

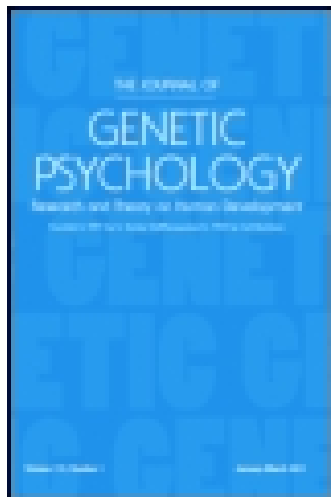
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THE CHILD AND SCHOOL ENTRANCE

By MICHAEL J. ZIGLER, Clark University

Growth is a fundamental process of life. The nature of this process in the child has long attracted the attention of students, and numerous facts regarding the shifting developmental stages have been determined. These facts, however, are more or less unrelated, and on the future investigator in this field devolves not only the task of discovering new facts to render a fuller account of the process of growth, but also, of correlating such facts with those already known, in order to cast them in true and significant relief.

Growth during pre-natal life is exceedingly rapid. In fact no period after birth can approximate this rapid growth from a single cell to 5,000,000 times its size at birth. We have come to recognize post-natal growth as consisting of alternating periods of acceleration and retardation. Minot (54) is not cognizant of such varying stages in the rate of growth in characterizing life as a process of gradual decline with age in the rate of metabolism due to the decrease of the relative amount of nucleus in relation to cytoplasm in the cells of the soma. The greatest absolute annual growth after birth takes place during the first year. Extensive investigations demonstrate that growth is very rapid during the first year or so after birth, after which there is a more or less uniform rate of growth until about 10 or 11 years in girls and 1 or 2 years subsequent in boys, when a distinct acceleration takes place. The maximum of increased growth occurs at about 12 in girls and about 2 years later in boys.

During early childhood several minor periods of acceleration are noted. Investigations before school entrance are meagre, hence only general statements are warranted. The second year of life is generally represented as less rapid and attended by somewhat less marked changes than the first. At the beginning of the third year, Christopher (22 p. 328) observed a change of the bodily proportions in a loss of rotundity and plumpness. Following this there is a period of more or less regular rate of growth until about the age of 5 or 6, when a rather distinct quickening takes place in various parts. The absolute annual height and weight values are augmented, changes in dentition are in progress, and various phenomena

of growth show alterations and irregularities in their procedure from about 5 to 7 years.

A glimpse into the investigations of such men as Crampton (25, 26, 27, 28) and Baldwin (3, 4) shows that physiological development does not proceed at a uniform rate in different individuals. Some reach accelerated periods younger than others and some pass through these periods more rapidly. They indicate, further, that the widest variation of individuals occurs at the stage of most marked acceleration—at puberty. But at the age of 6 these irregularities are quite noticeable and many inherent or environmental factors contribute to make them more significant, viz.—nationality, climate, relative social and economic status of parents, heredity, urban or rural environment, general health conditions, normal or abnormal mentally, nutrition, functioning of endocrine glands, size of families, et cetera. Variation of any of these influences may retard or accelerate physiological development. It is noteworthy, however, that in cases where some environmental factor has retarded growth, when the stage of acceleration is reached, there is an added rush as if to compensate for the time lost.

A more adequate understanding of the variable rates of growth, and an appreciation of the complexity with which growth and development take place, have antiquated the usage of chronological age as the basis of child study and a new principle has been adopted. Physiological age attempts to take account of the various factors of growth and to classify children on the basis of their physiological maturity rather than on that of years. This new standard has been demonstrated as practicable and bids fair to account well for many discrepancies to which chronological age could not be adjusted.

The changing conditions of growth at school entrance need further careful investigation before we shall gain an adequate understanding of the processes of growth at this stage and their pedagogic and hygienic imports, but it may be worth while to bring together the most significant changes, which have already been pointed out, and follow this by some deductions concerning the hygiene and pedagogy of the child at this stage of development. Our first task, then, is the enumeration of the facts of growth at this apparently accelerated period.

I. PHYSIOLOGICAL DEVELOPMENT

Height. According to Burk (16 p. 256) the average height of the child at 6 years is 44 or 45 inches. In Hamburg, Steinhaus (66 p. 20ff) found the average height of boys at school entrance from 114 to 117 centimeters and from 115 to 116 centimeters in girls. In Breslau these averages were

reduced several centimeters. Englesperger and Ziegler (36 p. 184) give the averages of boys as 111.05, of girls as 110.03 centimeters.

The tables of Bowditch (11, 12) and Porter (56) show acceleration in height at 6 or 7 years. Boas (9 p. 188) found the annual increase in stature at 6 years greater than at later yearly periods before puberty. The increment in girls was slightly greater than in boys. Similarly, Schmid-Monard (63 p. 362) found increase in the annual growth in stature at about 6; and the acceleration occurs in girls slightly earlier than in boys.

The significant thing in any period of irregular or accelerated growth is the wide variation from the norm, that some attain the stage at an earlier age than others. Moreover, some pass the stage more rapidly than others, and the rates of increment in individuals show no regularity. Let us note what facts we have as to these irregularities here. Most of the early workers made general averages, and these are of no value in such a study. In recent years a few studies show the individual variations very significantly.

Steinhaus (66 p. 20ff) measured 5914 children at school entrance and found the width of variation from 90 to 130 centimeters. 110 centimeters is sometimes given as the average height at 6 years, and from his figures 41.64 per cent are above and 58.36 below this average. The majority of the children fell within the limits 100 to 120 centimeters, but the width of variation at this early age is very significant.

Quirsfeld (66 p. 22) found the variation here from 98 to 127 centimeters, and the figures of Stephanis show boys varying from 101.7 to 124.5 centimeters, and girls from 99.5 to 123.9 centimeters. According to Englesperger and Ziegler (36 p. 183) the minimal height measurement of boys at school entrance was 96 and of girls 98 centimeters. The maximal height measurement of boys was 125 and of girls 126 centimeters. The majority of the boys were grouped within the height measurements of 107 to 118 centimeters, and most of the girls varied within the limits of 105 to 117 centimeters. They found growth at this period very irregular and individual differences more marked.

The statement of Baldwin in his recent extensive investigation is highly suggestive and corroborative of the inferences of earlier workers in this field. "From the years 6 to 13.5 the yearly increment in height varies from 1 to 8 or 9.5 centimeters. The increase from 6 to 7.5 years has no uniformity, and seems to depend on the individual. From the years 8 to 12 the usual increase is from 7 to 9 centimeters. Here too is the

greatest uniformity of increase, that is, more boys increase the same number of centimeters than at any other time." (4 p. 23)

Weight.—Weight in itself is not accepted as a very reliable index of growth. Unlike height, weight may continue to accrue up to old age, and also, once gained, it may be lost. But, taken with height, vital capacity, and other measurements, it becomes an important factor of growth, and indicates strength and state of health in a very obvious way.

The tables of Bowditch (11,12) show an average weight of 20 kilograms or about 45 pounds for boys at 6 years. Stratz gives averages of 19 kilograms for boys, and one kilogram less for girls. Steinhaus (66 p. 27) says the average at this age falls between 18 and 20 kilograms. Burk (16 p. 260) says boys are slightly heavier than girls at this age. Englesperger and Ziegler (36 p. 194) found the following facts as to weight at school entrance.

