

Preliminary Studies in the Postures of the Children
in the Elementary Schools of
Kansas City, Missouri.

by

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PREFACE.

In preparing this thesis grateful acknowledgement is due to Dr. Fred Burger, Director of the Department of Health and Physical Education for the many years he has spent in working for the physical welfare of the children in the schools of Kansas City, Missouri.

I wish also to express my appreciation of the faithful work of the members of his department, the teachers of physical training, and the school nurses, who are helping to solve many of the problems outlined in the following pages.

Furthermore, I wish to express my deep personal appreciation of the valuable advice which Professor Victor E. Helleberg of the Department of Sociology of the University of Kansas has given me in the preparation of this thesis.

The paper is by no means complete. It is just the beginning of an important study in child welfare.

L.H.

Chapter I.

Types of faulty posture.

Unsatisfactory posture, as revealed by our physical examinations, groups itself under two main heads, antero-posterior deviations and lateral deviations. In the former we find an exaggeration of the normal antero-posterior curves evidenced by one or more of the following defects; Forward droop of the head, flat chest, forward rotated, or protruding shoulder blades, round shoulders, or kyphosis, hollow back, or lordosis, and protruding abdomen.

In the postural lateral deviations we observe a low shoulder, or a functional scoliosis, which is usually of the single curve type. All functional curves tend to disappear when the child is placed in a favorable position. If the defect grows worse until a structural change takes place, the cure, if possible at all, becomes much more difficult to correct in public school classes.

The children of school age are, as a rule, so pliable that deviations nearly always disappear by placing the part in its correct position. Occasionally, we find the muscles so hard and the deformity so fixed that it resembles that of an adult accustomed to an occupation resulting in a postural defect. One marked case of kyphosis I have in mind was that of a six year old girl who had spent much time in carrying water to the family

home, and lifting younger children.

The functional lateral deviations develop readily into structural cases, due to the changing of a simple curve to a compound one, and to the accompanying rotation of the vertebral column on its longitudinal axis. The school can render an inestimable service in the discovery and cure of the milder cases.

In the examination for faulty posture the spine should not be considered alone. The gait, the tilt of the pelvis, an unequal length of the legs, and the condition of the feet are of equal importance. Too great an obliquity of the pelvis, bow legs, knock knees, flat, weak, pronated, or everted feet are exceedingly common among our school children.

Chapter II.

The Prevalence of poor posture among children.

The school children of Kansas City, Missouri are prone to habits of poor posture, just as children elsewhere are. The extent of these bad habits, however, cannot be estimated accurately, unless the children are examined nude, or, at least so, above the hips. The loose clothing worn by children conceals so many of the minor irregularities of posture and structure, that even the trained eye cannot detect them, ^{less} much/the casual glance of the teacher or parent. It is only when the deformity becomes very marked indeed that it is visible with the child clothed. I have consulted with hundreds of solicitous mothers who had never noticed a pronounced postural deformity in their own young children until the Department of Health and Physical Education pointed it out to them.

During the winter and spring of 1919 we made a survey in twelve elementary schools of Kansas City among the kindergarten and first grade children. The children were examined stripped to the waist and shoes and stockings removed. The number of postural defects, both lateral and antero-posterior were numerous beyond expectation in children only five and six years old.

In the years following we made more examinations, and gave corrective exercises in a number of schools so far as the equipment and the time of the teacher of physical education allowed.

The following table (No. I) shows the prevalence of defects. Each year the examinations were extended into more schools and more grades. While the majority of the 5489 children examined in 1919 - 1920 are also included in the groups examined the following years, the mass of new pupils each year was sufficiently large to cover up any decided improvement in posture which may have taken place in the 1919 - 1920 group, not all of whom received special instruction in corrective gymnastics.

The per cent of defects is fairly constant during these years. Among the boys they are somewhat less than among the girls, with the exception of flat feet. The antero-posterior deviations average about 25 per cent. If we include all the lateral tendencies we find them to be more numerous than the antero-posterior ones.

A striking similarity exists in the Kansas City tables, and in the study made by Dr. Poelchow of Charlottenburg, Germany.¹⁹ Dr. Poelchow included lack of tonicity, uneven shoulders, slight irregularities in lateral and antero-posterior development in his group of primary children.

Table I.

PREVALENCE OF POSTURAL DEFECTS.

Elementary Schools

Kansas City, Mo.

Year	Number of Schools	Grades	Number examined			Antero-Posterior Deviations	Lateral deviations			Flat or weak feet
			Boys	Girls	Both		R. shoulder low	L. shoulder low	Scoliosis	
1919 1920	23 White	Kindergarten 1st, 2nd.			5,489	24.3%	14.4%	14.2	17%	17.3%
1920 1921	34 White Schools	Kg., 1, 2, 3.	5,132			23.5%	11.2%	9.1%	13.1%	15.5%
				4,842		26.2%	12.9%	8.3%	16.1%	14.5%
					9,974					
1921 1922	45 White Schools	Kg., 1, 2, 3, 4	8,688			27.8%	12.2%	8.9%	12.7%	16.8%
				7,811		28.1%	14.1%	9.2%	14.1%	15.9%
					16,499					
1922 1923	52 White Schools	Kg., 1, 2, 3, 4, 5, 6, 7.	11,135			Statistics were dis- regarded because of dissimilarity of judg- ing.	9.2%	8.5%	7.6%	13.4%
				10,450			15.7%	9.7%	11.8%	22.3%
				21,585						
1922 1923	12 Negro Schools	Kg., 1, 2, 3, 4, 5, 6, 7.	1,322				11.2%	7.4%	26%	35.1
				1,847		28.8%	14.6%	26.3%	34.4%	
					3,169					

1902	Of 182 boys	79 or 43.4%	had defects		
	" 145 girls	62 Or 42.8%	"	"	
1903	" 136 boys	68 or 50%	"	"	
	" 140 girls	90 or 64.3%	"	"	
1904	" 133 boys	68 or 51.1%	"	"	
	" 89 girls	51 or 57.3%	"	"	
1905	" 106 boys	68 or 64.1%	"	"	
	" 85 girls	62 or 72.9%	"	"	

