.

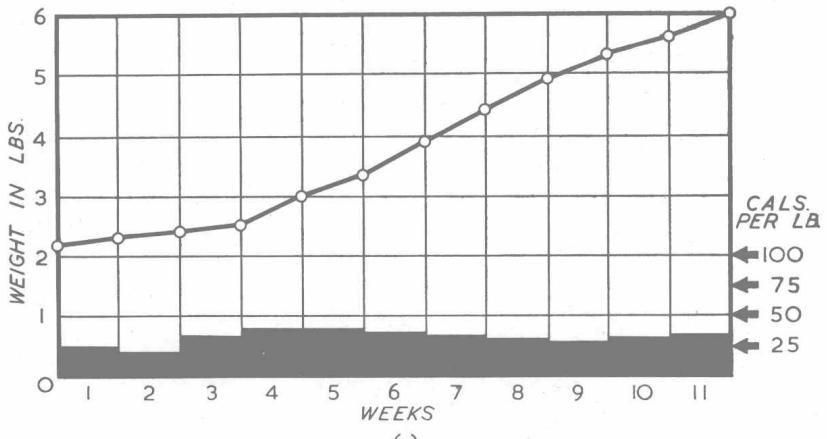
Fig. 2 shows the intake and weight-gain charts for two premature infants. Both show a good rate of gain. One takes about $1\frac{3}{4}$ oz. of milk per pound body weight per day, the other takes $3\frac{1}{2}$. The figure of $2\frac{1}{2}$ ounces of milk per pound body weight per day is widely accepted as the necessary intake of an infant. A more physiological way of putting it is that an infant needs enough to keep him happy and growing and the amount required for this varies between $1\frac{3}{4}$ and $3\frac{1}{2}$ oz., being usually about $2\frac{1}{2}$ oz. per pound body weight per day.

An adequate food supply is not the only thing the baby needs to grow happily. The baby grows by breathing, exercising, feeding and feeling. He needs fresh air, food, warmth, stimulation and security, which a loving mother will provide.

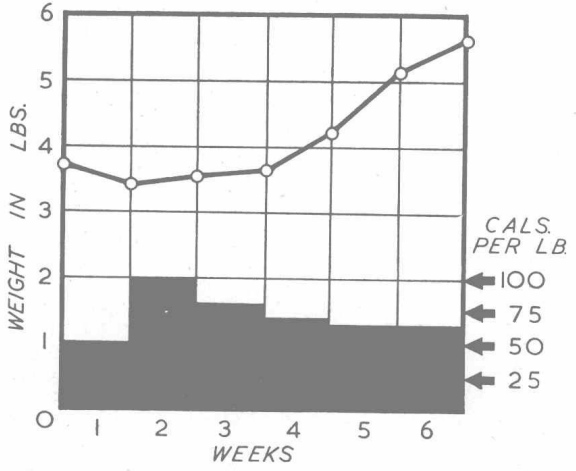
Expectant mothers are often more worried as to their capability for feeding and looking after their babies than about the prospect of accidents in the process of delivery. The doctor or nurse who looks after the mother and baby must have a sound knowledge of infant care and feeding if the mother is to be adequately prepared and the requisite atmosphere of confidence imparted.

The value to the child of a mother confident in her ability to feed her child properly whether by breast or artificial feeding is enormous. One advantage of breast feeding is that close contact with the mother satisfies emotional needs of the child at the same time as the need for food is met, but bottle feeds too can be given with the child firmly and snugly held.

The way in which the infant's nutritional needs are satisfied is of immense educational importance to him. Much of the information about the world which stimulates his mind is linked to feeding. Even towards the end of his first year his mouth is still his most delicate receptor organ and objects are explored by putting them into the mouth.



(*a*)



(*b*)

FIG. 2. Weight charts of two premature infants. (*a*) Gains well on $1\frac{3}{4}$ oz. per lb. per day. (*b*) Gains well on $3\frac{1}{4}$ oz. per lb. per day. (1 oz. of breast milk is equivalent to about 20 calories.)