	Boys	Girls
Mean weight	18.39 kg.	18.22 kg.
Minimum weight	13.51 "	13.01 "
Maximum weight	24.00 "	24.00 "
Variation	10.49 "	10.99 "

According to Quirsfeld (66 p. 24) the variation in individuals extends from 12 to 27 kilograms. 75.4 per cent of the children measured by him had an average weight of 19.5 kilograms. Schmid-Monard (63 p. 362) found that boys gain 1.7 kilograms between 4 and 5 years, 1.9 kilograms between 5 and 6 years, and 2.2 kilograms between 6 and 7 years. The girls gain 1.4 kilograms between 4 and 5 years, 1.9 kilograms between 5 and 6 years, and 1.9 kilograms again between 6 and 7 years. Baldwin (4 p. 24) characterises growth in weight at this period in this manner: "From the years 6 to 7.5 there is little uniformity in weight increment, for it varies all the way from 2 to 15 kilograms. At 7.5 years the increase begins to be a little more uniform, and a rough average can be taken. This is about 4 kilograms."

These facts indicate that the rate of increase of some children is much more rapid than others, some gaining only 2 kilograms while others increase as much as 15. This appears indicative of an accelerated stage of development to which some attain prior to others. But in the weight factor we must not overlook the gross individual differences which may occur, when we consider its value as an index of growth.

Many of the early writers pointed out the possibility of a node at about 6 or 7 or even 8 years, and some used this as a distinct dividing line in growth and development. But only

recently have many determinative data been obtained, and much more work will be necessary, particularly in the period prior to school entrance, before very definite statements can be made. But it seems obvious that there is a rather marked period of acceleration at this time, and the lack of uniformity of increments in height and weight bears evidence that the growth and development of the individual assumes new aspects now, and that various individuals attain this stage at different ages, and these facts render chronological age impracticable for our classification of children in such a node of variability.

As previously indicated, the width of variation and the individual differences in the rate of growth are points of special significance. Bowditch states that the large children show accelerated development at the nodes earlier than the smaller ones. (4 p. 36ff). Boas, however, does not find such an inference warranted. Porter (56) has maintained that children who pass the nodes earlier in physiological development are also more advanced mentally. He found that the larger children at a given age, not only grow faster at the nodes, which they reach earlier, but they also make higher marks in their school work and pass their grades younger. Schmidt (63 p. 379), in an investigation of 2118 boys and 2142 girls, discovered that the farther children are developed physiologically the better they stand in their classes. Baldwin also found the taller, heavier and stronger children at any period better developed physiologically, and they show increment in growth at the nodes of 6 and at puberty prior to the smaller and shorter ones. He states that children who have school medical inspection, and properly directed play and physical training reach these stages earlier. He found that the groups he studied surpassed the old averages and he attributes it to these factors. He is inclined to agree with Porter and Schmidt that the mental and physiological ages run parallel in their development. At least, there seems to be a positive correlation of physiological development and school progress.

Dentition—We find a most decided state of transition regarding dentition at about the age of 6. Most observers attest that the temporary teeth continue their calcination until about the age of 5, when rapid processes of resorption set in. At about 6 the first of the permanent teeth,—the first molar,—appears. Shortly thereafter and in close intervals the median and lateral incisors erupt. It is patent, then, that we have here a diverse state regarding dentition. Some teeth are undergoing resorption and some are no more than mere shells, while new teeth appear in place of some of the old ones; and, most

significant of all, is the appearance of a new type of tooth, which assumes a position farther back in the jaw than any of the preceding deciduous teeth. All investigators seem to confirm the law that the first permanent molar marks the transition from the deciduous to the permanent teeth, excepting three cases in a German study by Berten reported by Beik (7 p. 293). It is also generally accepted that girls erupt their first permanent teeth slightly earlier than boys.

The sixth year molar whose eruption marks this transition, is unique, first, in that it is the first of the permanent teeth to appear; second, in that it is the first tooth to appear in the jaw, which has had no predecessor in position in the temporary set; and third, in that it is a distinctly new type of tooth. Moreover, it comes into function when all the deciduous teeth have passed their climactic stage and are declining, some being no more than mere shells; consequently, the functioning of this tooth has now an important rôle. It is larger and broader tooth, and is quite different from any of the deciduous teeth. Hence, its form, position, and the need of its function, now, when the temporary teeth are in resorption stages, means a new procedure in chewing, and likely a changed condition of food transferred to the stomach. Furthermore, the development of the jaw subsequent to this alteration must assume a new situation. Dr. Hall (41 p. 77) says: "The deciduous teeth are more primitive in type, and the molars are less useful in warfare, but suggest a change in food habits, and involve greater length of jaw to make room for them and greater strength of muscle."

Bean (6) made a study pertaining to the time of eruption of the teeth in Filipino, German and American children. In American Boys the variation in eruption of the first molar in the upper jaw was from 6 to 9 and in the lower jaw from 6 to 8 years; in girls the variation in the upper jaw from 6 to 8, and from 5 to 8 years in the lower. He found girls more precocious than boys in the eruption of the permanent teeth. The Filipino children were more precocious than either of the other nationalities, and the American children, in general, were slightly earlier in eruption than the Germans. The work of Welcker (75) also shows the Germans a little less precocious than Americans. American children show the greatest variability between the eruption in boys and girls. Postponement in the appearance of the teeth may be due to factors in physical development being impeded, such as nutrition, condition of the temporary teeth, et cetera.

Some regard the new molar as the fundamental factor in the general transition here. It is obviously one of the most

significant factors appearing at this time. Bean has suggested that we classify this period as well as the period at puberty on the basis of the appearance of the first and second molars respectively. He maintains that their importance is adequate to warrant their sole usage as the standard of determining physiological age. But the facts at hand hardly justify the postulation of any single factor as a criterion sufficient to determine the stage of physiological development of the entire organism. The process is apparently more complex, and the data from all the parts of the organism should be obtained and considered for a satisfactory determination.

The Jaws—The views regarding growth of the jaws at this period are not uniform in all particulars. All investigators concede that there is prolongation at this period in the posterior parts of the jaw and alveolar processes to make room for the new type tooth and the other molars appearing later in the back part of the jaw. The views seem rather conflicting, regarding growth in the anterior parts. Hunter, Fox, Humphrey and others have maintained that there is no growth in the anterior regions (80). Harris (80 p. 370) tried to ascertain whether the permanent teeth, which replace the deciduous set, occupy any additional room, and found that on the whole the permanent teeth occupy just a little more space than the corresponding deciduous teeth. Zsigmondy (80) also found a slight increase in space necessary for the permanent teeth.

Zsigmondy, Wedl, Bell and others report that there is a noticeable change in the outline of the arches of the upper jaw at second dentition. The upper jaw, which in early childhood formed a half circle, assumes a figure like the segment of an ellipse at second dentition. Less marked alterations occur in the general outline of the lower jaw.

Delabarre and Zsigmondy (80), in France and Germany respectively, observed rather significant separation of the temporary teeth, particularly in the case of incisors, coincident with the approach and progress of second dentition. The former investigator suggested that where this separation of the teeth did not take place at about 5 to 6 years, the children were threatened with irregularities and abnormalities of second dentition.

The Face—Changes in face proportions would naturally be presupposed, at the period of second dentition. In measurements of children of various nationalities R  se (7 p. 299) found a lengthening of the face at a rapid rate at this time. Dr. Hall (41 p. 72ff) states that beginning at 6 years new proportions of the face are assumed. In a study of children of Worcester, Mass., West (77) found three distinct periods of

growth of the face particularly characteristic of girls. The first of these ends at 7 years. He noted that the transition from one period to the other was very abrupt and attended by peculiar alterations. In general, there is a sudden disappearance of the lower widths of the face, and a reduction of the distinctly childish features. The width of the face makes a change to almost adult dimensions. Growth proceeds more rapidly and in new directions after reaching the transitional stage. The changes in facial proportions of boys follow those of girls in a general way, but the transition from one stage to another is less abrupt.

The Brain—Practically all statements regarding the growth of the brain are referred to the tables of Vierordt. Basing his conclusions upon this study, Donaldson (34 p. 104) says the encephalon practically completes its growth in weight by the age of 7. President Hall (41 p. 105) states that the brain completes its rapid growth by the age of 6 and its weight and size is almost finished then. Subsequent to this, growth is very slow. We have no indication of nodality in growth of this organ, but it is significant that the growth in weight and size is practically completed and the further development takes place in internal ramifications and connections between the various centers.

