YOUTH

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CHAPTER I

PRE-ADOLESCENCE

Introduction: Characterization of the age from eight to twelve–The

era of recapitulating the stages of primitive human development–Life close to nature–The age also for drill, habituation, memory, work and regermination–Adolescence superposed upon this stage of life, but very distinct from it.

The years from about eight to twelve constitute a unique period of human life. The acute stage of teething is passing, the brain has acquired nearly its adult size and weight, health is almost at its best, activity is greater and more varied than it ever was before or ever will be again, and there is peculiar endurance, vitality, and resistance to fatigue. The child develops a life of its own outside the home circle, and its natural interests are never so independent of adult influence. Perception is very acute, and there is great immunity to exposure, danger, accident, as well as to temptation. Reason, true morality, religion, sympathy, love, and esthetic enjoyment are but very slightly developed.

Everything, in short, suggests that this period may represent in the individual what was once for a very protracted and relatively stationary period an age of maturity in the remote ancestors of our race, when the young of our species, who were perhaps pygmoid, shifted for themselves independently of further parental aid. The qualities developed during pre-adolescence are, in the evolutionary history of the race, far older than hereditary traits of body and mind which develop later and which may be compared to a new and higher story built upon our primal nature. Heredity is so far both more stable and more secure. The elements of personality are few, but are well organised on a simple, effective plan. The momentum of these traits inherited from our indefinitely remote ancestors is great, and they are often clearly distinguishable from those to be added later. Thus the boy is father of the man in a new sense, in that his qualities are indefinitely older and existed, well compacted, untold ages before the more distinctly human attributes were developed. Indeed there are a
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few faint indications of an earlier age node, at about the age of six, as if amid the instabilities of health we could detect signs that this may have been the age of puberty in remote ages of the past. I have also given reasons that lead me to the conclusion that, despite its dominance, the function of sexual maturity and procreative power is peculiarly mobile up and down the age-line independently of many of the qualities usually so closely associated with it, so that much that sex created in the phylum now precedes it in the individual.

Rousseau would leave prepubescent years to nature and to these primal hereditary impulsions and allow the fundamental traits of savagery their fling till twelve. Biological psychology finds many and cogent reasons to confirm this view if only a proper environment could be provided . The child revels in savagery; and if its tribal, predatory,

hunting, fishing, fighting, roving, idle, playing proclivities could be indulged in the country and under conditions that now, alas! seem hopelessly ideal, they could conceivably be so organized and directed as to be far more truly humanistic and liberal than all that the best modern school can provide. Rudimentary organs of the soul, now suppressed, perverted, or delayed, to crop out in menacing forms later, would be developed in their season so that we should be immune to them in maturer years, on the principle of the Aristotelian catharsis for which I have tried to suggest a far broader application than the Stagirite could see in his day.

These inborn and more or less savage instincts can and should be allowed some scope. The deep and strong cravings in the individual for those primitive experiences and occupations in which his ancestors became skilful through the pressure of necessity should not be ignored, but can and should be, at least partially, satisfied in a vicarious way, by tales from literature, history, and tradition which present the crude and primitive virtues of the heroes of the world's childhood. In this way, aided by his vivid visual imagination, the child may enter upon his heritage from the past, live out each stage of life to its fullest and realize in himself all its manifold tendencies. Echoes only of the vaster, richer life of the remote past of the race they must remain, but just these are the murmurings of the only muse that can save from the omnipresent dangers of precocity. Thus we not only rescue from the danger of loss, but utilize for further psychic growth the results of the higher heredity, which are the most precious and potential things on earth. So, too, in our urbanized hothouse life, that tends to ripen everything before its time, we must teach nature, although the very phrase is ominous. But we must not, in so doing, wean still more from, but perpetually incite to visit, field, forest, hill, shore, the water, flowers, animals, the true homes of childhood in this wild, undomesticated stage from which modern conditions have kidnapped and transported him. Books and reading are distasteful, for the very soul and body cry out for a more active, ob jective life, and to know nature and man at first hand. These two staples, stories and nature, by these informal methods of

the home and the environment, constitute fundamental education.

But now another remove from nature seems to be made necessary by the manifold knowledges and skills of our highly complex civilization. We should transplant the human sapling, I concede reluctantly, as early as eight, but not before, to the schoolhouse with its imperfect lighting, ventilation, temperature. We must shut out nature and open books. The child must sit on unhygienic benches and work the tiny muscles that wag the tongue and pen, and let all the others, which constitute nearly half its weight, decay. Even if it be prematurely, he must be sub jected to special disciplines and be apprenticed to the higher qualities of adulthood; for he is not only a product of nature, but a candidate for a highly developed humanity. To many, if not most, of the influences here there can be at first but little inner response. Insight, understanding, interest, sentiment, are for the most part only nascent; and most that pertains to the true kingdom of mature manhood is embryonic. The wisest requirements seem to the child more or less alien, arbitrary, heteronomous, artificial, falsetto.