It is a truism that mind and body are closely related, but in the first year of life their connection is close and evident. From the baby's point of view, feeding is of all-embracing importance. He reacts in an all-or-none way so that the need for food when he is

hungry and the pleasure of hunger satisfied are felt with an intensity difficult for an adult to appreciate. " The first emotional urges which any child develops are those which are concerned with self-preservation. Any frustration of these urges leads to a violent reaction of fear and hostility ; indeed the classic example of fear, hostility and aggression is that of a baby deprived of the breast or of its bottle when half-way through a meal. It goes purple in the face with rage, screams at the top of its voice, kicks out with its arms and legs and champs with its jaws, its eyes roving wildly in search of milk thieves or other possible aggressors. If this tiny child were of adult stature, that is to say some 5½ feet high and weighing upwards of 10 stone, it would be so dangerous that it would have to be kept in a cage for the protection of its unfortunate mother. It is only the fact of its smallness and impotence that makes us fail to realise the tremendous emotional force behind this display." (Odlum, 1948.)

In the article from which this is quoted, Dr. Odlum goes on to point out that it is obvious to anyone who has the care of a baby that he can suffer from a feeling of insecurity very early. Hunger unsatisfied may produce this, just as it may cause rage and fear. Of recent years it has become appreciated that these reactions in the earliest months of life are of prime importance in giving shape to the personality of the child and adult. Information accumulates from studies by pædiatricians and anthropologists as well as from psychoanalytical studies and has led to a general change in our methods of infant feeding.

Bakwin (1942) has shown that some convalescent infants who failed to gain weight in hospital, did so rapidly when they returned to their mothers' continuous twenty-four hours a day loving attention. Spitz (1945) showed that infants failed to grow well and also failed to develop their expected capabilities when they were, by admission to residential nurseries, separated from their mothers. In this country Spence, at Newcastle, and others have urged the importance of continuous maternal care.

The present change of attitude towards infant feeding and infant care generally is taking us away from the strict timetables,

schedules and feeding plans of thirty years ago towards a much more permissive attitude. This change has a number of causes.

The high infant mortality of fifty years ago was in part due to carelessness in methods of infant care which led to infection of feeds and to the use of indigestible artificial feeds. To-day there is a higher standard of cleanliness and wider knowledge of and use of suitable foods. On the other hand, many mothers, having grown up in families of only one or two, are less informed about infant care and more anxious in their approach to their children. This atmosphere is not good for babies, and we have a great opportunity to relieve this tension if we can convey to mothers that child rearing is something which they can approach with confidence of success. To advise mothers well, the doctor or nurse must understand the subject.

REFERENCES

ALDRICH, C. A., SUNG, C., and KNOP, C. (1945). Crying of newly born babies. *J. Ped.*, **26**, 313.

BAKWIN, H. (1942). Loneliness in Infants. *Amer. J. Dis. Child.*, **63**, 30.

ODLUM, D. M. (1948). The Rebellious Child. *Nutrition and Child Welfare*, **3**, No. 3, p. 3.

SPITZ, R. A. (1945). Hospitalism. An inquiry into the Genesis of Psychiatric Conditions in Early Childhood. *Psychoanalytic Study of the Child*, **1**, 53, and (1946), **2**, 113.

CHAPTER 2

STANDARDS OF NORMAL GROWTH

"Consider . . . the scientific notion of measurement. Can we elucidate the turmoil of Europe by weighing its dictators, its prime ministers, and its editors of newspapers? The idea is absurd, although some relevant information might be obtained. I am not upholding the irrelevance of science. Such a doctrine would be foolish. For example, a daily record of the bodily temperatures of the men, above mentioned, might be useful. My point is the incompleteness of the information."

A. N. Whitehead. MODES OF THOUGHT.

A HAPPY lively child, growing visibly in size and in capabilities *need* not be measured in height, weight, and so on, but his progress is of intense interest to his mother and she probably imagines that she goes to the Infant Welfare Clinic for this purpose. Once there she can be helped in many ways, given advice on the next steps in feeding, and management, told what new developments may be expected soon, and helped to solve social problems. Measurements of the child's progress in size and performance may show a failure to develop which neither the mother's nor the doctor's eye has noted. Sometimes this is cured by modifying the feeding or the management of the child, sometimes it leads us to detect disease or disorder at an early stage. The mother may be unduly worried about the child's weight gain, his appetite, or about the non-appearance of his teeth. To supervise his progress and to answer her questions, the child is measured, his progress is noted and his attainments compared with those of healthy children of the same age. The standards should be derived from measurements of children growing in optimal circumstances. The standards used for comparison must include not only the mean height, weight, etc., of healthy children in good conditions, but they must also give the normal limits of variability.