The Skull.—Some evidence of transition regarding growth of the skull is also noticed at this time. Quoting from Quain's Anatomy (15 p. 128): "The skull grows rapidly during about the first seven years of life—. By that time certain parts—including the circumference of the occipital foramen, the body of the sphenoid, the cribriform plate, and the petrous division of the temporal—have attained their definite size. The postauricular part of the skull enlarges more than the preauricular in the early years."

Landois (53 p. 984) says the ethmoid bone fuses with the neighboring bones of the skull between 5 and 6 years. Topinard (72 p. 133) states that, "About the fifth or sixth year the suture which separates the external occipital portions of the occipital shell is closed."

The Circulatory System—Some studies show alterations in the circulatory system at about this period. Investigations have convinced Gundobin (38 p. 100) that there are three periods of "Herzdämpfung," or retardation of the heart in childhood, viz.—during the first year, from 1 to 6, and from 6 to 12 years. Beneke found a diminution of the rate of growth of the heart beginning at 6 and extending to 12 years. According to Tyler (74 p. 82) the growth of the heart proceeds very rapidly the first five years of life after which the rate is diminished mark-

edly until puberty. The arteries are relatively large in childhood but grow much more slowly and thus the ratio between heart and arteries is constantly diverging.

Eminet (38 p. 121) found two periods of distinct rise in blood pressure. The rise is quite noticeable at 6, becomes much lower at 9, shows fluctuation between 11 and 12, and reaches its greatest height between 14 and 15 years. Vierordt suggested a sex difference in pulse frequency at about 6 years. Karnitzski found the specific gravity of the blood increased gradually between 6 and 8 years, and according to Leichtenstern the minimal hemoglobin quantity in the blood is at 5 years of age (38 p. 100). Perlin (55a) suggests an increase in hemoglobin quantity beginning at 6 and extending to 15 years.

It is obvious that these facts are more or less unrelated, but if corroborated and amplified by further investigations, there is significant indication of more or less general changes in the circulatory system at about the age of 6.

Gundobin (38 p. 238) concludes from investigation that the suprarenal glands show marked growth at 6 years and still greater at puberty.

Motor Control.—A few facts indicate transition in motor coordinations and neuro-muscular control. Hancock tested central steadiness from the ages of 5-7 by having the children stand with feet together and fixate a distant object. He discovered that the girls increase 32 or 33 per cent in steadiness and the boys from 15 to 16 per cent within these two years. This superiority of the girls is commensurable with our general law of disparity of growth between the sexes. Hancock also measured the quantitative unsteadiness by the tremograph and found an increase of about 50 per cent in boys and slightly less in girls. (17 p. 58). Burk concludes that girls of 6 years are more rapid in arm and hand movements due to their precocious development in general as compared with the boys. They gain a larger percentage of their total strength before 6 years than boys. Bryan (13) studied the improvement in precision of up and down writing movements in children between the ages of 6 and 16. Of the total increase in precision between these years, almost one-half was gained until the age of 8. This indicates a much more rapid motor coordinating period between 6 and 8 than in the periods of late childhood and early adolescence. A few other facts have bearing in this connection. Conradi (23) has stated that speech disorders after 6 years are to be regarded as pathological, thus intimating a stage of rather definite motor coordination some where before this time and a greater likelihood that the disorder will remain permanent hereafter. Gutzman (40 p. 51) finds a

widening of the range of the voice at 7 years and the case is more marked in girls than in boys. From these facts we infer that the motor coordinations of the speech function pass a nascent stage of development at about the age of 6.

The Larynx.—Gundobin found that the larynx grows rapidly until about the age of 5. From this time on, the most noticeable feature was that in boys it pushed forward into prominence, while in girls it became less perceptible. The first sex difference may be noticed as early as the third year but not until the age of 7 does this become very perceptible. Cunningham says that the larynx grows regularly and uniformly until 6 years, when growth ceases until puberty, where very rapid development takes place. (29 p. 972). Barth (5 p. 86) also found that growth of this organ is rapid to 6 years. Contrary to the recent discovery of Gundobin, Barth did not find sex differences noticeable, at least, until 14 years. Gutzman, as already observed, found a widening of the range of voice at about 7. The fact that growth ceases at about 5 or 6 and that the voice widens at about 6 or 7 years leads one to infer that there is a transition at this period from a predominance of structural growth to a stage of functional development of speech.

The Eyes.—We have a few facts suggestive of important changes in the development of the eye during this period. Merkel found that the horizontal breadth of the iris reaches its full size at about 6 years. (7 p. 304) Miss Sayer thinks that the ability to use binocular vision effectively and in such a way as to fuse the images of the two eyes perfectly becomes possible between 6 and 9 years. In passing through this stage of transition the child is apt to squint and he may do it to such an extent that it becomes a habit.

As many investigations have shown, the eye of the young child is hypermetropic. Woinoff (38 p. 522) has pointed out that the main difference between the child and the adult eye consists not in a change in the curvature of the eye as some have held, but in a change in the distance from the refracting medium. Adamjuk suggests that the child must be protected while changes in the visual organ are in progress. These changes cease between 8 and 12 years. Gundobin concludes that the child should not start to school until at least 7 years, or after the time when these changes are well advanced and eye strain is not apt to occur. Tyler (74 p. 142) states that the ability of accommodation and convergence of the eye to different distances is very marked at the time of school entrance. These facts lead us to believe that the eyes are undergoing rather significant and rapid changes at about the time that we ordinarily introduce the child to school instruction.

Metabolism—It is an ordinary observance that children require an additional amount of food relative to their size, particularly during periods of rapid growth. This has been erroneously interpreted by some to signify that the child grows in proportion to the amount of food consumed. Metabolism in childhood is accelerated and more heat and waste products of oxidation and catabolism are produced partly, as Camerer and Rubner hold, due to the fact that the child has a relatively greater body surface, and, partly due, as Kassowitz maintains, to the fact that the reflex arcs through which the energy is expended are shorter, and consequently, the activity greater. Tyler (74 p. 86) states that the child of 5 or 6 years produces twice as much heat per pound as the adult, and the infant produces even more. In infancy the supply of food is relatively greatest, but the smallest amount is oxidised in the muscular and nervous tissues. Emphasizing the genetic view point, he holds that the energy is appropriated to the more vital processes in the early years. Because of this genetic development, food is a paramount factor in the psychic life of the child. This concurs with the fact that the visceral organs grow relatively more rapidly in early childhood and that the higher and more voluntary functions develop later. According to Camerer (20a) there is a decided increase in the number of foods demanded at about the age of 5. Prior to this just a few foods seem to appeal to the appetite of the child, while now the varieties multiply.

Besides these facts of nutrition and their distribution to the various functions, Gundobin (38 p. 381) found a change in the constituents of the urine from 5 to 6 years. The percentage of urea per kilogram increases to 5 or 6 years and then diminishes. This age is also characterised by the smallest quantity of unoxidised assimilative matter in the urine.

Thorax.—Gundobin and Bondyreff (38: 137) have found that as a rule the thorax is circular with its widest base below up to 6 or 7 years in girls and just a little later in boys. After this time the broader base is at the upper part of the thorax. Throughout this period, and perhaps earlier, the thorax is becoming broader in proportion to the thickness through the chest.

The Roentgen Ray Method under the pioneer efforts of Dr. Rotch, (60, 61), formerly of Harvard, and Prof. Pryor, (57), of Kentucky, have portrayed some facts of the development of the epiphyses of the osseous structures at this period. Three of the small carpal bones make their appearance in the hand and wrist from about 5 to 6 years, viz., the scaphoid, trapezoid and trapezium. Besides these carpals, the

lower epiphysis of the ulna appears at 6 in girls and at 7 in boys. There is a regular order of appearance of all the carpals except the three which appear at this period. Usually not so many appear within such a short lapse of time. Hence this age is characterised by the appearance of more of the carpals, whose order is not uniform, consequently, indicating some irregularity of osseous development.