There is much passivity, often active resistance and evasion, and perhaps spasms of obstinacy, to it all. But the senses are keen and alert, reactions immediate and vigorous; and the memory is quick, sure

and lasting; and ideas of space, time, and physical causation, and of many a moral and social licit and non-licit, are rapidly unfolding. Never again will there be such susceptibility to drill and discipline, such plasticity to habituation, or such ready adjustment to new conditions. It is the age of external and mechanical training. Reading, writing, drawing, manual training, musical technic, foreign tongues and their pronunciations, the manipulation of numbers and of geometrical elements, and many kinds of skill have now their golden hour; and if it passes unimproved, all these can never be acquired later without a heavy handicap of disadvantage and loss. These necessities may be hard for the health of body, sense, mind, as well as for morals; and pedagogic art consists in breaking the child into them betimes as intensely and as quickly as possible with minimal strain and with the least amount of explanation or coquetting for natural interest, and in calling medicine confectionery. This is not teaching in its true sense so much as it is drill, inculcation, and regimentation. The method should be mechanical, repetitive, authoritative, dogmatic. The automatic powers are now at their very apex, and they can do and bear more than our degenerate pedagogy knows or dreams of. Here we have something to learn from the schoolmasters of the past back to the middle ages, and even from the ancients. The greatest stress, with short periods and few hours, incessant insistence, incitement, and little reliance upon interest, reason or work done without the presence of the teacher, should be the guiding principles for pressure in these essentially formal and, to the child, contentless elements of knowledge. These should be sharply distinguished from the indigenous, evoking, and more truly educational factors described in the last paragraph, which are meaty, content-full, and relatively formless as to time of day, method,

spirit, and perhaps environment and personnel of teacher, and possibly somewhat in season of the year, almost as sharply as work differs from play, or perhaps as the virility of man that loves to command a phalanx, be a martinet and drill-master, differs from femininity which excels in persuasion, sympathetic insight, story-telling, and in the tact that discerns and utilizes spontaneous interests in the young.

Adolescence is a new birth, for the higher and more completely human traits are now born. The qualities of body and soul that now emerge are far newer. The child comes from and harks back to a remoter past; the adolescent is neo-atavistic, and in him the later acquisitions of the race slowly become prepotent. Development is less gradual and more saltatory, suggestive of some ancient period of storm and stress when old moorings were broken and a higher level attained. The annual rate of growth in height, weight, and strength is increased and often doubled, and even more. Important functions, previously non-existent, arise. Growth of parts and organs loses its former proportions, some permanently and some for a season. Some of these are still growing in old age and others are soon arrested and atrophy. The old measures of dimensions become obsolete, and old harmonies are broken. The range of individual differences and average errors in all physical measurements and all psychic tests increases. Some linger long in the childish stage and advance late or slowly, while others push on with a sudden outburst of impulsion to early maturity. Bones and muscles lead all other tissues, as if they vied with each other; and there is frequent flabbiness or tension as one or the other leads. Nature arms youth for conflict with all the resources at her command–speed, power of

shoulder, biceps, back, leg, jaw–strengthens and enlarges skull, thorax, hips, makes man aggressive and prepares woman's frame for maternity.

CHAPTER II

THE MUSCLES AND MOTOR POWERS IN GENERAL

Muscles as organs of the will, of character and even of thought–The muscular virtues–Fundamental and accessory muscles and functions–The development of the mind and of the upright position–Small muscles as organs of thought–School lays too much stress upon these–Chorea–vast numbers of automatic movements in children–Great variety of spontaneous activities–Poise, control and spurtiness–Pen and tongue wagging–Sedentary school life vs free out-of-door activities–Modern decay of muscles, especially in girls–Plasticity of motor habits at puberty.

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The muscles are by weight about forty-three per cent. of the average adult male human body. They expend a large fraction of all the kinetic energy of the adult body, which a recent estimate places as high as one-fifth. The cortical centers for the voluntary muscles extend over most of the lateral psychic zones of the brain, so that their culture is brain building. In a sense they are organs of digestion, for which function they play a very important rˆole. Muscles are in a most intimate and peculiar sense the organs of the will. They have built all the roads, cities, and machines in the world, written all the books, spoken all the words, and, in fact, done everything that man has accomplished with matter. If they are undeveloped or grow relaxed and flabby, the dreadful chasm between good intentions and their execution is liable to appear and widen. Character might be in a sense defined as a plexus of motor habits. To call conduct three-fourths of life, with Matthew Arnold; to describe man as one-third intellect and two-thirds will, with Schopenhauer; to urge that man is what he does or that he is the sum of his movements, with F.W. Robertson; that character is simply muscle habits, with Maudsley; that the age of art is now slowly superseding the age of science, and that the artist will drive out with the professor, with the anonymous author of "Rembrandt als Erzicher";[1] that history is consciously willed movements, with Bluntschli; or that we could form no conception of force or energy in the world but for our own muscular effort; to hold that most thought involves change of muscle tension as more or less integral to it–all this shows how we have modified the antique Ciceronian conception vivere est cogitari , [To live is to think] to vivere est velle , [To live is to will] and gives us a new sense of the importance of muscular development and regimen.[2]

Modern psychology thus sees in muscles organs of expression for all efferent processes. Beyond all their demonstrable functions, every change of attention and of psychic states generally plays upon them unconsciously, modifying their tension in subtle ways so that they may be called organs of thought and feeling as well as of will, in which some now see the true Kantian thing-in-itself the real substance of the world, in the anthropomorphism of force. Habits even determine the deeper strata of belief; thought is repressed action; and deeds, not words, are the language of complete men. The motor areas are closely related and largely identical with the psychic, and muscle culture develops brain-centers as nothing else yet demonstrably does. Muscles are the vehicles of habituation, imitation, obedience, character, and

even of manners and customs. For the young, motor education is cardinal, and is now coming to due recognition; and, for all, education is incomplete without a motor side. Skill, endurance, and perseverance may almost be called muscular virtues; and fatigue, velleity, caprice, ennui , restlessness, lack of control and poise, muscular faults.