Average defects boys 52.1%

Average defects girls 59.2%

Omitting flat feet from the above Kansas City table
we have

1920-21	56.9%	of Kansas City boys	had defects		
	63.5%	" " " girls	" "		
1921-22	61.6%	" " " boys	" "		
	63.5%	" " " girls	" "		

Charlottenburg average, four years.	Boys, 52.1%	Girls, 59.2%
Kansas City	" two " Boys, 60.2%	Girls, 64.5%

Other European inquiries between 1897 - 1902 resulted in the following:¹⁹

Author	Place	No. of Children	Defects		
			Boys	Girls	Both
Krug	Dresden	1418	26%	22.5%	25%
W. Meyer	Fürth	336	no	56%	
Guillaume	Neuchatel	731	18%	41%	29%
Hagmann	Moscow	1664	no	29%	
Kallbach	Petrograd	2333	no	26%	
Axel Key	Stockholm	3000			10.8%
Peter Wisser		515	55%	45.6%	52.8%

prevalence of defects on children in the first school year in Bonn.

1900-1901	250 children	9.2%	scoliosis	6%	antero-posterior		
1901-1902	300	"	9%	"	7%	"	"
1902-1903	224	"	15.6%	"	and	"	"
1903-1904	258	"	17.8%	"	"	"	"

Prevalence of defects in the Wilhelmschule Bonn in a poor district 1906

Of 206 boys	13.1%	scoliosis	17.5%	antero-posterior
Of 184 girls	32.6%	"	15.2%	"

The most unfavorable environmental conditions in Kansas City are without doubt found among the negroes. In housing, sanitation, and education in general hygiene, they are still, as a race, at a disadvantage. The postural deformities are more numerous and severe than among the

white race. The preponderance is especially marked in scoliosis and flat feet, as the table on page 5 shows.

It is important that the great mass of children be examined periodically. If we rely only on the examinations of orthopedic institutions it would appear that all cases are of a severe type, because the milder cases are unrecognized, and are not brought for examination. The institutional records show a preponderance of girls with scoliosis. That is due, probably, to the fact that parents are more concerned about an esthetic defect in a girl. However, observations show that girls assume twisted positions more readily than boys. The latter are more inclined to sliding forward in their seats, making in them antero-posterior deviations more common.

In the fall of 1919 the Kansas City public schools began a study of the height and weight of school children. The sex, age, height, weight table of Dr. Thomas D. Woods of Columbia University, New York City, was used. The Kansas City plan classifies the children into three groups: those who are normal, or above in weight, receive white cards; those who are under weight, but less than 10 per cent receive blue cards; those who are 10 per cent or more under weight receive red cards. Such a large proportion of children were under weight that the Department of Health and Physical Education took every step possible to bring up the weight of the children.

Table II.

REPORT OF HEIGHT and WEIGHT OF CHILDREN

September 1919.

	Total Weighed	Normal or above in weight	Less than 10% under weight	10% or more under weight	Total number under weight
White Schools	27,114	7,603	11,110	18,401	19,511
		28%	41%	31%	72%
Colored Schools	2,304	1,217	710	377	1,887
		52.9%	30.8%	16.3%	47.1%
All Schools	29,418	8,820	11,820	8,778	20,598
		30%	40.2%	29.8%	70%

While, no doubt, some of the under weight children belong to a light weight type by inheritance, still in dealing with large numbers of children with a limited opportunity for a detailed medical examination, Dr. Wood's table offers the best means of determining the standard. The results are seen in the table on page 9.

Less than one third of the children were normal or above in weight. More than one fourth of them are ten per cent or more under weight. The negro schools average higher in weight. This may be the racial characteristic of a heavier bony frame. It may be due to a higher infant mortality eliminating more malnourished ones. We have also observed that when wages are high the negro children are heavier.

Our great problem is with the children who are 10 per cent or more under weight.

There is always a decided increase in weight in January over September. In May the children are lighter again. This may be due partly to the heavier clothing worn in January. But with shoes and coats removed the increase due to clothing is not great. I rather believe the theory that the growth in height is greater in the spring and summer; the growth in weight in fall and winter. It is the following of a natural law. In the fall and winter there is a tendency to eat rather more fattening foods.

Table III.

HEIGHT AND WEIGHT OF CHILDREN
ASSIGNED TO CORRECTIVE CLASSES FOR SCOLIOSIS AND POOR POSTURE.

September 1921.

41 Schools.

	Total Exam-ined	No. in Correct-ive Classes	Normal or above in weight	Less than 10% under weight	10% or more under weight	Total Under weight
Kg. Boys	1,017	324	76	165	83	248
			23.5%	50.9%	25.6%	76.5%
Kg. Girls	1,089	346	78	167	101	268
			22.5%	48.2%	29.2%	77.4%
1st Grade Boys	2,152	745	151	375	219	594
			23%	50.3%	29.4%	79.7%
1st Grade Girls	2,029	749	122	341	286	627
			16.3%	45.5%	38.2%	83.7%
2nd Grade Boys	2,373	694	150	334	210	544
			21.6%	48.1%	30.3%	78.4%
2nd Grade Girls	1,718	706	153	322	231	553
			21.7%	45.6%	32.7%	78.3%
3rd Grade Boys	1,629	683	147	311	225	536
			21.5%	45.5%	32.9%	78.5%
3rd Grade Girls	1,581	743	182	328	233	561
			24.5%	44.1%	31.4%	75.5%
4th Grade Boys	1,517	569	134	270	165	435
			23.6%	47.5%	29%	76.4%
4th Grade Girls	1,394	581	141	238	202	440
			24.3%	41%	34.8%	75.7%
Totals	16,499	6,140	1,334	2,851	1,955	4806
			21.7%	46.4%	31.8%	78.3%

Table IV.

HEIGHT AND WEIGHT OF CHILDREN
ASSIGNED TO CORRECTIVE CLASSES FOR FLAT FOOT.