This enumeration of changes in the anatomical and physiological development at this period seem highly indicative of more or less general alterations, which further investigations will need to establish more definitely or disprove. The facts taken as a whole are representative of the general development of the organism and have suggested the probability of a condition of life when puberty may have been attained at such an early age. The conclusion of President Hall regarding this period is significant: "Indeed, there are a few faint indications set forth in the text of a yet earlier age nodality or meristic segmentation, as if amid the increased instabilities of health at the age of about 6 we could still detect the ripple-marks of an ancient public beach now lifted high above the tides of a receding shore-line as human infancy has been prolonged." (41 p. X).

II. MENTAL DEVELOPMENT

In turning from the physiological to the mental characteristics of development, we find some interesting facts but no very significant and sharply delineated indications of transition. It appears that the mental development makes more steady progress throughout childhood. It is true, however, that certain psychical characteristics dominate the mental processes in certain more or less loosely defined periods, as in the case of imagination, perhaps, the most characteristic of all the mental processes from 4 to 7 years. Some investigators note the disclosure of new mental characteristics about this time, and many authors classify childhood with a dividing line at 6 or 7. There is, however, a difference in interpretation of the nascent tendencies. We shall attempt to present briefly the equipment of the child's mind at this period and indicate the mental traits, which now begin to come to the foreground and play a more or less significant rôle in his mind and life. Considerable study has been made of the mental content of children at school entrance, the first in America being carried out about 1880 by Pres. Hall (43). Englesperger and Ziegler have made very extensive investigations in Germany along the same line.

Just before this period, the chief mental interests of the

child have been sensory, and he has been developing concepts, which are often not distinguished from percepts, even at the time of his entrance into school. Imitation is exhibited in no small degree in all his activities. But he is a being to himself and all his interests seem to center in himself. The independence of his interests and actions are so characteristic that Kirkpatrick (51 p. 111) has termed this the "Period of Individualization."

At about 6 years some changes in the conduct of the child are noted, the chief of which, perhaps, is an incipient tendency to recognize others in plays and exercises. The child begins to compete with other children and his interests tend to become more socialized. This social tendency becomes more and more dominant throughout this period to puberty, and is the basis of Kirkpatrick's (51 p. 169) suggesting this period as a ripe time for introducing the child to formal instruction. Dr. Tanner (67 p. 25) observes that the fibres of the brain are now developing connections between the various centers in a rapid manner, and in consequence we notice mental changes in the child. "He has more interests, he plays more kinds of games, and he has a wider range of friends than before." His activities begin to go out in more manifold directions and there is general, through rather steady, mental expansion.

Dumville (35 p. 145) does not think there is any qualitative change in mentality at this period. He notes a slight increase in the ability to concentrate the attention over longer lapses of time. Also, the range of ideas begin to widen rapidly. He notes, further, that the child begins to show social tendencies in his interests and games. But, there is no sudden change, nor is there a qualitative increase of mental processes. The change occurring consists in a gradual transformation of processes already present and a greater facility of using them. A somewhat similar view is held by Thorndike (71 p. 92). "The six year old has all the elementary feelings involved in reasoning. The change which occurs is not the appearance of these feelings but their increase in number and in definiteness and a change in their manner of use."

Meumann (52a p. 107) states that the attention of children at school entrance passes rapidly from one object to another and is very easily diverted. Sustained attention is almost impossible with most children, and if attempted, produces fatigue very rapidly. Bagley (2a p. 188) says passive attention is characteristic at this period but soon active attention begins to function also.

The interests of the child are described by Nagy (65 p. 391) as being subjective from 2 to 7 years, and from 7 to 10 they

become more objective. Meumann (52a p. 116) observes that perception at school entrance is much more subjective than in later years. This pronounced subjectivity is one of the bases of the decidedly imaginative mind of the child. The sense of judgment is undeveloped, consequently falsehoods are a natural product of the child mind. Three types of perception are characterised by Meumann. The child of 6 or 7 years has a "fantastically synthetic" perception. Analysis of an object perceived is totally lacking, but there is a peculiar focalization on some one feature of the object, which is seen as a unit and the rest of the percept is ignored. The child does not combine a number of impressions into a single picture, but attaches his attention to one phase,—hence, a house is seen as a door, or even as a keyhole, perhaps. At about 8 years the analytical type of perception dawns, where parts, relations, properties, et cetera, are observed. Later, another synthetical type appears, but characteristically different from that at about 6 years. An object is perceived, analysed into its component parts, relations of parts are judged, and all taken together are synthesised. The child at school entrance uses concrete imagery in the main, while the adult employs verbal imagery chiefly and is able to judge the relation of parts and connect all the characteristics and parts into a unified whole. Perception in the earlier stage might be termed individualistic as compared with the unified perception in the later synthetic period.

The investigation of Dr. Mateer (20a) on the establishment of conditioned reflexes in children has revealed a striking situation at about 5 years of age. In general she found the ability to establish associations increases with chronological age, but at about 5 years new potentialities open up to the child. The curve becomes less regular, and the number of trials to establish associations show much more variation. Dr. Mateer suggests that potential powers, dormant heretofore, seem to dawn now in greatly increased numbers. She has even been led to regard this as somewhat analogous to and suggestive of the differences between the pre-adolescent and the adolescent.

In her review of the study of Pohlman, Dr. Smith (65 p. 386) stated that children of 6 years frequently do not have an understanding of the words they use. Words are employed as combinations of sounds without regard for meaning and context. Dr. Tanner (67 p. 415) agrees that at 7 years, "The love of words on account of sound persists," but from this time on words gain value in meaning.

Imagination is one of the most prominent mental manifestations at this age. It is portrayed in all plays and activities.

Kirkpatrick (50 p. 155) says imagination reaches its climax in the fifth and sixth years. It is distinctly vivid but notoriously inaccurate. He believes the mental images are analysed, shifted, and recombined more readily than in the case of adults. (51 p. 189). Slaughter (64) finds that the fancies of the child go in all directions now, and perceptions are transformed into fancies and are projected. The clouds provide the best screen for this, and anything from mountains to animals may be represented. Many other objects of nature are utilized by the child for projecting his fancies. In dark and secluded places he imagines horrible things and the emotions contribute their share to the imaginal products of the mind. His imagination also carries him to the invention of secret languages. Chrisman (67 p. 415) found that these begin to be formulated as early as 5 and 6 years. Dix (33 p. 75) says children of 6 years or over are often prone to day dreaming. According to Kirkpatrick (50 p. 138) imaginary companions are frequently created as early as this period.

Imitation is manifested in most of the activities of the child. The dramatic tendency is at its height in children from 4 to 7 years. (50 p. 138). Dr. Tanner (67 p. 376) says imitation is one of the chief media of education up to the age of 7, but thereafter its importance decreases. She also states that it has been found from Stern's "Aussage Tests" that the child becomes less suggestible at a very rapid rate beginning at 7 and extending to 15 years. (67 p. 189).

Dr. Hall (42 p. 220) noted that the collecting instinct began in childhood, and continued through adolescence. In his summary of the ages at which certain articles began to be collected, it appears that many begin at about 6 years. He characterises the manifestations of this impulse before 8 years as "Crude, groping and undirected."

