SOME COMMENTS ON THE PHYSICAL FINDINGS IN HIGH SCHOOL GRADUATES

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The generalizations made herewith are based directly upon 2955 medical examinations of high school graduates made in September, 1922, of which 885 were of women and 2070 were of men. They are further supported by similar approximate findings in a total of 12,000 medical records of high school graduates, of which 9000 are of men and 3000 of women. As one group of 26 physicians and 18 specialists and dentists assisted in examining the men, and another of 11 physicians and 4 specialists assisted in examining the women, the total defects considered represent a composite opinion rather than that of one individual with a preconception or a fixed idea.

The most important deduction, in my judgment, to be drawn from the findings of the medical examination of high school graduates is that physically, mentally, and morally, they are unsurpassed by any group of similar age of which there is record for comparison. It should be pointed out at the outset that a large proportion of the mechanical defects noted are minor and are not, in reality, a serious handicap in civil life. Impairments of the special sense organs and of the teeth are to such a large degree correctible, as, in the vast majority of cases, not to interfere markedly with effective living.

GENERAL DEVELOPMENT

Slightly more than one-half of the high school graduates examined in 1922 received a classification of good in their physical development at the time of their physical examination. About one-third were recorded as fair, 3.2% of excellent development, and 5.2% of poor development.

The relative general development of men and of women differs but little. A slightly larger per cent of the men are classified as good; a somewhat greater per cent of women than of men, as fair. This difference in physique of men and of women may be influenced, in a

measure, by the opinion of different groups of examiners, but it has tended to become less each year. This decrease in the variation in classification in the physical development of men and women parallels the progress of physical education in the grammar and in the high schools.

The general nutrition of the group is very close to average, but with a slight tendency towards thinness. Men are more apt to be average than women, who seem to show a slightly greater tendency to approach the extremes of either slenderness or obesity. The finding of a greater tendency of women than of men toward either overweight or underweight when registered is consistent with a similar finding of girls and boys from nine to sixteen years inclusive. The causes of underweight considered broadly may be classified as those of race and those of malnutrition. There is a greater general tendency for high school graduates from the city to be underweight than from the rural districts. This is chiefly due to the fact that such small races as southern Europeans and Polish Jews tend to locate in the towns rather than in the country. Shortness of stature is largely independent of environment. It is a characteristic of the above races, and in this country has a geographical distribution similar to them.

Unhealthy environment, bad habits of eating and exercise, and physical handicaps are productive of underdevelopment. Defective vision, deafness, large tonsils, adenoids, nasal obstruction and communicable disease are also preventives and deterrents of growth.

It is the general observation, however, that high school graduates presenting themselves for physical examinations at the time of registration are yearly showing better posture and general physique. The publicity of the physical findings of the draft and the consequent growth in interest in Hygiene and Physical Education is now bearing fruit.

DEFECTS OF THE EYES

Without the use of a cycloplegic, 25% of the men and 32% of the women applying for registration in the fall

of 1922 were found to have errors of refraction of a handicapping severity at the time that they were examined. About 91% of the men and 92% of the women with defective eyesight had their condition uncorrected. Myopia was the most common error of refraction observed. It is more frequent in students from the city. This is due primarily to the racial constitution of the population of large cities, and secondarily to the excessive eyestrain incidental to study, and to clerical and industrial occupations.

As causes of impaired vision, uncorrected astigmatism, short-sightedness and squint aggravated by close work are of the first importance. Dufour has shown that the number of pupils with myopia and the average degree of short-sightedness increases from class to class and with the addition in school demands. This form of myopia is usually primarily due to congenital astigmatism, a very common condition, and to the consequent strain upon the accommodation of the eye in the effort to see. Risley has reported a series of cases in which astigmatic eyes had passed, while under his observation, from hypermetropic to myopic refraction.

Neglected squint is an important factor in the serious impairment and destruction of vision. The bad advice to parents that the child beginning to squint will grow out of it, frequently has led to delay until the eye was practically blind. If the serious consequences of procrastination were known, children would be no more neglected than if they had appendicitis or diptheria.