To understand the momentous changes of motor functions that

characterize adolescence we must consider other than the measurable aspects of the sub ject. Perhaps the best scale on which to measure all normal growth of muscle structure and functions is found in the progress from fundamental to accessory. The former designates the muscles and movements of the trunk and large joints, neck, back, hips, shoulders, knees, and elbows, sometimes called central, and which in general man has in common with the higher and larger animals. Their activities are few, mostly simultaneous, alternating and rhythmic, as of the legs in walking, and predominate in hard-working men and women with little culture or intelligence, and often in idiots. The latter or accessory movements are those of the hand, tongue, face, and articulatory organs, and these may be connected into a long and greatly diversified series, as those used in writing, talking, piano-playing. They are represented by smaller and more numerous muscles, whose functions develop later in life and represent a higher standpoint of evolution. These smaller muscles for finer movements come into function later and are chiefly associated with psychic activity, which plays upon them by incessantly changing their tensions, if not causing actual movement. It is these that are so liable to disorder in the many automatisms and choreic tics we see in school children, especially if excited or fatigued. General paralysis usually begins in the higher levels by breaking these down, so that the first symptom of its insidious and never interrupted progress is inability to execute the more exact and delicate movements of tongue or hand, or both. Starting with the latest evolutionary level, it is a devolution that may work downward till very many of the fundamental activities are lost before death.

Nothing better illustrates this distinction than the difference between the fore foot of animals and the human hand. The first begins as a fin or paddle or is armed with a hoof, and is used solely for locomotion. Some carnivora with claws use the fore limb also for holding well as tearing, and others for digging. Arboreal life seems to have almost created the simian hand and to have wrought a revolution in the form and use of the forearm and its accessory organs, the fingers. Apes and other tree-climbing creatures must not only adjust their prehensile organ to a wide variety of distances and sizes of branches, but must use the hands more or less freely for picking, transporting, and eating fruit; and this has probably been a prime factor in lifting man to the erect position, without which human intelligence as we know it could have hardly been possible. ”When we attempt to measure the gap between man and the lower animals in terms of the form of movement, the wonder is no less great than when we use the term of mentality.”[3] The degree of approximation to human intelligence in anthropoid animals follows very closely the degree of approximation to human movements.

The gradual acquirement of the erect position by the human infant admirably repeats this long phylogenetic evolution.[4] At first the limbs are of almost no use in locomotion, but the fundamental trunk

muscles with those that move the large joints are more or less spasmodically active. Then comes creeping, with use of the hip muscles, while all below the knee is useless, as also are the fingers. Slowly the leg and foot are degraded to locomotion, slowly the great toe becomes more limited in its action, the thumb increases in flexibility and strength of opposition, and the fingers grow more mobile and controllable. As the body slowly assumes the vertical attitude, the form of the chest changes till its greatest diameter is transverse instead of from front to back. The shoulder-blades are less parallel than in quadrupeds, and spread out till they approximate the same plane. This gives the arm freedom of movement laterally, so that it can be rotated one hundred and eighty degrees in man as contrasted to one hundred degrees in apes, thus giving man the command of almost any point within a sphere of which the two arms are radii. The power of grasping was partly developed from and partly added to the old locomotor function of the fore limbs; the jerky aimless automatisms, as well as the slow rhythmic flexion and extension of the fingers and hand, movements which are perhaps survivals of arboreal or of even earlier aquatic life, are co¨ordinated; and the bilateral and simultaneous rhythmic movements of the heavier muscles are supplemented by the more finely adjusted and specialized activities which as the end of the growth period is approached are determined less by heredity and more by environment. In a sense, a child or a man is the sum total of his movements or tendencies to move; and nature and instinct chiefly determine the basal, and education the accessory parts of our activities.