It is in the play of the child that we find his mental equipment in its natural order. Here imagination and imitation are exercised freely and spontaneously and we discover his natural endowment better than in any other of his activities. His waking life is not much else than play. Dr. Tanner (67 p. 498) says children under 7 years do not play games unless urged by older children or adults. Their plays up to this time are individualistic and non-competitive. After 7 such games as, "Hide and Seek," "Tag," "Prisoners Base" and "Fox and Hounds" begin to be played. In these games competition plays an increasing rôle with advancing age. Kirkpatrick also noted such a change in the plays of the child, as already indicated. In the story of the Sand Pile, Dr. Hall (42) observed that the boys did not do much organising the first summer or two, but

after they passed 7 or 8 years, they began to make permanent plans as to the arrangement and organization of the play yard. Before this the interests and activities had been without much foresight and planning and they dug and built things which were soon destroyed. After this everything was planned and executed with a view of permanency. Schmidt (62 p. 17) states that in the sixth year the child becomes more interested in running, skipping, hopping, and the more violent exercises.

According to Dr. Tanner (67 p. 267) the child accepts unquestioningly what is told him regarding religion as well as other things before the age of 7. Hereafter, questions begin to be asked concerning religious matters. Quoting Dix (33 p. 129), "Children of 6 years are well awake to the voice of conscience as the whisper of God." This can be evoked, he says, by putting a few simple questions as to God and His place in the universe.

Dr. Tanner (67 p. 317) believes fears both of things seen and heard diminish slightly at the age of 6. Also, jealousy is manifested before 6 by stamping, kicking and screaming; after this age it is more apt to appear in sulking, slandering and threatening.

Some increase in the discrimination of colors and olfactory and taste perceptions are noticed here. Decroly and Degard (30 p. 107) relate from a study that at 5 years children do not discriminate many of the fundamental colors, and at 6 or 7 years only 43 per cent knew completely the series; white, black, red, green, blue and yellow, and none knew brown, gray and purple. Tracy (73 p. 17) also finds that many children at school entrance cannot discriminate or name the elementary colors. Englesperger and Ziegler (53a p. 230) investigated the discrimination of colors in children at school entrance and found that 30 per cent of the boys and 28 per cent of the girls could recognize and name the primary colors. Upon presentation, white and black were named by all the children without a single error. Meumann thinks it very significant that the child learns to associate the words white and black with their respective achromatic sensations before the names of colors become associated with their chromatic sensations. As a rule girls excel boys in knowledge of colors.

Garbini (21 p. 78) found a change in olfactory perceptions at about the age of 6. The child begins to correlate the olfactory perception and its corresponding verbal expression. Furthermore, he begins to differentiate between different intensities of the same quality of odor. With the changes in the teeth and the chewing surface, there appears another striking alteration in regard to taste. In his study of foods,

Bell (8) found that taste becomes mentalized at about 7 years, and that it has now a new and almost independent value. He states further, "The new importance of taste is shown by the universal tendency of children in this age to want to taste everything that is to be eaten or drunk, and many things that are not. They haunt the kitchen, the pantry, and the medicine cabinet. Their curiosity in the nature of different foods and the different methods of preparing them is increased to a remarkable degree, and taste becomes more than ever before a special organ of apperception." He notes also that along with this new tendency to taste things, children like to make all kinds of mixtures of foods and drinks, and also, demand a certain amount of raw food materials, that they may themselves exercise in preparing it. He states that this impulse begins at about 7 years and is dominant in both sexes.

In the revision of the Binet-Simon Tests, Terman (69:175) indicates that children at 6 years first distinguish perceptibly between right and left, and between morning and evening. Dr. Hall (43 p. 144ff) points out some interesting sex differences as to mental content at school entrance. He says, "Girls excel in fairy tales and boys in religious concepts. . . . More boys could repeat sentences said to them, or sing musical phrases sung to them, or sing a song, than girls. . . . The girls excel in knowledge of the parts of the body, home and family life, thunder, rainbows, in knowledge of the square, circle and triangle, but not in that of cube, sphere and pyramid. Their stories are more imaginative, while their knowledge of things outward and remote, their power to sing and articulate correctly from dictation, their acquaintance with numbers and animals, is distinctly less than that of boys. Boys seem more likely than girls to be ignorant of common things right about them."

These indications of sex differences were chiefly drawn from the investigations of others. Dr. Hall states that the most characteristic difference in his own study was that girls had knowledge of the parts of the body superior to that of boys.

This collection of facts concerning the mental status of the child at 6 years does not afford us much conclusive evidence as to transition. We note a more or less gradual and progressive development during this period. There seem to be new awakenings and nascency in some of the mental processes which heretofore were dormant. It appears that the environmental conditions during these early years determine largely the content of the mind. The social and economic standing of parents seem to contribute to the imitative propensity of

children as Dr. Hall has suggested. The better off the parents, the less imitative and stiller the children. The sense of right and wrong seems to be wholly dependent on the moral training and discipline imposed by parents.

From these facts we must conclude that the mental development proceeds through this period with a much more uniform rate of progress than in the case of physiological development. Imagination and imitation are at their climax, and soon recede in importance, and hereafter the subjective predominance of all the mental processes is diminished. The plays of the child seem to pass a rather marked stage here and the recognition of others grows with age in increasing importance. Games in which others compete begin to be indulged in soon after passing this period. The ability to form associations is indicated as somewhat transitional and perception makes a characteristic change at about 7 years. One writer thinks the ability to concentrate attention over longer periods shows a little progress at school entrance and another says active attention begins to function hereafter in addition to the dominant passive attention. There seem to be significant changes in the psychical states in olfactory and gustatory perceptions. The mental processes in general seem to undergo rather gradual transformations and interests widen and multiply. There is a shift and accentuation of processes which in early childhood were in the periphery of consciousness. Numerous studies have been reported on the content of mind at school entrance. It appears that a more promising point of attack would take account of the mental attitudes and the manner of procedure in accomplishing a task. The study of Meumann on the characteristics of perception in the child is in point here. Such studies seek to discover the processes rather than the products of mind, and if we shall ever apprehend the psychical development at the various stages we shall need to concern ourselves not only with the contents of mind, but also with the processes which underlie and mould them.

III. PATHOLOGY, MORBIDITY, AND MORTALITY

Pathological Conditions at Six Years.—Among the most noticeable pathological conditions at this period are those affecting the speech function. Kussmaul (15 p. 240) states that stammering may be due to inborn conditions, or to acquired faults of the use of the organs of articulation and breathing; it may be a functional disorder due to incorrect instruction or wrong practice of the use of the organs of speech, or the trouble may be purely organic. It is quite possible that all these factors may be complicated or

one may occur as a single cause of incorrect vocal expression. Speech disorders are manifest throughout the period of the development of the organs involved, and the trouble is often largely due to incoordination of the motor powers essential in the speech function. Though they are prevalent at all ages in childhood, we find rather conclusive evidence that there is increase in these disturbances at the 6 year period. Many investigators seem to attribute the faults of speech to improper school conditions; at least, they are generally looked upon as a school disorder.

Clouston (44 p. 745) places stammering among the neuroses which accompany "The periods of most rapid brain growth, special sense education, and of the development of leading motor coordinations," viz. from birth to 7 years of age. Conradi (23 p. 348) states that speech disorders are regarded as normal in early childhood, but after about 6 years they are to be classed as abnormal. He gives irregularities of the teeth as a most common cause of stammering. Faulty occlusion of the jaws is also a source of difficulty. Gutzman (39 p. 275) also finds the lack or improper position of the teeth a common cause of defective articulation.

Stuttering presents still more distinct evidence of nodality at this period. Most investigators regard second dentition and puberty as periods in which children become more susceptible to stuttering. Kussmaul (52 p. 232) noticed a significant increase in the percentage of children stuttering at these periods. Baginsky (2 p. 351) designates the years from 7 to 8 and from 12 to 14 as periods in which there is temporary rise in stuttering. The statistics given by Hartwell (44 p. 746ff) also indicate a temporary rise at these periods. "The table also shows what has frequently been noted, that stuttering is most frequent at the period of second dentition, and at the onset of puberty, which are the periods when the nervous system is specially susceptible to disturbance."