EAR

Excessive wax in the ear, ceruminosis, was rather a common finding, being present in 16% of the men and 8% of the women. Chronic suppuration of the ear was found in the total of ten cases. This is a very important finding since the condition impairs hearing, is a center of infection that may produce serious complications, and is rarely cured without a surgical operation for the removal of decayed bone.

Middle-ear disease, which causes eighty-five to ninety per cent of all deafness, usually has its origin in the naso-

pharynx and the Eustachian tube. Approximately thirty per cent of the deafness in the United States is due to the suppuration of the middle-ear during childhood. Ten per cent of the discharging ears of children are complications of scarlet fever, measles, or other communicable diseases; in ninety per cent diseased tonsils and adenoids are predisposing causes. In a systematic oral examination of patients with adenoids, Tomlinson found some grade of ear involvement in seventy-five per cent.

Where the function of hearing is impaired, the mentality of the child suffers. He becomes inattentive, in many instances diffident, and frequently a class repeater. Partial deafness, especially when it dates from childhood, is a disadvantage that seldom permits the individual to attain the efficiency of which he would be otherwise capable.

Much deafness would be avoided if disease of the ear were promptly treated by specialists and if parents would see that the adenoids and enlarged tonsils of their children received proper attention. Medical inspection of schools and free treatment for children with disease of the nose, throat and ear whose parents are unable to provide medical care for them should be an important part of any program for the prevention of deafness.

NOSE AND THROAT

Twenty-six and two-tenths per cent of the students examined showed some abnormality of the nose. In the vast majority of cases the conditions were not of pathological significance. Approximately 43% of the defects were due to deviation of the septum and 33% to nasal spurs. Enlarged adenoids showed a very low instance due to removal before examination at registration, the age of the individual, and possibly to being overlooked in rare instances by examiners when rushed. Of the 2955 students examined 17.6% had had their tonsils removed. This is an indication of the greater knowledge of the danger of diseased tonsils. This large per cent of

the removal of the tonsils is a preventive measure of great economic, social, and hygienic significance.

The public is beginning to appreciate more and more that although tonsillitis is generally a mild disease it is not one whose effect upon the patient is always local and one from which the victim always recovers quickly. If it is as Felty believes, a specific streptococcus disease caused by the hemolytic strain of this bacterium, it is a menace to health locally, by extension through the blood stream, by way of the lymphatics, and through the respiratory and intestinal tracts.

Bloomfield and Felty have shown that 40% of the individuals of a large group examined by them when tonsillitis was not prevalent were found to be carriers of the hemolytic streptococcus. Later when certain members of the group developed tonsillitis, the investigators were surprised to find that the ill were among those of the group who were not carriers of the organism. These carriers seem to enjoy immunity during the period of harboring the streptococcus. Spontaneous termination of the carrier state is followed shortly by relatively hypersensibility to tonsillitis. The organisms present in the tonsils of carriers seem to have produced a protective immunity which lasted but a short time after the removal.

From the standpoint of resistance individuals may be divided into two groups; those naturally resistant, who rarely have the disease, and susceptibles who have frequent recurrences with intervals of immunity due to a previous attack and its associated carrier state.

The 17.6% of the prospective students examined who had their tonsils removed had not only gotten rid of a menace to their health but had made conditions in the throats less favorable for the growth for the hemolytic streptococcus. Removal of the tonsils, therefore, would seem to be justified under two conditions; namely, repeated attacks of tonsillitis, and possibly to prevent the individuals from remaining carriers and infecting others. The mere appearance of the tonsils would not necessarily be an indication for excision.

TEETH

The dental examination revealed that every third man examined had defective teeth. In most instances these defects were only slight cavities requiring filling. In a few cases a number of teeth had been lost and consequent facial asymmetry was present. The findings of the dentist emphasize the importance of the care of the teeth to insure proper alignment of the permanent set. It is indeed a rare thing to find perfect teeth in high school graduates. Most of them give their teeth proper attention; a very small per cent are careless of their oral hygiene.