September 1921

41 Schools.

	Total Exam-ined	No. in Correct-ive Classes	Normal or above in weight.	Less Than 10% under weight	10% or more under weight	Total under weight
Kg. Boys	1,017	100	32	48	20	68
			32%	48%	20%	68%
Kg. Girls	1,089	109	34	53	22	75
			31.2%	48.6%	20.2%	68.8%
1st Grade Boys	2,152	244	75	113	56	169
			30.7%	46.3%	23%	69.3%
1st Grade Girls	2,029	160	46	66	48	114
			28.8%	41.3%	30%	71%
2nd Grade Boys	2,373	195	74	69	52	121
			37.9%	35.4%	26.7%	62.1%
2nd Grade Girls	1,718	187	65	73	49	122
			34.8%	39%	26.2%	65.2%
3rd Grade Boys	1,629	248	79	105	64	169
			31.9%	42.3%	25.8%	68.1%
3rd Grade Girls	1,581	223	70	90	63	153
			31.4%	40.4%	28.3%	68.6%
4th Grade Boys	1,517	176	60	74	42	116
			34.1%	42%	23.9%	65.9%
4th Grade Girls	1,394	192	62	67	63	130
			32.3%	34.9%	32.8%	67.7%
Totals	16499	1834	597	758	479	1237
			32.6%	41.3%	26.1%	67.4%

In several types of special schools or groups the red cards are highly predominant. In February 1922 a survey was made of 6140 children assigned the previous September to corrective gymnastic classes, because of lateral and antero-posterior deviations. 31.8 per cent were found to belong to the red group, and 46.4 per cent to the blue group. In other words 78.2 per cent of these children were under weight. At that time, in the white schools at large 26.5 per cent of the children were 10 per cent or more under weight. This shows that there is a close relation between under weight, or malnutrition, and postural defects. Of the children with flat, or weak and wobbly feet, 26.1 per cent were 10 per cent or more under weight and 41.3 per cent were under weight but less than 10 per cent. Here we have a total of 67.4 per cent under weight, in spite of the fact that nearly all of the children who are pathologically over weight have flat feet, and would be included in this list.

The group that shows the largest number of under weight children is the one assigned to open air classes. Practically all of these children show postural defects. The January 1923 record of the open air rooms is as follows:

	White Schools		
	White	Blue	Red
H. C. Kumpf	19.9%	54.8%	33.3%
Humboldt	25%	45%	30%
Karnes	10.7%	48.2%	41.1%

	White	Blue	Red 14.
Lowell	51.6%	35.5%	12.9%
Manchester	13.8%	62.1%	24.1%
McCoy	29.8%	46.8%	23.4%
Whittier	22.2%	22.2%	56.6%

Negro Schools.

Wendell phillips	33.3%	50%	16.7%
W. W. Yates	13%	43.5%	43.5%

The per cent of red cards in the schools at large at this weighing was 12.1

poor posture and under weight are so prevalent because the individuals of a group face the same social situations of food, rest, exercise, clothing, housing, and exposure. Children acquire bad habits of posture, or fail to assume correct ones, because they acquire their habits under conditions set by prior habits.

Chapter III.

The Beginning of poor posture.

Observers have made the assertion time without number that scoliosis and poor posture were due mainly to faulty school room environment. It is a conclusion easily reached when observations are made only upon older children who have been subjected to unfavorable school surroundings. But after examining hundreds of young children who are just entering the kindergarten or who, at most, have spent one year there, and finding a large per cent of them with beginning postural defects, we must necessarily look for causes that operate earlier than the kindergarten year.

Biologically speaking, the erect position in man is a rather recent accomplishment. The difficulty that an infant experiences in learning to walk is a recapitulation of race history. It is not surprising then that we find indications of a semi-upright position in the human body. The erect position is maintained by the shape of the foot with its long, strong, great toe which is the anterior support of the longitudinal arch, a well developed heel, and strong elastic bands of fascia and ligament. The structure of the foot is light, elastic, and well adapted to carry weight and withstand shock. In the second place, the erect position is maintained by the

muscles known as the extensors. With the exception of the quadriceps, extensor, they are situated on the posterior aspect of the body. The muscles of the calf, the buttocks, and the back are located at the points of greatest strain in holding the body upright. The gluteal muscles and the erector spinae are stronger and more effective in man than in the lower animals, or in young children. In the third place, the erect position is fostered by the structure of the great joints which are held locked when a good standing position is assumed.

During intra-uterine life the spine has but one single antero-posterior curve. This is not adapted to the erect position, but before the child learns to stand he has gradually taken steps toward the erect position, if he has been wisely guided. As he lies prone and lifts his head and shoulders, the extensor muscles of the back are getting exercise; as he lies on his back, and kicks his legs, the extensors of the legs are put to work. In due time these preliminary movements will enable him to creep, stand, and walk. The infant's desire to get things, to hold them, and to carry them from place to place, no doubt is a stimulus that culminates in his ability to walk. Just as in primitive man the wider use of the hand was a stimulus for the erect posture and brain development?

Now, if anywhere along the line of human development, factors enter that prove a hindrance to a normal growth

toward erect carriage, poor posture will be the result. These factors may be inherited through the germ plasm. Probably the unalterable poor posture of the definitely feeble minded has its origin here. However, social or environmental influences are more numerous and far reaching. The one great cause, no doubt, is malnutrition, or lack of development through improper or insufficient food supply. Undernourishment may begin its dire effect before or after birth.

The prevalence of rachitis is more widespread than is generally supposed. It begins in infancy and disappears between four and five years of age. By this time, however, the musculature is sufficiently weakened to cause both antero-posterior and lateral spinal deviations. The toxic poisoning of the child's system due to wrong feeding deranges the motor mechanism to such an extent that its normal functioning meets with obstruction. Proper nutrition of an organism must be followed by activity to insure the best development. If in addition to a nutritional handicap, the social environment of the child is such as to make the load still greater, we need not be surprised at the numerous physical deficiencies revealed during the school years. The wonder is that the human race does as well as it does.

