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On the Physiological and Therapeutical actions of Exercise.

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Of all the articles comprehended under the term Sonic Regimen, there is probably none of greater importance than duly regulated exercise, the beneficial effects of which are chiefly observed in those diseases which are Chronic and functional only.

The many benefits resulting from exercise in health and disease, present so wide a field for investigation, that, I fear time will not permit me to devote that attention and consideration to it which a subject of so much interest and importance demands.

In writing this Thesis I must observe, that I have few, if any original observations to make, and feel deeply sensible of it's many imperfections; however, I have endeavoured to obtain information regarding some of the most important circumstances Connected with exercise, and hope to arrange these in a manner which will prove satisfactory — Treating, first of the Physiological actions of Exercise; and secondly of its Therapeutical virtues.

I. Of the Physiological actions of Exercise.

Exercise comprehends those movements of the body, which bring all the members more or less into motion, diffusing and aiding the circulation of the blood to the every part of the frame, so as to produce, according to the strength of the Patient, a greater or less degree of perspiration. It increases the flow of blood to the surface of the body especially, and to all the muscular parts, giving tone and tension to the muscular fibre. It accelerates the heart's action; first, by increasing the quantity of blood; secondly by exciting the action of the heart directly through nervous influence, which excites both voluntary and involuntary muscular action, the stimulus probably passing through ganglia. By muscular contraction the blood is gently assisted in it's course through the capillaries, and more distant parts of the body, and it's undue accumulation in the internal organs is prevented. The important processes of Digestion, Respiration, Secretion, Absorption, and Nutrition are promoted, and the health of the whole body immediately influenced.

The ordinary rate of Nutrition of the muscular tissue depends upon it's functional activity.

Every exertion of it's vital contractility involves — there is good reason to believe, a waste or disintegration of a proportional amount of it's sub-

stance: The vital force, which previously manifested itself in the acts of growth and developement, being now expended in the form of Mechanical power, and the living tissue being consequently reduced to the Condition of dead matter, and being thus subject to decomposition which it previously resisted. Of this there is a great variety of evidence. The increase of demand for food occasioned by muscular activity, is an indication that the nutritive operations are excited by it; and the purpose of these can scarcely be anything else than the reparation of the loss which the muscle has sustained. Again the presence of oxygen is essential to the developement of the Contractile force, and there is evidence, that in this developement a chemical change is effected in the substance of the muscle, which is of a nature destructive to it's integrity as an organic structure. The pequently renewed exercise of muscles, by producing a determination of blood towards them, occasions an increase in their Nutrition, so that a larger amount of new tissue becomes developed, and the muscles are increased in size and vigour. This is true, not only of the whole muscular system when equally exercised, but also of any particular set of muscles, which is more used than another; Of the former we have examples in those who practice

a system of Gymnastics, adapted to call the various muscles alike into play: and of the latter, we have a good illustration in the great muscular development of the Blacksmith's arm, or of the legs of the Opera dancer, whose calling requires the habitual exertion ~~of~~ ~~exertion~~ of either pair, to the partial exclusion of the other. We also observe the same in hypertrophy of the heart, which from some obstruction to the free movement of the blood, takes on increased action, the result of which is an undue development of it's muscular fibre – a wise provision of Nature. But this increased nutrition cannot take place unless an adequate supply of blood be afforded; and if the amount of nutritive material be insufficient, the result will be a progressive diminution in the size and power of the muscles, which will manifest itself the more rapidly as the amount of exertion, and consequently the degree of waste, is greater. Nor can it be effected if the exercise ~~if the exercise~~ be too constant, for it is during the interval of repose that the reparation of the muscular tissue occurs; and the muscular system, like the nervous, may be worn out by too constant use. The more violent the action the longer will be the period of subsequent repose required for the reparation of the tissue; and the longest time will of course be re-

quisite, when, as sometimes occurs, the Contractility of the muscles is so completely exhausted by excessive stimulation, that no more manifestation of it can be excited. Nevertheless it is certain that there must be a provision in some muscles for the continuance of their nutrition during their state of activity; for in no other way could the Heart and Respiratory muscles, which are in unceasing action, during the whole period of life, be kept in a state fit for the discharge of their functions.