Normal Limits of Variability

If a group of healthy six-month-old babies is weighed there will be a few high, a few low weights, and many nearer the middle of the range. The largest set will usually be at the average or mean in the centre of the range.

Table I

Weight	Number of Infants
Under 12 lb.	0
12·0–12·15 lb.	1
13·0–13·15 „	2
14·0–14·15 „	5
15·0–15·15 „	15
16·0–16·15 „	17
17·0–17·15 „	19
18·0–18·15 „	15
19·0–19·15 „	13
20·0–20·15 „	6
21·0–21·15 „	4
22·0–22·15 „	2
Over 23 lb.	0

Table I gives an example of the results that might ideally be obtained by weighing such a group of six-month-old infants. From these figures a diagram can be constructed as in Fig. 3 by measuring horizontally equal intervals corresponding to pounds weight and placing on each interval a rectangle whose height is proportional to the number of babies in that *class*, *i.e.*, having weights of, for example, 13 lb. to 13 lb. 15 oz. This is a histogram or frequency distribution diagram. It is possible to draw a curve through the midpoints of the tops of the rectangles. The frequency distribution curve so obtained is bell-shaped. By taking large numbers of recordings and increasing the number of columns a smoother curve is usually obtained. The larger the number of observations the nearer the true distribution will be approached. It is also to be noted that the larger the number of subjects measured the wider the range covered by the curve will probably be. This is because the rare very small or very large examples are more likely to be included by increasing the total number observed.

In using the results of our survey we can, of course, make use of the *average*. It is clear, however, that not all healthy babies are of the average weight of their group. To meet this we can use the *range*, but to say that at six months the average weight is 17½ lb. and the range is 12 to 22 lb.

gives no idea of whether a particular difference from the average is unusual or not.

In any measurement series, if most of the subjects are close to the average, the distribution curve will be a tall narrow bell. If large differences are common, the curve will be a wide shallower bell. The variation present in a series may be summarised in various ways. One is by averaging the differences from the mean, the quantity so obtained being known as the *mean deviation*. It is not often used. If the differences are squared and the average of these squares is taken, another measure the *variance* is obtained,

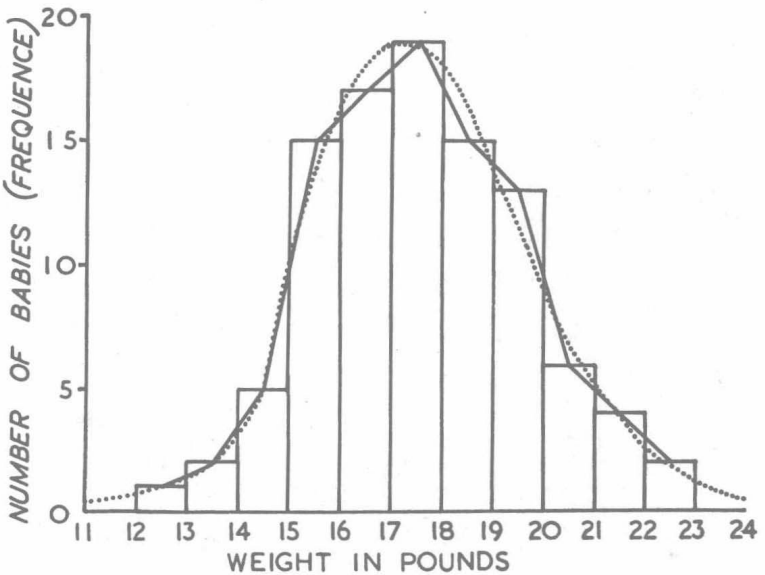


FIG. 3. Histogram constructed from the infants' weights given in Table I.

whose importance to us is that its square root is called the *standard deviation*. It is the standard deviation (S.D.) which is widely used to express what differences from the average are common in any series of measurements. The figures given in Table I may be conveniently summed up by saying that in this series of six-month-old babies, the mean weight is 17·6 lb. (8·4 kilo.) and the S.D. is $\pm$ 2·01 lb. (0·9 kilo.).

In any series those with weight (or height, etc.) near the average usually form the biggest classes. Included between the limits *average plus one standard deviation* and *average minus one standard deviation*, or

$$\text{Mean} \pm 1 \text{ S.D.}$$