Among the more common environmental conditions adding to the burden of the growing child are play surroundings

which deprive the child of sufficient air, sunshine, and free and natural activity. Indoor life and clothing begin their hampering influences in infancy. The therapeutic value of sunlight on the nude body is just beginning to be understood, and its application in counteracting the results of malnutrition among the babies of war devastated Europe is gaining in favor.³²

If sunlight, artificial or natural, is of value to scrofulous, rickety, or tubercular children, it should also prove its worth in immunizing every young child from the possible contraction of infectious diseases. The younger the child, the more disastrous are the effects of wrong food and poor hygiene. Inefficient musculature is one of the earliest results, and inability to assume the erect posture at the normal time follows. One sided habits are frequently forced upon the infant. Many mothers constantly carry their infants on the left arm and thereby cause a scoliosis to develop. One sided play habits among pre-school children are not uncommon. Just notice how the one sided use of the toy called the scooter or the use of a single roller skate is prevalent.

As soon as the child enters school it must cope with a new series of detrimental surroundings, as unsuitable desks, wrong lighting, and long hours of sitting. Still other factors may be at work causing the child to assume

and habituate himself to posture favorable to developing kyphosis, lordosis, and scoliosis. Among them are defective vision, especially astigmatism and myopia; partial deafness with its tendency of leaning toward one side; the unreleaved carrying of heavy loads; clothing which pulls the shoulder blades forward, or hampers the freedom of movement; assymetrical body development, as a short leg, or one flat foot.

These environmental factors have long been recognized as being detrimental, and still we may enter almost any children's play space, home, or school room, and see violations to common rules of hygiene. Indeed the trend of the times is to add more harmful influences. The motion picture and the automobile are hampering the use of the extensor muscles to a large degree. We are in a sitting age. We sit to talk, to listen, to eat, to read, to write, in traveling, and at work. Few of our chairs are built correctly. Only when the spinal column is relieved of its load can sitting be considered a rest. Most sitting positions are assymetrical. The school has not done its duty when it puts in more approved models of seats, and a new system of writing. The whole attitude must change. Schools as yet do not require for graduation a healthy body.

The beginning of poor posture lies largely in the pre-school years. However, since wrong influences are not removed early, but carry over into school life, and are there augmented by tendencies toward fixed habits, the moral obligation rests on society as a whole of which the school is an all important part. But the school ^lalong is not to blame.

Chapter IV.

Relation of the Intelligence Quotient to Height and Weight.

In a previous chapter we have shown that poor posture, and the condition of underweight due mainly to malnutrition, are prevalent at an early school age. The question frequently arises as to whether this undesirable fact has any effect upon the mental efficiency of the child. In the table on page 22 we have a tabulation of the intelligence quotients of 3033 kindergarten and first grade children, and a comparison with the sex, age, height, weight standard. The mental tests were given by kindergarten teachers, trained to make the examination. The Terman test, Leland Stanford revision was used. The height and weight ^{was} (was) ascertained and the groupings were made by members of the department of Health and Physical Education of the elementary schools.

Sixty two per cent of the children are underweight; fourteen per cent are ten per cent underweight. Only indirectly is an account taken for rapid growth in height, and inherited or racial tendencies for a light bony frame. Nor do pathological over weight conditions receive any recognition in our grouping.

While the Terman tests are supposed to show native ability regardless of environment, the fact remains that

Table V.

INTELLIGENCE QUOTIENT, HEIGHT AND WEIGHT OF
3033 Kindergarten and First Grade Children.

Intelligence Quotient	No. of Children	Normal or above in weight,	Less than 10% under weight	10% or more under weight
140 and above genius or near genius	6	3	3	0
		50%	50%	
120 to 140 very Superior	237	93	115	29
		39.22%	48.52%	12.23%
110 to 120 superior	691	253	352	86
		36.61%	50.94%	12.44%
90 to 110 average or Normal	1675	635	785	255
		37.91%	46.86%	15.22%
80 to 90 dull	319	133	139	47
		41.69%	43.57%	14.73%
70 to 80 Border line	79	22	40	17
		27.84%	50.62%	21.51%
Below 70 Feeble minded	26	10	11	5
		38.46%	42.3%	19.23%
Totals	3033	1,149	1,445	439

we find more superior children in schools in which the environmental influences stimulate the mental growth of young children. This is less true when we come to the underweight problem. Many observers have noticed that a better environment induces a more rapid growth in height. The importance of an earlier growth in height with an adequate development of muscle tissue is perhaps the same in result as stress upon weight with less attention to height. Our school children know the meaning of normal weight. Each youngster knows what he should weigh. Few, I dare say, know whether they are tall enough, except as they themselves draw comparison with their playmates. The table of Dr. Woods which has just been revised with the aid of Dr. Baldwin (June 1928) will give us a better height standard.

The table on page 22 shows a fairly definite increase in the proportion of the ten per cent underweights, or red cards, as the intelligence quotients decrease. The blue group fluctuates about the fifty per cent mark in each of the intelligence groups. The white group shows an approximate decrease with a decrease of the intelligence quotient. The number of children with an intelligence quotient of 140 or above is too small for statistical purposes, but the fact that none of these fall within the red group, and the members of the blue group were so slightly under normal (one half pound in two cases, and one pound

in one case) that they rather verge into the white group, may be significant.

It is interesting to know the per cent of white cards among the dull children (I.Q. 80 to 90). Here we, no doubt, find many of the overweight children who are inclined to be mentally sluggish. These children are more in evidence in groups older than five or six years. It is the group that causes many class room teachers to say, "The heavy children are dull; my bright pupils are mostly underweight." With these children much effective work in motor training can be done. They should receive a maximum amount of training in muscular coordinations, presented in a manner that insures as much pleasure as possible.

Among the children in the border line group (I.Q. 70 to 80) there is a definite increase of the ten per cent underweights. Observations show that many border line cases are handicapped by removable defects. Here is a fertile field of constructive work that the school should push to the fullest extent. If these young children are given the best care physically, and are placed in the best possible environment, mental retardation may be prevented in many cases.