Holt (46 p. 691) suggests that most people who become habitual stutterers do not begin until after 7 or 8 years. It has long been recognized that the prevalence of this trouble is much less in girls. Some hold that it is very rare that girls stutter. Perhaps the most reliable figures are reviewed by Terman (68 p. 337) in which the ratio of the predominance of this trouble in boys and girls is as 3 to 1. Most investigators would make this ratio still more discordant.

The table given by Conradi (23 p. 365) from his study of 87,440 school children corroborates the main facts already noted. His figures indicate that the tendency towards a natural cure after these periods of changing development is

stronger in the case of stammering than in stuttering. His study is conclusive that there is marked increase in these disorders at second dentition and another rise at puberty. After the pubertal age the number decreases very markedly, and in the case of stammerers is very rare after about 15.

According to Kussmaul (52 p. 259) speech and audition are intimately related in their development, particularly before 5 years. He says that the origin of the trouble in deaf mutes can usually be traced back to the first 4 years of life. Deafness occurring after the age of 5 does not affect verbal imagery, even though it may debar the speech function. Heerman (48 p. 342) concluded from his study of children that those losing their sight before 5 or 6 years did not employ visual imagery in their dreams. He also believed that those who lost audition before this age became mute as well. More recently Jastrow (48 p. 342) confirmed the view that a loss of vision before 5 or 6 years incapacitates the individual to dream in visual terms. He describes the significance of this period, as follows: "The period from the fifth to the seventh year is thus indicated as a critical one. Before this age the visual center is undergoing its elementary education; its life is closely dependent upon the constant food supply of sensations; and when these are cut off by blindness, it degenerates and decays. If blindness occurs between the fifth and seventh years, the preservation of the visualising power depends on the degree of development of the individual. If the faculty is retained it is neither stable nor pronounced."

Terman (68 p. 25) sounds a note, which is gradually increasing in strength as we gain more knowledge of the development of the child. "It is now well established that the period of about six or seven years is marked by an increased frequency of nervous and digestive disturbances."

A very frequent irregularity occurs at this node in regard to the heart. This organ is very small in childhood and the arteries relatively large, as elsewhere indicated, and the growth and increasing demands on the heart often lead to fatigue and even more disastrous consequences. Christopher (22 p. 328) presents the result of his study thus, "Not infrequently children seven or eight years of age present the anomaly of dilated heart, and quite frequently evidence of cardiac incompetence, such as shortness of breath and readiness of fatigue. . . . The child of seven fatigues less readily than the child of six years, but the child of eight fatigues more readily than the child of either six or seven."

Beik (7 p. 315) has found that abnormal conditions of the tonsils frequently occur with the appearance of the first per-

manent molars. The tonsils inflame and enlarge and lose their power of resisting infections of micro-organisms. Tyler (74 p. 142) says curvature of the spine is very apt to be started now. Some investigators note a decided tendency towards myopic vision at about this time. The eye passes a transition in development and eye strain is very apt to occur.

These facts indicate nodality here in the development of various organs and their functioning. There is general instability and lack of completed neuro-muscular development in the case of quite a few organs. After this transition injury or apathy of the same organs might lead to quite different symptoms. With the facts of muscular development mentioned above, these additional facts seem adequate to establish that the motor coordinations of the more fundamental, and perhaps of some of the accessory types, undergo significant changes within this period.

Morbidity and Mortality.—It is well recognized that in early childhood the percentages of sickness and death are very high as compared with later life. Contagious and infectious diseases are more apt to attack the organism in the very early years. More than 90 per cent of deaths from contagious diseases occur before the age of 10. In the early years the child is making rapid adjustment to his novel environmental conditions, and in the procedure of growth the equilibrium of the different processes may not be maintained; thus, the child is rendered more susceptible to morbid conditions. It is also a commonplace that in the first few years of life, the child, if attacked by contagious diseases, as measles, mumps, whooping cough, scarlet fever, diphtheria, et cetera, is much more likely to succumb. Some of these diseases, as the first three named, occurring later in childhood, seldom cause death. In early childhood these diseases attack the very processes which subserve the vitality of the organism. Abbott (1 p. 27) says in early childhood these diseases attack the lymphatic, osseous, and serous tissues, and growth is rendered impossible or at least retarded.

Statistics show that at about 5 or 6 years there is a rather marked reduction in mortality, although there may be some increase in the morbid conditions as Terman (68 p. 25) suggests. Hartwell (45) has shown that fatality of diseases is much reduced at puberty, and it has been established that the periods of accelerated growth are accompanied, on the one hand, by an increase of acute morbid conditions, and on the other, by an immunity to fatality of diseases. More diseases may attack the organism but less deaths occur. This law would not obtain during the first few years of life when the child

is making his first rapid adjustments to his novel milieu, and before some of the inner glands and tissues begin to secrete antitoxins. However, facts seem to warrant the suggestion that the physiological transition at about 6 years, the rapid growth of certain parts of the organism, and the altered function of certain organs at this time, may be found to play an important rôle in the patent diminution of mortality. Moreover, this change in development renders the organism more susceptible to disorders and morbid conditions increase.

Burgerstein (14) has made a study in several cities in Germany as to morbid conditions in childhood and finds the resistance to disease much greater after school entrance. It would appear that on entering school, where the child is subject to more contagious and infectious diseases, and often more favorable means of contracting them, the conditions would be made worse rather than ameliorated. But the resistance of the organism becomes so marked that this is more than compensated for. There seems to be a gradual increase in resistance after the first year, but the case becomes distinctly marked after about 5 or 6 years.

Rial (59) finds that the largest percentage of children succumb to measles in the second year. From 3 to 5 years there is an increase in the number of children attacked, but a much larger percentage overcome the disease. After 5 years this power of resistance becomes very marked.

Burgerstein (15 p.258) refers to the table of Hertel on morbidity, which shows no sex difference at 6 years, but at 7 there begins a sex differentiation, particularly regarding the impoverished condition of the blood in girls. The anemic condition increases to puberty when it becomes very marked.

It is patent, then, that some changes in the organism make for better resistance of diseases at about 6 years. The morbid conditions seem to multiply, but there is a very marked decrease in deaths. This period, therefore, in a certain sense resembles that of puberty.

IV. PEDAGOGICAL AND HYGIENIC CONSIDERATIONS

As far back as we have record, it seems to have been customary for school instruction to begin at the age of 5 or 6. Just why the child was taken from his home environment and placed in school at this age by the peoples of all times is not definitely known. This custom has passed down through time and has been in practice almost universally. Some radical pedagogical theorists, as Rousseau and Pestalozzi, arraigned this traditional custom and proclaimed the inappropriate environment of conventional schools for children of this age.

Their general observation of the nature of development gave them an idea of the needs and demands of the growing child, and a conviction that the conventional school environment did not satisfy them. In recent years there has been considerable discussion and some scientific investigation concerning this question. We believe the problem is now being attacked with a view to meet the needs and demands of the child, and that some insight into the requirements at the various stages of development has been gained.

Our chief concern in dealing with the growing child should be to make his growth conditions the very best possible. The principle of adapting instruction to the needs of the individual child is one of paramount importance. Let us epitomize, briefly, some of the facts already enumerated in an earlier section of this article regarding the developmental status of the child at this age. The fact of prime importance, as already indicated, is that many phases of development indicate more or less marked transitional characteristics. We found that the average boy of 6 years measures about 110 centimeters, but individual variations may range as much as 30 centimeters. Somewhat similar variation occurs as to weight. The changes in the teeth and jaws are distinctly transitional, and there is likewise wide variation; some children have not erupted all four of the first molars until after 9 years. In development of the osseous structures of the hand and wrist, we also found significant changes. Some indications of rapid development of motor coordinations are also suggested. Stuttering is common, and the development of the eyes is in a stage of adjustment. The rapid growth of the brain and the accompanying increase in size of the skull show a change in rate of growth, in which the growth both of skull and of the brain size and weight comes to an approximate standstill. A change in the range of voice is manifested, and we have differentiation of the sexes at this time in regard to several phenomena of growth for the first time.