The entire accessory system is thus of vital importance for the development of all of the arts of expression. These smaller muscles might almost be called organs of thought. Their tension is modified with the faintest change of soul, such as is seen in accent, inflection, facial expressions, handwriting, and many forms of so-called mind-reading, which, in fact, is always muscle-reading. The day-laborer of low intelligence, with a practical vocabulary of not over five hundred words, who can hardly move each of his fingers without moving others or all of them, who can not move his brows or corrugate his forehead at will, and whose inflection is very monotonous, illustrates a condition of arrest or atrophy of this later, finer, accessory system of muscles. On the other hand, the child, precocious in any or all of these later respects, is very liable to be undeveloped in the larger and more fundamental parts and functions. The full unfoldment of each is, in fact, an inexorable condition precedent for the normal development to full and abiding maturity of the higher and more refined muscularity, just as conversely the awkwardness and clumsiness of adolescence mark a temporary loss of balance in the opposite direction. If this general conception be correct, then nature does not finish the basis of her pyramid in the way Ross, Mercier, and others have assumed, but lays a part of the foundation and, after carrying it to an apex, normally goes back and adds to the foundation to carry up the apex still higher

and, if prevented from so doing, expends her energy in building the apex up at a sharper angle till instability results. School and kindergarten often lay a disproportionate strain on the tiny accessory muscles, weighing altogether but a few ounces, that wag the tongue, move the pen, and do fine work requiring accuracy. But still at this

stage prolonged work requiring great accuracy is irksome and brings dangers homologous to those caused by too much fine work in the kindergarten before the first adjustment of large to small muscles, which lasts until adolescence, is established. Then disproportion between function and growth often causes symptoms of chorea. The chief danger is arrest of the development and control of the smaller muscles. Many occupations and forms of athletics, on the contrary, place the stress mainly upon groups of fundamental muscles to the neglect of finer motor possibilities. Some who excel in heavy athletics no doubt coarsen their motor reactions, become not only inexact and heavy but unresponsive to finer stimuli, as if the large muscles were hypertrophied and the small ones arrested. On the other hand, many young men, and probably more young women, expend too little of their available active energy upon basal and massive muscle work, and cultivate too much, and above all too early, the delicate responsive work. This is, perhaps, the best physiological characterization of precocity and issues in excessive nervous and muscular irritability. The great influx of muscular vigor that unfolds during adolescent years and which was originally not only necessary to successful propagation, but expressive of virility, seems to be a very plastic quantity, so that motor regimen and exercise at this stage is probably more important and all-conditioning for mentality, sexuality, and health than at any other period of life. Intensity, and for a time a spurty diathesis, is as instinctive and desirable as are the copious minor automatisms which spontaneously give the alphabet out of which complex and finer motor series are later spelled by the conscious will. Mercier and others have pointed out that, as most skilled labor, so school work and modern activities in civilized life generally lay premature and disproportionate strains upon those kinds of movement requiring exactness. Stress upon basal movements is not only compensating but is of higher therapeutic value against the disorders of the accessory system; it constitutes the best core or prophylactic for fidgets and tense states, and directly develops poise, control, and psycho-physical equilibrium. Even when contractions reach choreic intensity the best treatment is to throw activities down the scale that measures the difference between primary and secondary movements and to make the former predominate.

The number of movements, the frequency with which they are repeated, their diversity, the number of combinations, and their total kinetic quantum in young children, whether we consider movements of the body as a whole, fundamental movements of large limbs, or finer accessory motions, is amazing. Nearly every external stimulus is answered by a motor response. Dresslar[5] observed a thirteen months' old baby for four hours, and found, to follow Preyer's classification, impulsive or

spontaneous, reflex, instinctive, imitative, inhibitive, expressive, and even deliberative movements, with marked satisfaction in rhythm, attempts to do almost anything which appealed to him, and almost inexhaustible efferent resources. A friend has tried to record every word uttered by a four-year-old girl during a portion of a day, and finds nothing less than verbigerations. A teacher noted the activities of a fourteen-year-old boy during the study time of a single school day[6], with similar results.

Lindley[7] studied 897 common motor automatisms in children, which he divided into 92 classes: 45 in the region of the head, 20 in the feet and legs, 19 in the hands and fingers. Arranged in the order of

frequency with which each was found, the list stood as follows: fingers, feet, lips, tongue, head, body, hands, mouth, eyes, jaws, legs, forehead, face, arms, ears. In the last five alone adolescents exceeded children, the latter excelling the former most in those of head, mouth, legs, and tongue, in this order. The writer believes that there are many more automatisms than appeared in his returns. School life, especially in the lower grades, is a rich field for the study of these activities. They are familiar, as licking things, clicking with the tongue, grinding the teeth, scratching, tapping, twirling a lock of hair or chewing it, biting the nails (B´erillon's onychophagia), shrugging, corrugating, pulling buttons or twisting garments, strings, etc., twirling pencils, thumbs, rotating, nodding and shaking the head, squinting and winking, swaying, pouting and grimacing, scraping the floor, rubbing hands, stroking, patting, flicking the fingers, wagging, snapping the fingers, muffling, squinting, picking the face, interlacing the fingers, cracking the joints, finger plays, biting and nibbling, trotting the leg, sucking things, etc.

The average number of automatisms per 100 persons Smith found to be in children 176, in adolescents 110. Swaying is chiefly with children; playing and drumming with the fingers is more common among adolescents; the movements of fingers and feet decline little with age, and those of eyes and forehead increase, which is significant for the development of attention. Girls excel greatly in swaying, and also, although less, in finger automatism; and boys lead in movements of tongue, feet, and hands. Such movements increase, with too much sitting, intensity of effort, such as to fix attention, and vary with the nature of the activity willed, but involve few muscles directly used in a given task. They increase up the kindergarten grades and fall off rapidly in the primary grades; are greater with tasks requiring fine and exact movements than with those involving large movements. Automatisms are often a sign of the difficulty of tasks. The restlessness that they often express is one of the commonest signs of fatigue. They are mostly in the accessory muscles, while those of the fundamental muscles (body, legs, and arms) disappear rapidly with age; those of eye, brow, and jaw show greatest increase with age, but

their frequency in general declines with growing maturity, although there is increased frequency of certain specialized contractions, which indicate the gradual settling of expression in the face.