In the definitely feeble minded group (I.Q. below 70) we probably have too few children for statistical purposes. It is significant, however, that several with blue cards have a weight that places them almost in the

group. Five of them escaped the red group by from one tenth to eight tenths of a pound (.1, .3, .3, .5, .8).

The children with an intelligence quotient less than 80 come largely from homes in which the economic and social environment is not conducive to rapid mental awakening.

While this table does not conclusively prove that the mentally better endowed children are physically up to a better standard, it does show a tendency in that direction, even with the rather meager information obtained from the sex, height, weight, age standard alone.

Chapter V.

A Study of Scholarship, Posture and Weight.

The table on page 27 was compiled from the records of special posture classes of fifty-two elementary schools. In the September 1922 examination, conducted by the physical training teachers and school nurses, all of those children whose posture was unsatisfactory were listed, and parallel records were kept of teacher's estimate of scholarship, and posture, and weight in the three groupings red, white and blue. Poor posture in this table includes antero-posterior deviations, and functional lateral deviations. The examination of the child was made while it was stripped to the waist. A second recording occurred in January 1923, and a third one in May 1923. The total of 4666 children is small compared with the defects found in the fifty-two schools. There had to be many eliminations. Those children whose posture was marked "fair" or "medium" were excluded in many of the schools, because the time of the teacher of gymnastics was too limited to take care of more than those children whose posture was marked "poor". In several schools the less pronounced cases of unsatisfactory posture were reached by the room posture work. In this work the special teacher of physical training spent ten or fifteen minutes a week in the classroom with such posture drill as could be given in that place.

Table VI.

A STUDY OF SCHOLARSHIP, POSTURE AND WEIGHT

In 52 Schools

1922 - 1923

Pupils assigned to Corrective Classes.

	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Grade	7th Grade	Total
I. † † † Scholarship satisfactory Posture improvement satisfactory Weight " "	403	370	331	217	147	104	1572
II. † † - Scholarship satisfactory Posture improvement satisfactory Weight " unsatisfactory	309	277	241	165	119	102	1212
III. - † † Scholarship unsatisfactory Posture improvement satisfactory Weight " "	129	153	113	86	47	31	559
IV. - † - Scholarship unsatisfactory Posture improvement satisfactory Weight " unsatisfactory	114	113	106	77	52	29	491
V. - - - Scholarship unsatisfactory Posture improvement unsatisfactory Weight " "	57	46	46	60	40	9	258
VI. + - - Scholarship satisfactory Posture improvement unsatisfactory Weight " "	27	28	44	41	19	19	178
VII. + - † Scholarship satisfactory Posture improvement unsatisfactory Weight " satisfactory	39	38	34	45	31	8	195
VIII. - - † Scholarship unsatisfactory Posture improvement unsatisfactory Weight " satisfactory	40	38	42	35	27	18	200
Totals by grades	1118	1063	957	726	482	320	4666

Groups I, II, III, IV, Posture improvement satisfactory, 3834 or 82.1%
 Groups V, VI, VII, VIII, " " " unsatisfactory, 831 or 17.8%

Individual work was necessarily limited, but good results were observed, especially in those rooms in which the class room teacher did some follow-up work in the course of the week.

In compiling the table further eliminations were made when a child's record through transfer or absence was incomplete for the year. The Kindergarten and first grade children also were eliminated. Moreover, about seven names had to be omitted, because several teachers of gymnastics had not followed, or understood the directions accurately.

The table represents the part time work of fifty five physical training teachers, the scholarship estimate of the class room teachers, and the work of the school nurses and physical training teachers who weighed and measured the children, and classified them in the weight groups.

The 4666 children received one half hour posture lesson each week in the corrective room or gymnasium. The groups were small ranging from six to fifteen children each. The teachers used as many incentives and devices as possible to encourage the children to practice at home on their exercises, and to interest the parents.

The number of children in the corrective classes of the lower grades is larger, because in the upper grades the examinations for corrective work, and the time allotted to them are as yet not as extensive throughout the schools, as we hope to have them in a few years more.

In the first division (marked + + +) the scholarship, the improvement in posture, and the gain in weight are satisfactory. It included more children than any of the other divisions, 33.6 per cent. scholarship, as before stated, was teacher's estimate; improvement in posture was also measured by the estimate of the teacher, as we as yet have no graphic devices for measuring posture. Weight was considered satisfactory, if the child started with a white card and continued with a white card throughout the year; if he started with a blue card and changed to white during the year; ~~or, if he started with a blue card and changed to white during the year;~~ or, if he started with a red card and changed to blue or white.

Considering the limited time allowance for corrective gymnastics during the school hours (one half hour per week), the uncertainty of home co-operation, and the fact that the children who went to ^{the} corrective gymnastic class lost that time from their academic training, the 33.6 per cent above mentioned is eminently worth while. In judging by teacher's estimate alone, certain human elements are bound to enter into the grading. The conduct, attendance, and effort of the pupil may have been evaluated rather than actual improvement. However, one third of the instructors were serving their first year of teaching, and in corrective gymnastics, as in other lines of teaching, experience aids very largely in gaining the desired ends.

In the next group (+ + -) scholarship and improvement in posture are satisfactory, but the weight increase as stated in the previous paragraph does not occur. An unfair condition, however, shows itself here. No allowance is made for an increase within the blue or red group.

In groups III and IV posture also is satisfactory, giving us then in the four groups a total of 3834 cases, or 82.1 per cent in which posture improvement was satisfactory.

Group V (- - -) illustrates a rather deplorable condition of a comparatively small number. The individual members of this group, ought to receive the best possible follow-up work in another year.

In groups V, VI, VII, VIII, the four smallest groups, the improvement in posture is unsatisfactory. 832 children, or 17.8 per cent show unsatisfactory results in posture improvement. Perhaps our training is not intensive enough, perhaps the lack of home co-operation prevents the attaining of the desired results. There is room here for much study and work for years to come.

Improvement in posture and normal growth, without doubt, are conducive to the well bring of the child, and improvement in school grades, as evidenced by the estimate of the teacher follows, as this table shows.

Table VII.