While dental caries is primarily due to bacteria of the mouth acting in the presence of food debris and to certain elements in the saliva which lead to the formation of acid which attacks the enamel, many other factors are predisposing causes. The teeth may have little resistance to decay because of developmental defect, faulty diet, neglect as result of ignorance of parents, cost or lack of dental facilities so common in rural communities.

The ill effects of carious or defective teeth reach beyond the mouth. Decayed teeth may prove the gateway through which pathogenic bacteria reach the blood stream and a root abscess may be the source of arthritis, valvular heart lesions or Bright's disease. Poor teeth are often the cause of indigestion and improper assimilation of food.

With the exception of certain professions and a few individuals in whom the sense of the cosmetic is highly developed, the majority of men and women do not seek their fortune through their faces. The average man or woman, however, desires a symmetrical face. Yet, few parents give sufficient attention to their children's first set of teeth to prevent asymmetry by insuring proper alignment of the permanent set.

GOITER

Thirty-one and eight-tenths per cent of the women and 4 per cent of the men high school graduates showed some enlargement of the thyroid gland, when examined in the

fall of 1922. This gland tends to enlarge during adolescence, but as this swelling seems to be influenced by the locality from which the individual comes, a particular age is not the important factor responsible for the increased size of the thyroid observed. It has been known for a number of years that in certain regions of the world swelling of the thyroid gland was common, and it has been known for a century or more that in America this enlargement is pre-eminently a disease of the Great Lakes' Basin, and its greatest incidence corresponds rather well with that of the hard waters of the Niagara limestone. It is only comparatively recently, however, that this enlargement of the neck was known to occur so extensively in this region and to be common in men, although much less frequent than in women.

Goiter is a disease usually characterized by the enlargement of the thyroid gland which occupies the lower portion of the neck, anterior-laterally. There are two forms of this disorder; simple goiter which is primarily a swelling of this gland, and exophthalmic goiter, an enlarged thyroid accompanied by a distention of the eyeballs, anemia, overactivity of the heart, tremor, muscle weakness, mental irritability, and general organic disturbance.

In the three groups of men and women examined in the falls of 1920-21-22 simple enlargement of the thyroid gland was found to be a health problem of importance in this state. As it is due apparently to iodine insufficiency, it is preventable by the administration of this element, either through such foods as cereals, beets, potatoes, and sea-water salt, or of iodine or its compounds. Prevention of goiter reduces the death rate, increases resistance of the individual to disease, improves his economic status, and promotes his mental, moral, and physical efficiency.

HEART DISEASE

If the hearts of individuals of high school age are carefully auscultated both in the erect and recumbent position and before and after exercise, definite murmurs that are not cardio-respiratory in origin may be heard in from

10 to 15 per cent of those examined. In the great majority of such cases the heart is of normal size, reacts properly to exercise and position, and the diastolic and systolic blood pressure will be found to be within the range of normal. Such individuals enjoy the usual activities of their age without inconvenience or without showing cardiac symptoms of any kind. If this group is carefully observed and repeatedly examined, it will be difficult in most cases to discover anything more indicative of heart abnormality than the murmur. Such conditions are probably functional.

There are, however, of all those examined from 2 to 4 per cent with definite organic heart disease. This latter group is showing a small increase year by year and undoubtedly will eventually go to make up a part of the increasing death rate from organic heart disease in early middle life, unless measures are adopted to protect their hearts.

Heart disease is generally a reminder that entire recovery from infection is often only apparent. The great destruction of life caused by it is usually not the immediate result of acute infection, but rather a slowly progressive failing of the cardio-vascular mechanism due to injuries received originally from such diseases as rheumatism, chorea, tonsillitis, scarlet fever, diphtheria, influenza, or pneumonia. Dublin, in comparing the life expectancy of those who have had typhoid fever, for the three years immediately following the disease, with those who have not had the disease found the death rate in the first group doubled as compared with those who have not had typhoid. It was remarkable that 14.8% of the deaths were due to heart disease, showing that although recovery was apparent the heart was so injured as to cause death in a few years. Lues, of course, plays a great role in the production of heart disease in middle life but was not an apparent factor in any of the cases that came under our observation.