Often such movements pass over by insensible gradation into the morbid automatism of chorea, and in yet lower levels of decay we see them in the aimless picking and plucking movements of the fingers of the sick. In idiots[8] arrest of higher powers often goes with hypertrophy of these movements, as seen in head-beaters (as if, just as nature impels those partially blind to rub the eyes for "light-hunger," so it prompts the feeble-minded to strike the head for cerebrations), rockers, rackers, shakers, biters, etc. Movements often pass to fixed attitudes and postures of limbs or body, disturbing the normal balance between flexors and extensors, the significance of which as nerve signs or exponents of habitual brain states and tensions Warner has so admirably shown.

Abundance and vigor of automatic movements are desirable, and even a considerable degree of restlessness is a good sign in young children. Many of what are now often called nerve signs and even choreic symptoms, the fidgetiness in school on cloudy days and often after a

vacation, the motor superfluities of awkwardness, embarrassment, extreme effort, excitement, fatigue, sleepiness, etc., are simply the forms in which we receive the full momentum of heredity and mark a natural richness of the raw material of intellect, feeling, and especially of will. Hence they must be abundant. All parts should act in all possible ways at first and untrammeled by the activity of all other parts and functions. Some of these activities are more essential for growth in size than are later and more conscious movements. Here as everywhere the rule holds that powers themselves must be unfolded before the ability to check or even to use them can develop. All movements arising from spontaneous activity of nerve cells or centers must be made in order even to avoid the atrophy of disease. Not only so, but this purer kind of innateness must often be helped out to some extent in some children by stimulating reflexes; a rich and wide repertory of sensation must be made familiar; more or less and very guarded, watched and limited experiences of hunger, thirst, cold, heat, tastes, sounds, smells, colors, brightnesses, tactile irritations, and perhaps even occasional tickling and pain to play off the vastly complex function of laughing, crying, etc., may in some cases be judicious. Conscious and unconscious imitation or repetition of every sort of copy may also help to establish the immediate and low-level connection between afferent and efferent processes that brings the organism into direct rapport and harmony with the whole world of sense. Perhaps the more rankly and independently they are developed to full functional integrity, each in its season, if we only knew that season, the better. Premature control by higher centers, or co¨ordination into higher compounds of habits and ordered serial activities, is repressive and wasteful, and the mature will of which they are components, or which must at least domesticate them, is

stronger and more forcible if this serial stage is not unduly abridged.

But, secondly, many, if not most, of these activities when developed a little, group after group, as they arise, must be controlled, checked, and organized into higher and often more serial compounds. The inhibiting functions are at first hard. In trying to sit still the child sets its teeth, holds the breath, clenches its fists and perhaps makes every muscle tense with a great effort that very soon exhausts. This repressive function is probably not worked from special nervous centers, nor can we speak with confidence of collisions with ”sums of arrest” in a sense analogous to that of Herbart, or of stimuli that normally cause catabolic molecular processes in the cell, being mysteriously diverted to produce increased instability or anabolic lability in the sense of Wundt’s Mechanik der Nerven . The concept now suggested by many facts is that inhibition is irradiation or long circuiting to higher and more complex brain areas, so that the energy, whether spontaneous or reflex, is diverted to be used elsewhere. These combinations are of a higher order, more remote from reflex action, and modified by some Jacksonian third level.[9] Action is now not from independent centers, but these are slowly associated, so that excitation may flow off from one point to any other and any reaction may result from any stimulus.

The more unified the brain the less it suffers from localization, and the lower is the level to which any one function can exhaust the whole. The tendency of each group of cells to discharge or overflow

into those of lower tension than themselves increases as correspondence in time and space widens. The more one of a number of activities gains in power to draw on all the brain, or the more readily the active parts are fed at cost of the resting parts, the less is rest to be found in change from one of these activities to another, and the less do concentration and specialization prove to be dangerous. Before, the aim was to wake all parts to function; now it is to connect them. Intensity of this cross-section activity now tends to unity, so that all parts of the brain energize together. In a brain with this switchboard function well organized, each reaction has grown independent of its own stimulus and may result from any stimulation, and each act, e.g., a finger movement of a peculiar nature, may tire the whole brain. This helps us to understand why brain-workers so often excel laborers not only in sudden dynamometric strength test, but in sustained and long-enduring effort. In a good brain or in a good machine, power may thus be developed over a large surface, and all of it applied to a small one, and hence the dangers of specialization are lessened in exact proportion as the elements of our ego are thus compacted together. It is in the variety and delicacy of these combinations and all that they imply, far more than in the elements of which they are composed, that man rises farthest above the higher animals; and of these powers later adolescence is the golden age. The aimless and archaic movements of infancy, whether massive and

complex or in the form of isolated automatic tweaks or twinges, are thus, by slow processes of combined analysis and synthesis, involving changes as radical as any in all the world of growth, made over into habits and conduct that fit the world of present environment.