PERCENTILES OF SEVENTH GRADE PUPILS ASSIGNED TO
CORRECTIVE CLASSES BECAUSE OF POOR POSTURE

1922-1923

Grade Percentiles	No. of Pupils	Per cent of Pupils
90 to 100	9	3.2%
80 to 89	12	4.27%
70 to 79	14	4.78%
60 to 69	20	7.1%
50 to 59	39	13.8%
40 to 49	38	13.5%
30 to 39	38	13.5%
20 to 29	41	14.5%
10 to 19	48	17.08%
0 to 9	22	7.8%
	281	

Age Percentiles	No. of Pupils	Per cent of Pupils
90 to 100	11	3.9%
80 to 89	18	6.4%
70 to 79	23	8.18%
60 to 69	18	6.4%
50 to 59	21	7.47%
40 to 49	36	12.8%
30 to 39	35	12.4%
20 to 29	37	13.1%
10 to 19	53	18.8%
0 to 9	29	10.3%
	281	

Chapter VI.

Posture and Percentiles.

An interesting study of the relation between posture and intelligence is found in table VII. The National Intelligence tests are given to groups of children in our schools. These measure native intelligence, but they presuppose ability to read and write. The tests are given each year to all seventh grade pupils. The table shows the results obtained from 281 pupils whose posture was unsatisfactory in September 1922, and who had been assigned to corrective classes. The grade percentiles represent the result obtained from the tests regardless of the age of the child. In the age percentile more is expected of the older child. His percentile is lowered if he is older than the average child of the given school year.

In an unselected group we would find one half of the children making a percentile above fifty, and one half of them below fifty. In the grade percentiles of the poor posture group we have ninety-four children above the fifty mark and one hundred eighty-seven below. In other words forty-seven or 16.7 per cent have fallen into lower intelligence groups, presumably, because of poor posture. In the age percentiles ninety-one children are above the fifty mark and one hundred and ninety below, that is, fifty children, or 17.7 per cent have fallen below standard. In both comparisons the number of children who have fallen below a percentile of twenty is large.

Whether poor posture in itself causes the mental inefficiency, or whether inherited low intelligence has as its concomitant the postural peculiarities of a lower race, the table does not prove.

We hope that by improving the posture we can improve all of the functions of the body, that of the brain included.

Chapter VII.

Results of Inefficient Posture.

If the body is held erect, the organs of the thoracic, abdominal, and pelvic cavities have the best mechanical advantage for efficient functioning. One of the accompanying evils of poor posture is a relaxation of the thoracic and abdominal muscles that is soon followed by a sagging of the internal organs, and the individual is prone to all the evils of visceroptosis. There are few diseases that attack the adult that are not directly or indirectly the result of a drooping, or ptosis, of heart, lungs, stomach, pancreas, liver, spleen, kidneys, intestines, and pelvic organs.

Pressure on blood vessels and nerves, and pain naturally follow. Physical fatigue and mental depression enter into this vicious circle of poor posture and ptosis. Ultimately deleterious structural changes occur in the viscera.

Quadrupeds do not labor under the disadvantage of mechanical stress caused by the upright posture. Visceroptosis and their sequelae are unknown among them.

Karl Vogel¹⁹ made an examination of 305 old people in a home for invalids. Every one of the eighty-three scoliotics of this group showed one or more other defects of the supporting structures as follows:

	Of 83 scoliotic the following had			Of 222 non-scoliotic the following had		
Flat foot	49	persons or	59.1%	28	persons or	12.6%
Genu valgum	3	"	3.6%	4	"	1.8%
Varicose veins	68	"	81.9%	36	"	16.2%
Hemorrhoids	11	"	13.3%	7	"	3.2%
Hernia	55	"	66.3%	32	"	14.4%
Pendulous abdomen	12	"	14.5%	7	"	1.4%
Emphysema	13	"	15.7%	9	"	4.1%
Prolapsus uteri	11	"	13.3%	6	"	2.7%
Prolapsus recti	2	"	2.4%	0	"	0%
Enteroptosis	23	"	27.7%	18	"	8.2%

This list indicates a constitutional weakness of the connective tissues, and its derivatives, the bones and blood vessels. It is true that most of those with scoliosis and other postural deformatives have, at one time, suffered from acute infectious diseases, or from malnutrition. Still there are some cases that can be explained only by long continued lack of systematic exercise of the supporting organs. The nervous system and the vegetative organs function through natural laws, but the supportive organs, bones, ligaments, and many muscles are forced to idleness throughout much of the day. These parts therefore are poorly developed and deteriorate, and are in consequence unequal to the demands made upon them.

Fatigue induces the individual to be physically on a par with the individual of a lower race. Both fatigue and old age mimic the past history of the race.

The assuming of the correct posture, because of its aesthetic appeal will ever be a stimulus to young people. It is not necessarily an end in itself, but what ever is beautiful and effective in posture is conducive to efficiency and economy in the functioning of the human body and mind.

Chapter VIII.

What Shall We Do About Poor Posture?

After studying the extent of faulty posture among children, and the probable results, the great problem before us is to find ways and means of reducing poor posture to a minimum. In order to establish the habit of erect carriage, we need first of all co-operation between the organism and the environment. Infants owe to adults food and protection, all that preserves life. The social medium is responsible for the establishment of proper habits in the infant. The causes of poor posture frequently are due to conditions surrounding the infant, but blaming these conditions is wrong. Such causes are not excuses. Neither has the mother a valid excuse for not co-operating to improve the child's posture when she says, "Yes, I know my boy is round shouldered. But he comes by it honestly. His father is just like that." Not offering more resistance to the child's habit of incorrect posture certainly promotes it.

Haertel¹⁹ quotes a rhyme that shows the indifference that some parents have

"Its nur das Kind im Kopf nicht dumm
Hms Andre ist's nicht schade
Ein bissel schief, ein bissel krumm
Der Schneider macht's gerade."

