

THE MENTAL GROWTH OF  
PREMATURELY BORN INFANTS

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From the Clinic of Child Development. The  
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## THE MENTAL GROWTH OF PREMATURELY BORN INFANTS

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THE uterus is the normal environment of the fetus until the end of a gestation period of 40 weeks. But birth with survival may in very exceptional instances occur as early as 24 weeks and as late as 48 weeks,—an enormous range of variation in natal age amounting to six lunar months. Variation within a range of two or three months is comparatively common. Prematurity of birth constitutes an abnormal alteration of environment which might conceivably affect the developmental career of the infant.

We have investigated the “mental” aspects of the problem by means of periodic examinations of the behavior status of premature infants at advancing age levels. Mental growth expresses itself in changing patterns of behavior in the field of posture, locomotion, eye-hand coordination, prehension, etc. With the aid of normative methods and by means of systematic cinema records, the developmental progress of behavior patterning in selected cases was objectively studied. The general findings will be briefly indicated below.\* First, however, a word may be said concerning the influence of prematurity on physical growth.

Scammon has reported an interesting investigation which bears directly on the problem. It is a study “On the Weight Increments of Premature Infants as Compared with Those of Foetuses of the Same Gestation Age and Those of Full-Term Children.”<sup>1</sup> His results show that “premature children after a short period of retarded growth incident to the adjustment to the extrauterine environment, tend to regain the fetal rate of growth and to follow this course of growth until some time in the latter part of the first year, when the rates of fetal and post-natal growth approximate one another. In other words, the growth tendency of prematures is in general that of fetuses of the same size and age rather than that of full-term children.”

*Does prematurity have any radical effect upon the character and the course of mental growth?* The question is one which arises frequently in the minds of parents, and is of medical importance. But there can be no simple, general answer. Prematurity of birth takes place under such a diversified array of conditions, that at the one extreme there is the certainty of permanent defect or of early death; and at the other

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See also the author's *Infancy and Human Growth*. New York: Macmillan. 1928. Pp. 299-333.

extreme, the full assurance of ultimately normal maturity. The developmental fate of the prematurely born infant is always an individual matter, depending upon the severity of the complications produced by the prematurity and on his primary growth potentialities. There is always the logical danger that we shall ascribe to prematurity consequences which arise out of more fundamental or purely associated factors.

Since the developmental status of each case of prematurity requires individual, clinical appraisal, it is well to rephrase our question and inquire whether prematurity *as such* alters the ordinary course of mental growth. At the Clinic of Child Development we have made detailed individual studies of several cases of prematurity by means of a series of developmental examinations (and cinema records) with this question in mind. The development of two children without evidence of birth injury was investigated over a period of two years. Both children in early infancy were seriously underweight, and estimated on the basis of their behavior capacities alone, would have been diagnosed as mentally retarded or defective. For example, one child at the age of five months resembled in behavior equipment a child of three months, a serious degree of retardation under ordinary circumstances. But making due allowance for the two months of prematurity, the behavior picture was relatively normal. The detailed study of individual cases of uncomplicated prematurity strongly suggests that the general course of development is not markedly accelerated or retarded by mere precocity of birth. The central nervous system, unless it is actually impaired, tends to mature in accordance with inherent determiners, so that the cycle of behavior growth is not greatly altered by the birth displacement.

Similar factors of safety and stability seem to operate when the infant is postmaturely born, for in his behavior equipment he is advanced even though birth is postponed. There is a stable substrate of maturation, strongly entrenched in the nervous system, which tends to keep the underweight, the preterm and the postterm infant close to his normal maturity levels in the field of behavior. Accordingly monozygotic twin infants, whether born prematurely or not, whether alike or much unlike in weight, tend to display similar behavior patterns. Biologically age must be reckoned from conception rather than from birth, and when so reckoned it proves to be a fundamental factor in determining behavior level.

This principle of stable maturation is of importance in any critical consideration of the effects of prematurity on mental growth. Ylppö has proposed the term "immature" to designate any infant weighing less than 2500 grams at birth, irrespective of the length of gestation. The term suggests that the infant is not completely developed and not prepared for extrauterine life. To what extent the "immature" infant is actually immature from the standpoint of behavior development

remains a subject for careful investigation. Unfortunately it leads to confusion if the terms immature, premature, and underweight are not carefully differentiated. It has by no means been demonstrated that the fetus or infant of subnormal weight is correspondingly subnormal or immature in behavior equipment. Indeed there is evidence to the contrary. The developmental problems involved are so numerous and complicated that intensive clinical research alone can clarify the issues. Statistical conclusions may mislead unless the correlation of causative factors in each individual case is open to estimate.

Aaron Capper<sup>2</sup> has made a noteworthy study of the physical and mental development of 437 immature (including 72 per cent premature) children. His general conclusions are depressing. "The fate of immature children is not enviable; almost one-half of them die during the first year of life. Of those that remain alive, the majority are physically, as well as mentally, underdeveloped. Some of them show a late mental development; others show a condition of psychic infantilism, if the term may be used in its nonspecific sense; while still others show permanent and severe mental diseases. While they are passed in review, one is surprised at the variety and amount of abnormality encountered, almost a regular 'pathologic museum.' In brief, the immature infant becomes the backward school child, and is a potential psychopathic or neuropathic patient and even a potential candidate for the home for imbeciles and idiots."