But, thirdly, this long process carried out with all degrees of completeness may be arrested at any unfinished stage. Some automatisms refuse to be controlled by the will, and both they and it are often overworked. Here we must distinguish constantly between (1) those growing rankly in order to be later organized under the will, and (2) those that have become feral after this domestication of them has lost power from disease or fatigue, and (3) those that have never been sub jugated because the central power that should have used them to weave the texture of willed action–the proper language of complete manhood–was itself arrested or degenerate. With regard to many of these movements these distinctions can be made with confidence, and in some children more certainly than in others. In childhood, before twelve, the efferent patterns should be developed into many more or less indelible habits, and their colors set fast. Motor specialties requiring exactness and grace like piano-playing, drawing, writing, pronunciation of a foreign tongue, dancing, acting, singing, and a host of virtuosities, must be well begun before the relative arrest of accessory growth at the dawn of the ephebic regeneration and before its great afflux of strength. The facts seem to show that children of this age, such as Hancock[10] described, who could not stand with feet close together and eyes closed without swaying much, could not walk backward, sit still half a minute, dress alone, tie two ends of a string together, interlace slats, wind thread, spin a top, stand on toes or heels, hop on each foot, drive a nail, roll a hoop, skate, hit fingers together rapidly in succession beginning at the little finger and then reversing, etc., are the very ones in whom automatisms are most marked or else they are those constitutionally inert, dull, or uneducable.

In children these motor residua may persist as characteristic features of inflection, accent, or manners; automatisms may become morbid in stammering or stuttering, or they may be seen in gait, handwriting, tics or tweaks, etc. Instead of disappearing with age, as they should, they are seen in the blind as facial grimaces uncorrected by the mirror or facial consciousness, in the deaf as inarticulate noises; and they may tend to grow monstrous with age as if they were disintegrated fragments of our personality, split off and aborted, or motor parasites leaving our psycho-physic ego poorer in energy and plasticity of adaptation, till the distraction and anarchy of the individual nature becomes conspicuous and pathetic.

At puberty, however, when muscle habits are so plastic, when there is a new relation between quantity or volume of motor energy and qualitative differentiation, and between volitional control and reflex activities, these kinetic remnants strongly tend to shoot together

into wrong aggregates if right ones are not formed. Good manners and correct motor form generally, as well as skill, are the most economic ways of doing things; but this is the age of wasteful ways, awkwardness mannerisms, tensions that are a constant leakage of vital energy, perhaps semi-imperative acts, contortions, quaint movements, more elaborated than in childhood and often highly anesthetic and disagreeable, motor co¨ordinations that will need laborious decomposition later. The avoidable factor in their causation is, with some modification, not unlike that of the simpler feral movements and faulty attitudes, carriage, and postures in children; viz., some form of overpressure or misfit between environment and nature. As during the years from four to eight there is great danger that overemphasis of the activities of the accessory muscles will sow the seeds of chorea, or aggravate predispositions to it, now again comes a greatly increased danger, hardly existing from eight to twelve, that overprecision, especially if fundamental activities are neglected, will bring nervous strain and stunting precocity. This is again the age of the basal, e.g., hill-climbing muscle, of leg and back and shoulder work, and of the yet more fundamental heart, lung, and chest muscles. Now again, the study of a book, under the usual conditions of sitting in a closed space and using pen, tongue, and eye combined, has a tendency to overstimulate the accessory muscles. This is especially harmful for city children who are too prone to the distraction of overmobility at an age especially exposed to maladjustment of motor income and expenditure; and it constitutes not a liberal or power-generating, but a highly and prematurely specialized, narrowing, and weakening education unless offset by safeguards better than any system of gymnastics, which is at best artificial and exaggerated.

As Bryan well says, "The efficiency of a machine depends so far as we know upon the maximum force, rate, amplitude, and variety of direction of its movements and upon the exactness with which below these maxima the force, rate, amplitude, and direction of the movements can be controlled." The motor efficiency of a man depends upon his ability in all these respects. Moreover, the education of the small muscles and fine adjustments of larger ones is as near mental training as physical culture can get; for these are the thought-muscles and movements, and their perfected function is to reflect and express by slight modifications of tension and tone every psychic change. Only the brain itself is more closely and immediately an organ of thought than are

these muscles and their activity, reflex, spontaneous, or imitative in origin. Whether any of them are of value, as Lindley thinks, in arousing the brain to activity, or as M¨
uller suggests, in drawing off
sensations or venting efferent impulses that would otherwise distract, we need not here discuss. If so, this is, of course, a secondary and late function–nature's way of making the best of things and utilizing remnants.