These facts suggest a period of more or less general transition of development, wherein retardation and acceleration account for the increased width of variation. It has been shown that some children reach the stage of transition younger than others. Some children are accelerated in their development while others are retarded. Thus, a group of children of the same age may show a range of variation in development of several years. This fact makes chronological age impracticable as the basis of admitting children to school. The principle of physiological age, so strongly advocated in recent years, allows only children of a certain physiological

maturity, regardless of their age, to enter, and those of retarded development are not admitted. The school environment has been indicated as a factor in prolonged retardation. In order to meet this condition, Dr. Burnham (18, 19, 20) has long advocated a health examination at school entrance. He would urge that the parents cooperate in this examination, and thus, they may give as well as receive information concerning the child and his welfare. It appears that such a procedure would avail much good both in the schools and in the homes. Many parents, ignorant of bad influences in the environment of the child, might assist in eradicating them.

Besides the possible discovery of retardation by the examination, organs and glands which function improperly or which may be defective may be discovered and remedies applied, and the child thus avoids later impairment in development. Defects of these organs, diseases to which the child may be predisposed, his peculiar habits, and much information of the individual child become important considerations for both teacher and parent in their dealing with him.

In order to further our knowledge of the individual child, Dr. Thiele (70) has made a biological study of children in Chemnitz just before school entrance. He studied 5538 children between the ages of 6 and 7 years. The basis of his study was the returns to questionnaires sent to the parents in which he inquired; the number of parents living, number of children in the family, diseases the child had had, whether the child was born prematurely, were there any epileptic or pathological ancestors, when did the child begin walking, accidents the child had experienced, defects of sense organs or of glands, of nutritive function, et cetera. Among the interesting facts revealed in his investigation were that, where there was an only child, he had had less diseases, walked earlier, was more interested in older folk and showed precocity in general. As to diseases in families of 6 or more children, the conditions were no worse than where there were only 2 or 3 in the family. It appears that such a study of the hereditary influences in the family, as tuberculosis, epilepsy, or abnormal mentality, should furnish us a good clue in our study of conditions of development, and in our grading and attempt to provide the individual child with proper training and instruction. Retardation in development may often be traced to some hereditary factor of which the above diseases may be symptoms. Such studies are indispensable in explaining retardation and irregularities of development. Measles was the most common disease, about two-thirds having had it. His

study concerning the impoverishment of the blood would also prompt an improvement of health conditions.

Quirsfeld (19 p. 238) made a study of the effect of school influences on growth during the first year. Among 1014 children the increase in height the first year of school attendance was 2.5 centimeters. After this the annual increase was about 5 centimeters. Also weight during the first year in school was only .5 kilogram, while the next year the annual increment was between 1 and 2 kilograms. During the first year there was a decrease in weight of 15.87 per cent of the boys and 24.84 per cent of the girls, and a condition of standstill prevailed among 29.73 per cent of the boys and 44 per cent of the girls. Here, about 75 per cent of the girls and nearly 50 per cent of the boys show no increase in weight at all in the first school year. He also says that in 29.59 per cent of the boys and 49.05 per cent of the girls there is a decrease in muscular development during the first year of school attendance. It is patent from such facts that the child of retarded development should not enter school, at least, until he has reached the transitional stage of development. From the suggestion of Baldwin (4) and Porter (56) that mentality and physiological growth are correlated, to enter a child of retarded development means that he will probably be unable to keep up with his class in addition to his retardation period being prolonged. Thus, the health examination at school entrance becomes an important factor in grading.

An interesting study conducted in Munich from 1892-94 demonstrated the more appropriate use of vertical writing at school entrance. Both Berliner and Seggel agree that vertical writing gives a greater distance from the eye, thereby favoring this unstable stage of development. (66 p. 22). Slant writing has been charged with inducing asymmetrical development of the body and lateral curvature of the spine during the periods of rapid growth.

Seggel says the time of school entrance is a period when myopia is easily induced. When children below the height of 110 centimeters are allowed to enter school, special observation should be given to the distance of the work in order to avoid eye strain, or else the child should not enter school until his eyes have passed the transitional stage, and he is able to fuse the images of the two eyes properly and make skillful accommodation. The eye is of such importance that the greatest care should be exercised during this stage of rapid changes.

The statement that stuttering increases at school entrance, and its being characterised as a school disorder may only

signify in the majority of cases that the neuro-muscular co-ordinations are passing a stage of transition, and have not become definite; hence, the child should not be subjected to worse conditions until he has passed this stage.

Steinhaus (66) advocates that the mental status should show certain characteristics before the child is admitted to school. His memory ideas, and the reconstruction of them, should show clearly that they are available for use, and that he is capable of employing them effectively. By applying a test here we again improve our grading system. Dr. Burnham (19) suggests that it may be impossible for us to learn with any degree of definiteness the type of imagery a child of this age uses predominantly, but we can get at the type of his learning and his comprehension of things to be learned. The Stanford revision of the Binet-Simon Tests (69) asks the child of this age to repeat a certain number of syllables, to define certain words, which are names of ordinary objects, et cetera, and his mode of response in this procedure can well give us an idea of his type of learning. Various other tests can easily be devised for this purpose. The mode of attacking a simple task is more important than the accomplishment of the task itself so far as it pertains to eligibility for school entrance.

Dr. Burnham (19 p. 227) suggests that our examination at school entrance should consist of four main factors; 1. the physiological age, 2. the psychological age, 3. the general health condition of the child, and 4. the history of morbidity of the individual child. This plan is very comprehensive and if carefully worked out and applied should provide the necessary data for us to deal judiciously with the child. No one of these factors, however in detail it may be studied, is adequate for a safe judgment of the child's status but all should be considered in our determination of his stage of physiological and psychological development.

The datum of a health and morbid examination at school entrance is an indispensable criterion for the teacher in dealing with the child, and furthermore it gives opportunity for the remedy of troubles in the period of growth when slight matters can be most easily rectified and overcome. The conditions of the teeth, nasal and pharyngeal cavities, tonsils, and the functioning of glands should be carefully looked into, and as far as possible all the factors which control and promote growth and development should be kept in normal condition. The types of diseases which the child has had in his early years, and those which seem to have an hereditary influence in his family should be carefully noted and considered. Individual records

should be made and filed. Bad habits should also be noted and included in the record, and remedies applied to overcome them. These factors should all be considered in our determination of the child's fitness to enter school, and they should likewise be carefully considered in all our dealing with him after he enters.

Thus, it appears unwise and even dangerous to admit the child to school before this stage of transition has been reached and perhaps passed. To admit him before he reaches the transitional period portends an arrest in development; to admit him while he is in the stage of transition before permanent adjustment in various processes of development has been made may mean injury to certain developmental features due to overstrain at the nascent period. Some corrective measures in school instruction may make the change from the home to the school less harmful, but at present it appears proper not to allow the child in the school until he is well past the stage of transition. Dr. Burnham (20) suggests as a minimal requirement that he should have all four of the first molars, his height should be 115 centimeters and his weight 20 kilograms.

It has been suggested by various writers that the transfer from the carefree life in the home to the monotonous grind and state of repression demanded in our schools may have disastrous effects on the growing child. The schoolroom may be unhygienic, and the type of life exacted is frequently not adapted to the needs of the child. The study of Quirsfeld (19) referred to above indicates a retarding influence on growth incurred in the first year of school attendance. An important and primary step, then, when once we have an insight into the nature of growth and development and the type of life appropriate at the various stages, is the correction of the school instruction. The child should not be expected to sit stockstill for several hours, and after a short intermission return to a similar state of confinement in the afternoon. Intermissions should be more frequent, and the type of instruction should give ample opportunity for activity. The predominance of the work in these early years should be motor training, and such instruction as appeals directly to the senses. The very nature of the child, as we note his spontaneous activities, would teach us that he demands constant change and freedom of action. The greatest reform in our educational procedure, and one which is becoming more and more urgent, is the adaptation of the work to the needs of the individual child. A fuller adoption of such a policy in educational practice prom-

ises a significant advance and improvement both for the mental and somatic development of the child.