The general validity of Capper's conclusions can be assessed only after a critical examination of the factors of selection which determined his cases, the complicating social and medical factors in addition to immaturity, and the nature of the data on which the estimates of mental inferiority were made.

Maria Comberg<sup>3</sup> has made a study of the fate of 212 premature infants, on the average 53 for each of 4 years, and 27 pairs of twins, all weighing less than 2500 grams at birth. Her general conclusions are at variance with those of Capper and in abstract are as follows: "Neuropathic irritability which, like cerebral hemorrhage, appears to be a sign of special immaturity, is found frequently in children at the ages of from three to seven who were born prematurely and who showed cerebral symptoms at an early age. Any connection between cerebral symptoms in the first weeks and later impairment of intelligence is not observed in these children, whose mentality is of the highest type in almost every particular. The age at which they learn to walk and to speak is more a lack of tone and a delayed development rather than a manifest and lasting mental injury. . . . The prematurity itself remains as the chief cause for the peculiar development of the children. . . . Physical and mental injuries which remain throughout life as a result of prematurity are not observed."

The mental development of the premature was especially investigated in a study by George J. Mohr and Phyllis Bartelme.<sup>4</sup> The subjects were prematurely born with birth weights of 2500 grams or less. The mean fetal age was 7.77 months. The study was carried out in the infant welfare clinic in Michael Reese Hospital, Chicago. The number of subjects is: 51 boys and 62 girls, white, 8 months to 7 years, with mean chronological age of 2 years 9 months. "There are 17 sets of twins and 7 surviving members of twin births in the group"; and 40 of their siblings, aged 6 months to 12 years and 5 months, with mean chronological age of 5 years and 8 months. Less than one-fourth of the premature children are Russian or Polish Jews, and over one-fourth are Anglo-Saxon; ten other nationalities comprise the remainder of the group of 113 subjects. The majority of families are of lower middle economic level.

The investigators found that "one hundred seven of the prematurely born children were classified as of average, above average, or below average intelligence, according to performance on the Gesell Developmental Schedules and the Kuhlmann-Binet test." "On the Gesell ratings, 43 per cent of the children were classified as average, 35 per cent as below average, and 22 per cent as above average."

The results of this study are in general agreement with those of Comberg and also, in a measure, with the clinical experience of Dr. J. H. Hess, as summarized in the following statement. "The majority of premature infants born after the thirty-second week into a proper environment, without birth injuries, undergo a normal mental development, progressing more slowly than the full-term infant during the first years. They average walking and talking about 6 months later and are somewhat slower in learning to coördinate, as evidenced by clumsiness and ease of falling, slight speech defects, etc. All of these are, however, usually temporary manifestations and are followed by normal progress."

The amount of actual retardation which premature infants as a group show in motor and language functions can only be determined by normative studies which take into account the interval of prematurity. Mohr and Bartelme<sup>4</sup> found that, "The prematurely born children do not differ from full-term children in time of beginning eruption of teeth, in onset of walking, in beginning of talking, and in learning of bladder control, if correction is made for the period of prematurity. The smaller prematurely born children are consistently a little later in these developments, but again the difference is minimized if this correction is made." A most interesting finding relates to the 28 of the 113 prematurely born children who "were cyanotic, had convulsions, or otherwise gave evidence of possible intracranial hemorrhage or central nervous system injury at birth. Twelve of these show no noteworthy deviations on present physical examination, five others show some disturbance of the reflexes,

and the remaining 11 present various findings. Three of these latter are mentally retarded. The general distribution of these 28 cases into the three groups, average, above, and below average, according to Gesell schedules, does not differ from that of the entire group."

#### GENERAL CONCLUSION

Present data, though scanty and sometimes contradictory, indicate that prematurity of birth in itself does not markedly distort, hasten, or retard the course of mental development, when the age of the infant is reckoned from conception. Intrinsic organic factors of maturation, as opposed to environment, are so powerful and stabilizing that the infant tends to follow his inherent cycle of behavior development independent of the placement of birth. Deviations and defects of development occur when the conditions of the prematurity cause pathologic changes in organs or tissues. Deviations, such as imperfect postural and locomotor control, are not necessarily permanent; but frequently resolve in the first two years of life.

It is even suggested that in some instances the effects of intracranial hemorrhage may be overcome, possibly by substitutive or compensatory development. Little is known about these important phenomena, and they could be fruitfully analyzed in the premature. They can be systematically investigated only by periodic behavior examinations, should more frequently be supplemented by correlated neuropathologic studies of cases which come to autopsy.

The behavior of the premature infant is not alone a subject of scientific interest from a genetic standpoint. It is a subject of medical significance with direct and indirect bearing upon problems of child protection. Too frequently prematurity is not recognized by physician or nurse, and the child's welfare suffers in consequence. When more is known about the behavior characteristics of the premature, there will be greater accuracy in diagnosing both the presence and the degree of prematurity. Refinements in the hygiene of the premature infant also will come through a better understanding of his behavior limitations and requirements.

Prematurity carries with it numerous hazards which may inflict temporary or permanent penalty; but fortunately the infant is also protected by the inherent factors of organic maturation, which make for a normal course of mental growth.

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