With these facts and their implications in mind we can next pass to consider the conditions under which the adolescent muscles best

develop. Here we confront one of the greatest and most difficult problems of our age. Changes in modern motor life have been so vast and sudden as to present some of the most comprehensive and all-conditioning dangers that threaten civilized races. Not only have the forms of labor been radically changed within a generation or two, but the basal activities that shaped the body of primitive man have been suddenly swept away by the new methods of modern industry. Even popular sports, games, and recreations, so abundant in the early life of all progressive peoples, have been reduced and transformed; and the play age, that once extended on to middle life and often old age, has been restricted. Sedentary life in schools and offices, as we have seen, is reducing the vigor and size of our lower limbs. Our industry is no longer under hygienic conditions; and instead of being out of doors, in the country, or of highly diversified kinds, it is now specialized, monotonous, carried on in closed spaces, bad air, and perhaps poor light, especially in cities. The diseases and arrest bred in the young by life in shops, offices, factories, and schools increase. Work is rigidly bound to fixed hours, uniform standards, stints and piece-products; and instead of a finished article, each individual now achieves a part of a single process and knows little of those that precede or follow. Machinery has relieved the large basal muscles and laid more stress upon fine and exact movements that involve nerve strain. The coarser forms of work that involve hard lifting, carrying, digging, etc., are themselves specialized, and skilled labor requires more and more brain-work. It has been estimated that "the diminution of manual labor required to do a given quantity of work in 1884 as compared with 1870 is no less than 70 per cent."[11] Personal interest in and the old native sense of responsibility for results, ownership and use of the finished products, which have been the inspiration and soul of work in all the past, are in more and more fields gone. Those who realize how small a proportion of the young male population train or even engage in amateur sports with zest and regularity, how very few and picked men strive for records, and how immediate and amazing are the results of judicious training, can best understand how far below his possibilities as a motor being the average modern man goes through life, and how far short in this respect he falls from fulfilling nature's design for him.

For unnumbered generations primitive man in the nomad age wandered, made perhaps annual migrations, and bore heavy burdens, while we ride relatively unencumbered. He tilled the reluctant soil, digging with rude implements where we use machines of many man-power. In the stone, iron, and bronze age, he shaped stone and metals, and wrought with infinite pains and effort, products that we buy without even knowledge

of the processes by which they are made. As hunter he followed game, which, when found, he chased, fought, and overcame in a struggle perhaps desperate, while we shoot it at a distance with little risk or effort. In warfare he fought hand to hand and eye to eye, while we kill "with as much black powder as can be put in a woman's thimble."
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He caught and domesticated scores of species of wild animals and taught them to serve him; fished with patience and skill that compensated his crude tools, weapons, implements, and tackle; danced to exhaustion in the service of his gods or in memory of his forebears imitating every animal, rehearsing all his own activities in mimic form to the point of exhaustion, while we move through a few figures in closed spaces. He dressed hides, wove baskets which we can not reproduce, and fabrics which we only poorly imitate by machinery, made pottery which set our fashions, played games that invigorated body and soul. His courtship was with feats of prowess and skill, and meant physical effort and endurance.

Adolescent girls, especially in the middle classes, in upper grammar and high school grades, during the golden age for nascent muscular development, suffer perhaps most of all in this respect. Grave as are the evils of child labor, I believe far more pubescents in this country now suffer from too little than from too much physical exercise, while most who suffer from work do so because it is too uniform, one-sided, accessory, or performed under unwholesome conditions, and not because it is excessive in amount. Modern industry has thus largely ceased to be a means of physical development and needs to be offset by compensating modes of activity. Many labor-saving devices increase neural strain, so that one of the problems of our time is how to preserve and restore nerve energy. Under present industrial systems this must grow worse and not better in the future. Healthy natural industries will be less and less open to the young. This is the new situation that now confronts those concerned for motor education, if they would only make good what is lost.

Some of the results of these conditions are seen in average measurements of dimensions, proportions, strength, skill, and control. Despite the excellence of the few, the testimony of those most familiar with the bodies of children and adults, and their physical powers, gives evidence of the ravages of modern modes of life that, without a wide-spread motor revival, can bode only degeneration for our nation and our race. The number of common things that can not be done at all; the large proportion of our youth who must be exempted from any kinds of activity or a great amount of any; the thin limbs, collapsed shoulders or chests, the bilateral asymmetry, weak hearts, lungs, eyes, puny and bad muddy or pallid complexions, tired ways, automatism, dyspeptic stomachs, the effects of youthful error or of impoverished heredity, delicate and tender nurture, often, alas, only too necessary, show the lamentable and cumulative effects of long neglect of the motor abilities, the most educable of all man's powers, and perhaps the most important for his well-being. If the unfaithful stewards of these puny and shameful bodies had again, as in Sparta, to strip and stand before stern judges and render them account, and be smitten with a conviction of their weakness, guilty deformity, and arrest of growth; if they were brought to realize how they are fallen
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beings, as weak as stern theologians once deemed them depraved, and how great their need of physical salvation, we might hope again for a physical renaissance. Such a rebirth the world has seen but twice or perhaps thrice, and each was followed by the two or three of the brightest culture periods of history, and formed an epoch in the advancement of the kingdom of man. A vast body of evidence could be collected from the writings of anthropologists showing how superior unspoiled savages are to civilized man in correct or esthetic proportions of body, in many forms of endurance of fatigue, hardship, and power to bear exposure, in the development and preservation of teeth and hair, in keenness of senses, absence of deformities, as well as immunity to many of our diseases. Their women are stronger and bear hardship and exposure, monthly periods and childbirth, better. Civilization is so hard on the body that some have called it a disease, despite the arts that keep puny bodies alive to a greater average age, and our greater protection from contagious and germ diseases.