CONCLUSIONS AND SUGGESTIONS

The data presented in this study seem adequate to warrant the assumption of a general stage of transition in development at about 6 years of age. The phases of development and other conditions of the organism which indicate such transition may be briefly summarized as follows:

1. The annual increment in height from about 5 to 7 years of age is greater than in the subsequent years before puberty. The increment in individuals varies widely, indicating that the rate of growth has no regularity during these years and that various individuals reach the period of accelerated growth at different ages.
2. In weight, great irregularity occurs in the annual increment. From 5 to 7 years of age no general average can be taken, but thereafter this is possible. The annual increment varies widely and depends on the individual.
3. Very distinct changes in dentition occur at this time. The eruption of the 6 year molar marks the transition from the deciduous to the permanent teeth. The characteristics of this new type of tooth and the changes accompanying its eruption mark this period distinctly transitional regarding dentition.
4. The jaws show significant changes of development at the time of the appearance of this new type of tooth. Slight changes may occur in the anterior parts of the jaw, but in the posterior portions the alterations are quite obvious.
5. The skull has been found to grow rapidly until the age of about 6, when the rate of growth is markedly diminished. Some portions of the skull have attained their definite size at this age.
6. The face shows characteristic changes coincident with the eruption of the 6 year molars and the altered development in the posterior portions of the jaws.
7. The brain has attained its approximate size and weight at this period. The growth of this organ is very rapid up to about 6 or 7 years, after which the rate of growth is reduced very greatly.
8. In the circulatory system, the heart grows rapidly during the first 5 or 6 years, after which the rate of growth is reduced noticeably; moreover, a rise in blood pressure occurs at the age of 6.

9. The suprarenal glands, as indicated by one investigator, grow very rapidly at the 6 year period and then diminish in rate of growth until puberty.
 10. Motor control and neuro-muscular coordinations show a stage of rapid development here.
 11. The larynx has been found to grow much less rapidly after this period, and the range of the voice is widened somewhat.
 12. The eyes show marked development in ability of binocular function, and changes indicating more facile and adept accommodation and convergence occur.
 13. The variety of foods demanded by the child widens greatly at about 5 or 6 years and taste becomes "mentalized." The waste products of metabolism show some significant changes. The smallest amount of unoxidised assimilative matter in the urine is from 5 to 6 years.
 14. The thorax is circular with its widest base below up to 6 or 7 years, and thereafter the widest base is at the shoulders, and the thorax becomes less circular.
 15. The development of the carpal bones of the hand and wrist exhibit rapid progress at this period. Several new carpals and the lower epiphysis of the ulna appear in the 6-7 year period.
 16. Some less sudden changes in mental development have been noted. Play gradually becomes less individualistic, the range of knowledge increases, the facility of establishing associations is increased, the characteristics of perception become less subjective after about 7 or 8 years, taste and olfactory perceptions make significant changes, and other processes of the mental life show more or less gradually progressive development.
 17. Stammering and stuttering show marked increase at this period.
 18. Nervous and digestive disturbances are increasingly prevalent at 6 and 7 years of age.
 19. Cardiac incompetence and anomalies of dilated heart are apt to occur at this period. Fatigue is a very common complaint.
 20. Abnormal conditions of the tonsils occur about the time of the eruption of the first permanent molars and often lead to infections by microorganisms.
 21. Morbid conditions increase at this period; but the rate of mortality is distinctly lessened, thus indicating a state of increased resistance to disease.
- These various points indicating transition are representative of almost all phases of development, so that it seems safe to

conclude that the processes of development in general pass a stage of transition here, and are modified noticeably in passing this node.

Some interesting sex differences occur in development at this early period. It is well known that girls attain their completed growth about 2 years prior to boys, and in some phenomena of development differentiations begin early in life. The facts regarding height and weight at the 6 year period are not very decisive, however; the figures of Boas show the annual increment of height in girls a couple millimeters greater at this period. All studies indicate that girls are more precocious in development of dentition than boys. It is also stated that they attain full size of skull and brain earlier than boys. Vierordt found a manifestation of sex differentiation in pulse frequency at about this time. In motor control, girls have a larger percentage of their adult strength at 6 years than boys and show more rapid development of motor coordinations during this period. The studies by the Roentgen Ray Method show girls precocious in osseous development in general. Likewise, some sex differences were noted in mental development. Also, girls are found to be less susceptible to stuttering, the boys prevailing in a ratio of 3 to 1. A sex difference appears in the impoverishment of the blood beginning at about 7 years. In brief, these sex distinctions are points well worth noting. Just what pedagogical import such facts may have remains to be determined.

A matter of chief concern for pedagogy in any period of accelerated growth is the wide individual variations in such a period. Wide variations have been pointed out in various phases of development. Some children reach the accelerated stage of growth at a younger age than others, often decidedly outstripping those of retarded development. This fact has been indicated as the chief occasion for the adoption of physiological age as the criterion of determining the stages of development instead of the traditional chronological age standard. Furthermore, the rate of growth within this accelerated stage varies with individuals. Some pass the period more rapidly and growth is more saltatory than in others. Variability is a chief characteristic in any period of accelerated development.

As Terman has suggested, stages of rapid development render the organism more unstable in general. During rapid growth some parts may grow more than their relative proportions and others may not grow adequately; thus, the harmony of parts of the organism is easily impaired. Hence, particular care should be given the child in his stages of rapid growth and development in order that disturbances occurring may be recti-

fied before the period of rapid growth is past. In such a stage of growth the mental attitude of the child is also apt to show a little less equanimity. These general statements are highly significant in the more rapid stage of growth at puberty, but they are sufficiently true here to warrant attention.

Because of the great variability and of the danger of retardation at this period and perhaps of increasing conditions favorable to disturbances in development, it has been suggested, that school instruction should not begin until the child is at least well into this stage of accelerated development. Physiological age, as our standard, can be applied to the individual to determine his fitness for school occupations. Health examination at school entrance can well determine the fitness of the child to enter school and give additional data of his history which are indispensable in dealing properly with him in school and at home.

Regarding hygienic care and treatment, it cannot be emphasized too strongly that the environment of the child should be adapted as far as possible to his particular stage of development. The importance of recognising the changing stages of development is gradually becoming emphasized. A delay of the accelerated period means a distinct loss to the individual. Various features of development within the stage of transition should receive careful attention. The condition of the teeth, and particularly of the first molars, which have been found most susceptible to disease and onset of microorganisms, should receive careful attention. Likewise, malocclusion of the jaws in this stage is apt to cause injuries to various organic functions. Should there be any difficulty of occlusion, the best time to ameliorate conditions is in this stage of rapid development. The eyes should be carefully guarded in their changing development so as not to incur eye strain or other ocular troubles. The changes in the heart and the facts concerning cardiac incompetence should also put the teacher and parent on guard. Precautions should be taken to avert bad conditions of the tonsils prevalent at the eruption of the first molars. If not, this may become a breeding place of diseases of the teeth, throat, and even of the entire alimentary tract. The rapid changes in motor coordinations should warn us against giving training and work at this period that involve the more delicate neuro-muscular coordinations.

Thus, the fact of transition here seems established, and this connotes a need of particular care to keep the equilibrium of the various parts in relation to one another normal; and, in growth and development of parts, precautions should be taken that all the processes of growth are normal so that the pro-

gressive stages may not be arrested in any one feature of development. It can hardly be accentuated too strongly, that at school entrance, the question of fitness to enter, and the character of the instruction as well, should be determined by the individual child and his particular needs.

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