The prevention of heart disease in youth is largely a problem of the elimination of communicable disease. The general adoption of the usual means for the control of epidemic diseases whose complications are involvements

of the heart would undoubtedly be followed by a decrease in the number of cases of this disease found in high school graduates. The high death rate from organic heart disease demands renewed emphasis upon the importance of routine medical examination of the heart and chest. Much will be done in the prevention of this disease when parents, as well as physicians, appreciate the close relation of rheumatism, chorea, and tonsillitis to endocarditis.

It should be generally understood that the symptoms of rheumatism vary in severity from so-called "growing pains" to obvious acute rheumatic fever with an immediate, impending dissolution. The publiic must be so educated as to understand that repeated sore throat and St. Vitus' dance are truly menaces to life, because of the frequent damage to heart valves and to the cardiac muscle.

Both parents and physicians should be on the alert for diseased or permanently enlarged tonsils and adenoids, and should have them removed. The child complaining of tiredness, aching limbs, or who is fidgety or does not desire to work or play should be given a medical examination. Children with even the mildest attack of rheumatism or chorea should receive medical attention and should be watched most carefully to prevent, if possible, the development of inflammation of the heart. The child with an impaired heart should be given close supervision and special school work. Finally, parents as well as the victims of heart impairment should know that a damaged heart, properly treated and cared for in its earliest stages and guarded intelligently through life, is not incompatible with old age and many useful years of service.

HERNIA

The average incidence of hernia among the men graduates of high school registering at the University for the first time over a period of four years is approximately one in twenty-five examined, or 3.7%. A number of these cases observed are of congenital origin or are superinduced by anatomical abnormalities. This condition is also in evidence of the inability of the lower abdominal muscles and fascia to withstand the extraordinary ab-

dominal strain of modern civilization. It may also be considered an indication of man's imperfect adaptation to the erect position.

Chronic constipation, faulty posture, lack of exercise and improper clothes, with the resulting flabby abdominal musculature and sudden strain, are factors in its production. Hernia, to a considerable degree, is preventable. Its presence in young adults is proof of neglected surgery.

SPINAL CURVATURE

While heredity may produce conditions favorable to the development of curvature of the spine, faulty posture is the most frequent cause. Abnormalities of the spine are more common among girls than boys, due, to a large degree, to the differences of dress and the manner of living. Curvature of the spine is part of the price paid by man for the ability to stand erect. The force of gravity is both a predisposing and an exciting cause. Curvature may be secondary to disease and deformity, both of the spine and of other parts of the body.

As only a very small per cent of the cases under consideration are structural in origin, we wish to call attention to them, particularly, as defects of carriage and posture. Happily, the great majority of abnormalities are correctible by physical training and individual attention. Only about 10% of the women and 7% of the men show anatomical abnormalities of the spine that are correctible by gymnastics with difficulty, if at all.

There has been a slight tendency to increase in curvature of the spine among high school graduates during the last four years. This rise, we believe, to a considerable degree is explainable by more careful record of slight deviations from normal. Many of these postural deformities might be described as a slouch or sag and are correctible by the individual himself when his attention is called to it. As his musculature is weak, he needs exercise, otherwise he will resume his old position as soon as his attention is diverted.

In the comparison of the relative frequency of lateral curvature, stooped shoulders, and swayback, scoliosis

is by far the most common deviation of the spine. It constitutes about two-thirds of all spinal abnormalities noted among high school graduates. The comparison also shows that lordosis, or swayback, is more common than kyphosis, or stooped shoulders.