The progressive realization of these tendencies has prompted most of the best recent and great changes motor-ward in education and also in personal regimen. Health- and strength-giving agencies have put to school the large motor areas of the brain, so long neglected, and have vastly enlarged their scope. Thousands of youth are now inspired with new enthusiasm for physical development; and new institutions of many kinds and grades have arisen, with a voluminous literature, unnumbered specialists, specialties, new apparatus, tests, movements, methods, and theories; and the press, the public, and the church are awakened to a fresh interest in the body and its powers. All this is magnificent, but sadly inadequate to cope with the new needs and dangers, which are vastly greater.

[Footnote 1: Dieterich. G¨ottingen, 1886.]

[Footnote 2: See Chap. xii.]

[Footnote 3: F. Burk in From Fundamental to Accessory. Pedagogical Seminary, Oct., 1898, vol. 6, pp. 5-64.]

[Footnote 4: Creeping and Walking, by A.W. Trettien. American Journal of Psychology, October, 1900, vol. 12, pp. 1-57.]

[Footnote 5: A Morning Observation of a Baby. Pedagogical Seminary, December 1901, vol. 8, pp. 469-481.]

[Footnote 6: Kate Carman. Notes on School Activity. Pedagogical Seminary, March, 1902, vol. 9, pp. 106-117.]

[Footnote 7: A Preliminary Study of Some of the Motor Phenomena of Mental Effort. American Journal of Psychology, July, 1896, vol. 7, pp. 491-517.]

[Footnote 8: G.E. Johnson. Psychology and Pegagogy of Feeble-Minded Children. Pedagogical Seminary, October, 1895, vol. 3, pp. 246-301.]

[Footnote 9: Dr. Hughlings Jackson, the eminent English pathologist, was the first to make practical application of the evolutionary theory of the nervous system to the diagnosis and treatment of epilepsies and mental diseases. The practical success of this application was so great that the Hughlings-Jackson ”three-level theory” is now the established basis of English diagnosis. He conceived the nervous mechanism as composed of three systems, arranged in the form of a hierarchy, the higher including the lower, and yet each having a certain degree of independence. The first level represents the type of simplest reflex and involuntary movement and is localized in the gray matter of the spinal cord, medulla, and pons. The second, or middle

level, comprises those structures which receive sensory impulses from the cells of the lowest level instead of directly from the periphery or the non-nervous tissues. The motor cells of this middle level also discharge into the motor mechanisms of the lowest level. Jackson located these middle level structures in the cortex of the central convolutions, the basal ganglia and the centers of the special senses in the cortex. The highest level bears the same relation to the middle level that it bears to the lowest i.e., no continuous connection between the highest and the lowest is assumed; the structures of the middle level mediate between them as a system of relays. According to this hierarchical arrangement of the nervous system, the lowest level which is the simplest and oldest "contains the mechanism for the simple fundamental movements in reflexes and involuntary reactions. The second level regroups these simple movements by combinations and associations of cortical structure in wider, more complex mechanisms, producing a higher class of movements. The highest level unifies the whole nervous system and, according to Jackson, is the anatomical basis of mind."

For a fuller account of this theory see Burk: From Fundamental to Accessory in the Nervous System and of Movements. Pedagogical Seminary, October, 1898, vol. 6, pp. 17-23.]

[Footnote 10: A Preliminary Study of Some of the Motor Phenomena of Mental Effort. American Journal of Psychology, July, 1896, vol. 7, pp. 491-517.]

[Footnote 11: Encyclopedia of Social Reform, Funk and Wagnalls, 1896, p. 1095]

CHAPTER III

INDUSTRIAL EDUCATION

Trade classes and schools, their importance in the international market–Our dangers and the superiority of German workmen–The effects of a tariff–Description of schools between the kindergarten and the industrial school–Equal salaries for teachers in France–Dangers from machinery–The advantages of life on the old New England farm–Its resemblance to the education we now give negroes and Indians–Its advantage for all-sided muscular development.

We must glance at a few of the best and most typical methods of muscular development, following the order: industrial education, manual training, gymnastics, and play, sports, and games.

Industrial education is now imperative for every nation that would excel in agriculture, manufacture, and trade, not only because of the growing intensity of competition, but because of the decline of the apprentice system and the growing intricacy of processes, requiring only the skill needed for livelihood. Thousands of our youth of late have been diverted from secondary schools to the monotechnic or trade classes now established for horology, glass-work, brick-laying, carpentry, forging, dressmaking, cooking, typesetting, bookbinding, brewing, seamanship, work in leather, rubber, horticulture, gardening, photography, basketry, stock-raising, typewriting, stenography and bookkeeping, elementary commercial training for practical preparation for clerkships, etc. In this work not only is Boston, our most advanced city, as President Pritchett[1] has shown in detail, far behind Berlin, but German workmen and shopmen a slowly taking the best places even in England; and but for a high tariff, which protects our inferiority, the competitive pressure would be still greater. In