One of the most effective means of combating the beginning of inefficient posture is by periodic examination

of pre-school children. Free clinics, well baby stations, or the activities of the Children's Bureau which are so well begun in Kansas City ought to give a decided impulse toward the desired goal. However, medical examinations are still too much inclined to overlook faulty posture in the beginning stages. Of course, an adequate follow-up system should be in operation. If the handicap of the child has been pointed out it should be taken care of by the proper agency, as, parents, family physician, specialist, clinic, public health nurse, or institutional care. In order to forestall habits of poor posture, the pre-school child must be guided by a series of prophylactic measures. The child should not be allowed to assume positions during sleep, rest, or play periods that are conducive toward preventing the assumption of good posture later on. Parents sometimes hurry a child beyond its ability to sit, stand, or walk before it is equal to the task in muscular strength. The common habit of carrying an infant in a sitting position on the left arm without varying it at times to the right side is likely to cause a scoliosis in the child, and possibly in the young mother or nurse as well. We need forethought to change present factors which enter into future bad results.

When the child enters school the forming of good habits of posture becomes largely an educational problem in addition to the environmental one. The child spends many hours a day in surroundings that tax his resistance to poor posture

considerably, even though school authorities are aware and desirous of eliminating detrimental factors. As soon as the financial problem appears health matters are pushed only cautiously.

Those children in whom there are indications of tendencies toward poor posture must face the slow process of changing bad habits to good ones.¹¹ Telling a child to stand straight, will accomplish no result worth while. He is quite apt to pull his shoulders back, thrust his abdomen forward, tense his muscles, and make matters worse. A child must learn the control of the body through a long process of trial and error. It is unreasonable to expect a child to stand straight unless he has learned to know the elements of the erect posture. We might as well throw an untrained young child into the water, and tell him to swim, or turn an entirely unlettered person into a library and say to him, "Now, read." But few would survive this method of instruction. Even these few would be highly benefited by wise guidance.

Modern educational methods have devised a series of intermediate steps to be taken in teaching either swimming or reading. Each intermediate step is for the time being the end. We allow the young child to get used to the "feel of the water", by the wading pool method. He sticks his toes in; he may stoop over and splash with his hands; now, his face accidentally gets wet; gradually, he wades out perhaps to knee deep, and learns to balance himself against

the pressure of the water. He soon gets into a horizontal position, and "mud crawls", or, he holds to an object, and kicks with his legs. Wise guidance, or imitation, hurry these steps in the older child. Through skillful teaching he learns the proper muscular co-ordinations, and begins to feel at home in the water. He should never experience the stage of "being afraid of the water".

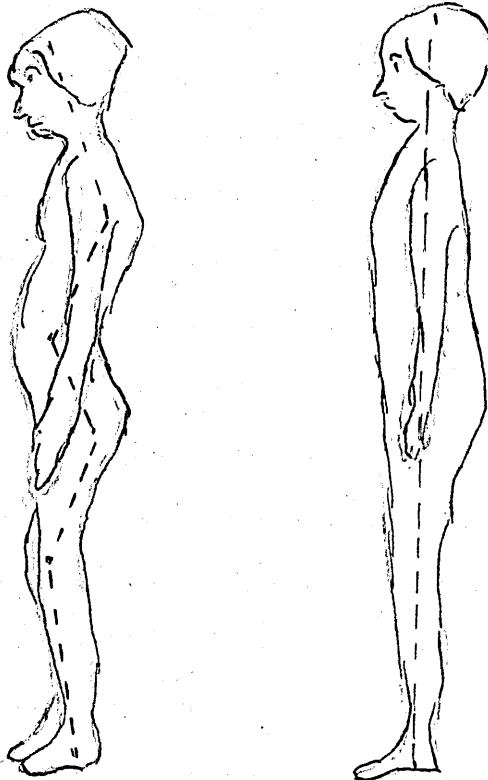
Waving the magic wand, and telling the child to stand straight will not bring results. The untrained child has not the power of free expression; but give him poise and control of his bodily habits, and the growth of his power of adapting himself to his environment is assured.² In the past haphazard advice in regard to correct posture has been altogether too prevalent. On the one hand the child has been told to sit straight and to stand straight, and parents and teachers have considered their duty ended. Or, the mother has gone to the nearest shop, bought a shoulder brace, put it on the child without carefully investigating whether the brace did for the child what it was supposed to do. On the other hand, advice has been as indefinite as that told by Mr. Skarstrom³⁶ of a sporting editor of a newspaper who advised his inquirers to "Go to a gym., swing Indian clubs, use the chest weights, play hand ball and tennis".

Neither in the matter of normal body development nor in true free expression of any activity can the child be allowed to work out his own salvation. The right impulse to read, or swim, or stand straight may be in the child's mind, but results can be obtained only by intelligent

control of means.

The idea of tallness should be conveyed. Saying to the child, "stand tall!" "sit tall!" are the most effective phrases I know of. The instructor should place her hands on the child until he sways forward with the weight over the balls of the feet, the hips back, but not so far as to hyper-extend the lumbar spine. The axes of the body segments should be one continuous straight line from the ear to the middle of the foot, and not a series of diagonal lines.

The following drawing illustrates the point:



From Individual Gymnastics by Lillian C. Drew.

A large mirror, or several of them at various angles is the very best adjunct in the teaching of good posture. No corrective room should be without one. With the aid of the mirror the pupil can learn more easily the feel of good posture.

The analysis of a tall sitting position should be made to conform to the child's ability of understanding. Leaning back to rest, and leaning forward to write should come with a movement of the hip joint, not with a flexion of the spine.

When the ideas of correct standing and sitting are properly fixed, they should carry over into walking and other types of movements. Good posture should be in evidence not only when the child is under observation, but as a part of the child at all times. A child that can stand straight knows what it is like to stand correctly.

Many children when they are placed in good posture hold it for a few moments, but tire soon and lose it. In order to lead these children toward the goal of good posture, we must take their minds off of the ultimate end, and lead them through a series of intermediate acts. These acts taking the nature of corrective exercises, on the one side inhibit the habit of poor posture, and on the other lead into the correct posture by strengthening the muscles which are active in holding the erect position. The discovery and the teaching of this series of acts is

the work of the skillful teacher of gymnastics. Rarely are two individuals treated exactly alike in such a program, although the working basis may be similar.