FLAT FEET

While our records show that 35% of the high school graduates examined have some abnormality of the feet, it should be noted that only about 7% of the men and 10% of the women have frank flat feet. Undoubtedly, our statistics include some instances of flat feet that are normal, as it is characteristic of certain races to have flattened arches. It should also be borne in mind that this large per cent is more apparent than real, because it includes a large number of cases of defects in standing and walking that are potential, and not actual signs of pes planus.

We have attempted to discover and to treat flat feet with reference to their predisposing causes by recognizing pes planus as weak feet before flattening of the long arches has developed and the usual train of symptoms are present. The body weight normally passes slightly to the inside of the center of the knee, through a line prolonged from the crest of the tibia, through the ankle, over the dorsum of the foot to the second toe. With the beginning of eversion of the foot and the change of direction of the body weight, it is only a question of time before the symptoms and signs of flat foot become evident.

The importance of muscle insufficiency, improper nutrition and communicable disease in the production of flat foot are shown in the following table, taken from the statistics of Ehrenfried:

Children under twelve years of age examined	1,000
Children with debility of the feet	440
Congenital—club-foot	18
Idiopathic—physical debility	95
Secondary, due to some other condition	327
A. Rickets	200
B. Cases of unsuspected infantile paralysis	107

No comment upon the occurrence of flat feet is complete without emphasis upon the relation of the wearing of ill-fitting shoes to pes planus. The necessity of education directed toward the use of hygienic shoes, proper post-

ure, and of correct methods of walking, is obvious. A study of the geographical distribution of defects of the feet found by Examining Boards under the draft reveals that abnormal feet were comparatively rare in the southern states, due to the practice of the rural part of the population going barefoot and to the negroes, whose feet are not commonly pathologically flat. In the northwest part of the country flat foot is due, presumably, to the large size of the immigrants in this territory. This finding is confirmatory of the role of weight in the causation of flat foot.

Biologically, the relatively high instance of flat foot in young adults indicates that civilization is making demands for adjustment of the feet to modern conditions faster than it can meet them.

The physical and clinical examination of a portion of so representative a group from our population as high school graduates is, in reality, a partial inventory of the physical assets and human liabilities of the nation. Approximately only 7% of all children who enter primary school reach the point in their education where they are about to enter an institution of higher learning. A survey of the physical, mental, and temperamental health of a part of such a group is of great educational, social, economic, and public health interest.

Such a survey gives some indication of the physical, mental, and moral fiber that shows the endurance, persistence, and capacity to meet the increasing requirements of modern education. It reveals something of the ability that, in many instances, overcomes social and economic handicaps to push forward in pursuit of high ideals. It serves as a barometer of the failure and success of man to make complete adaptation to the rapidly advancing requirements of a highly artificial civilization and is, therefore, of biological, racial, and eugenic significance.

Such an inventory provides a rough index of the efficiency of child welfare, and of the care of children during the pre-school age. It gives a rather clear insight into the efficiency of the departments of physical education, and of medical inspections in the community and in the

schools from which these graduates come. It gives more than a hint of the social conditions and the progressiveness and effectiveness of medicine in the various communities in which these graduates live. It is an admirable review of the physical results of competitive athletics upon the adolescent. It is a relatively accurate estimate of the proportion of men in a select group available for military service. It reveals the physical defects which handicap the individual, and justifies itself by increasing his efficiency through correction or alleviation of his condition.

A physical examination is of social and industrial significance since it gives some conception of the suitability of the population for the various occupations which our complex social organization requires. It teaches the laity the nature and value of a good medical examination and stimulates interest in hygiene and sanitation. It gives physicians an opportunity to acquire greater skill in recognizing potential and incipient disease when prevention and cure are most likely to be successful. They get a broader outlook upon disease and have their judgment quickened in the evaluation of symptoms. It benefits society by lengthening the period of activity of those who, by training and experience, will be best fitted to serve it.

A physical examination reveals something of the size and nature of the task before those who seek to raise the physical status of the population to a level more nearly commensurate with the possibilities of attainment. According to the actuarial and medical departments of certain insurance companies, a periodic medical examination has a potential life-saving value of about $30.00 for each such examination.