A so-called day's order has been devised and worked over in many ways. There is none I like so well for practical purposes, in the corrective room, as the one given by Miss Drew in her valuable book, "Individual Gymnastics" (page 91).

Order of exercises for program

1. Introductory: Breathing, relaxation, posture training.
2. General flexibility.
3. Local flexibility.
4. Self-correction (at mirror).
5. Strong back exercises.
6. Abdominal exercises.
7. Relaxation (in hook lying position).
8. General strengthening exercises in a corrected position.
9. posture training.
10. Walking in good posture, and balance exercises of various sorts. Short rest.

The entire course of action is reasonably clear. Each exercise bears a relation to the whole. It is looked at in perspective, although for the time being it is the end in itself. Take, for instance, any one of them as the

abdominal exercise. The child will concentrate on this as if it were the end, although it is only one of a series of means in the general program. Ultimately the end is converted into one of a series of means.¹¹

Many of the children who are in our corrective gymnastic classes appear to have been much improved, or entirely cured of bad posture in the spring, but when they come for re-examination in the fall the posture again is unsatisfactory. Two causes account for this backsliding. On the one hand, the minds of the children are away from the subject of holding good posture. On the other hand, three months of growth have so changed the leverage of the body that there is almost a new body to be controlled. More is the need of continued attention and guidance in the matter of posture throughout the growing years.

Chapter IX.

Some Gratifying Results.

Posture improvement judged by teacher's estimate alone, presents uncertainties. We hope in time to have better methods of gauging and recording posture.

However, with us the scales and the measuring rod tell a more exact story. The effort The Department of Health and Physical Education has made in trying to reduce the large number of ten per cent underweights is showing itself in the figures of the four years. Parents and children have learned that a child should gain in weight steadily. They know that it is one index of a child's health.

Table VIII shows a steady decrease in the ten per cent underweights among the white children, the same month of the year, of course, being considered. There is a greater fluctuation among the negro children due, no doubt, to the race as a whole being more sensitive to changing economic conditions. Probably, if a group of white children were studied whose parents were on the border line of poverty, and readily affected by economic conditions, the same fluctuation would occur. In the figures including all schools the steady decrease in the ten per cent underweights is quite evident.

In January 1922 there was not the looked for decrease in the underweights. This was the winter of the smallpox

Table VIII.

NUMBER OF CHILDREN WEIGHED AND PER CENT OF CHILDREN
TEN PER CENT OR MORE UNDERWEIGHT DURING FOUR YEARS.

	September 1919	September 1920	September 1921	September 1922
White Schools	27,114 31%	32,134 28%	33,044 27.9%	34,436 25.93%
Colored Schools	2,304 16.3%	3,131 16.3%	2,688 21.3%	3,311 18.76%
All Schools	29,418 29.8%	35,265 26.9%	35,732 26.5%	37,747 25.3%
	January 1920	January 1921	January 1922	January 1923
White Schools	31,511 17.1%	31,028 15.1%	32,716 15.2%	33,634 19.9%
Colored Schools	2,678 4.7%	2,877 8.6%	3,600 9.7%	3,217 10.8%
All Schools	34,189 16.1%	33,905 14.5%	36,316 14.7%	36,851 12.1%
	May 1920	May 1921	May 1922	May 1923
White Schools	30,315 22.2%	31,350 20.1%	31,865 17.6%	32,071 15.5%
Colored Schools	2,411 5.4%	2,805 14.5%	3,051 17%	3,298 9.5%
All Schools	32,726 20.9%	34,155 20.9%	34,916 17%	35,369 14.1%

epidemic. Great numbers of children were vaccinated, because in Kansas City, Missouri, vaccination is not compulsory except during the time of an epidemic of smallpox. The indisposition caused by the vaccination held back a normal increase in weight in many children. Most of these children were in school, however, and did not miss the January weighing. By May the growth interference had adjusted itself.

Conclusion.

This brief study shows that there is a prevalence of tendencies toward poor posture before the age of five years, and an increase of such tendencies during school age.

A close correlation exists between mental efficiency, good posture, and normal body growth. The correlation would be closer, if the tasks assigned to the pupil, that is, academic lessons, posture training, and health habits were presented to arouse equal interest.

Improvement in posture among our children is of necessity slow, because of the large numbers concerned, because of the variety of social factors entering into the problem, and because adequate co-operation of environmental factors is not easily obtained.

Results are apt to be discouraging, or unreliable unless measured over a long period of time.

Because the school is the best organized institution for changing existing conditions, the work must be concentrated there, and extended into the home and wider fields in course of time.

The effort toward correcting postural defects in the Kansas City, Missouri, elementary schools during the past five years has been very much worth while. Good results

are in evidence. To cover the extensive field adequately, however, we need time, a careful study of ways and means, and an untiring effort.

We need co-operation, intelligently guided, between the individual and the environment. Conscious control is fundamental in the attaining of bodily poise.²

ADDENDUM

If the correlation of improvement in posture and improvement in scholarship were easily demonstrated, a single study might suffice. But changes in mind and body work slowly, and the causes of these changes are traceable to many factors. Skillful and conscientious teachers can bring about large results. However, if the wider sociological factors that operate beyond the immediate reach of the school are not in faithful co-operation with it, the results may appear almost negative.

One group of thinkers believes that there is no connection between posture and scholarship, because both are the expression of inherent unchangeable brain capacity. Others believe that improvement in physical condition improves the functioning of the brain. I hold that posture is closely related to physical condition. The functioning of the brain, as manifested in scholarship and in the ability to pass mental tests, is also dependent upon physical condition.

The studies in the preceding pages have been extensive, but the time allotted to them has not been sufficient to make them intensive. Two further studies are under way. The one may corroborate or deny the statements made in connection with table VII, page 31. The other will deal with a more individualized study of a smaller group showing the relation between teachers' marks and posture. I shall take also into consideration numerous environmental conditions and their effect upon the progress of the children.

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