But, on the other hand, the muscular tissue, like all the softer and more decomposable portions of the organised fabric, has a limited term of existence, and hence, even if it's Contractility be not called into existence, it undergoes a gradual disintegration so soon as all the nutritive changes, of which it's component cells are susceptible, have been completed. This change seems to be a necessary consequence of the high temperature of the bodies of warm blooded animals; for it does not occur with near the same rapidity in cold blooded Animals, nor in the condition of torpidity which certain warm blooded Mammalia periodically undergo: indeed, when the temperature of the body is reduced to within a few degrees of the freezing point, no mechanical Change seems possible in muscle, it's

spontaneous decay and it's vital activity being alike checked. Now when a muscle, or set of muscles, in a warm blooded animal is reduced to a state of prolonged inactivity, from whatever cause, it's supply of blood is diminished, and it's spontaneous decay is not compensated for, by an equally active renewal; so that in time the characters of the structure are changed and it's distinguishing properties no longer presented. Thus it was found by Dr John Reid that in a rabbit, a portion of whose sciatic nerve had been removed on one side, the muscles of that leg were but very feebly excited by Galvanism. After the lapse of even weeks the change in their nutrition was evident to the eye, and was made equally apparent by the balance. The muscles of the paralysed limb were smaller, paler, and softer than the corresponding muscles of the opposite leg, and they scarcely weighed more than half, being only 170 grains, whilst the others were 327 grains. So in persons, whose lower extremities have been long diseased, the muscles first become pale and flabby; their bulk gradually diminishes; their contractile force progressively decreases; and at last departs almost entirely, and their proper structure is replaced by a deposit of fat, intermixed with ordinary fibrous tissue, in which few or ~~one~~ no characteristically

striated muscular fibres can be detected. But muscles, that have for some time remained in this condition, may be gradually brought back to their original condition by exercise, provided that the feeblest contractility remains; for every action which they can be made to perform determines an augmentes flow of blood through the tissue and gives rise to an improvement in its nutrition, which is the true increase in its contractility, and renders it capable of vigorous action.

When in a state of activity the quantity of blood which muscles receive is considerably increased, and in consequence, those which are much exercised become of a deeper red colour than those which are less used. Arterial blood is an indispensable stimulus to every organ of the body, its supply during health being always proportioned to the extent and energy of the action. When any part is not supplied with its usual quantity of blood, it soon becomes weakened, and ultimately loses its power of action altogether, although every other condition requisite for its performance may remain unimpaired.

There can be no question that the condition most essential to the maintainance of muscular contractility is an adequate supply of Arterial blood. It is well known, when a ligature is applied to

a large arterial trunk in the human subject, there is not only a deficiency of sensibility in the surface, but also a partial or complete suspension of muscular power, until the collateral circulation is established. The same result has been constantly attained in experiments upon the lower animals; the Contractility of the muscle being impaired, or altogether extinguished when the flow of blood in it was arrested; and being recovered when the supply of blood was restored. ~~The experiments~~ The influence of the supply of Arterial blood upon the muscles is two-fold; it affords the material for the nutrition of the tissue, and it furnishes (what is perhaps more immediately necessary) the supply of oxygen required for the metamorphosis of the tissue, which seems to be an essential condition of the generation of its Contractile force. Since the oxygen is taken in by the lungs, and as the greater part of it is thrown off (when united with Carbon in the form of Carbonic acid gas) by the same Channel, we should expect to find a very close Correspondence between the amount of muscular power developed in any animal, and the quantity of oxygen consumed in its respiration. And this is in reality the case. We find for example in Birds and Insects, whose respiration is the highest, the muscular power is greater in proportion to their size, than

in any other animals. In the Mammalia and in certain Fishes that might almost be called warm blooded, it is only in a degree inferior. But in the Cold blooded Reptiles, Fishes and Mollusca, the muscular power is comparatively feeble, though, even here, we are able to trace gradations, which accord well with the relative quantities of oxygen consumed. But in proportion to the feebleness of the power, we usually find its duration greater; so that, it is not so immediately dependent upon the supply of oxygen in cold blooded, as in warm blooded animals. Thus, it is found that Frogs are still capable of voluntary movements after the heart has been cut out, and can move limbs which are connected with the trunk by the ~~limbs~~ nerves only. And that this power is not altogether due to the blood, which may remain in the Capillary vessels, is shown by the experiments of Müller, who found the muscles still contractile, after he had expelled all the blood by forcing a current of water into an artery, until it escaped from the divided veins. It seems probable that the muscles of organic life are less immediately dependent upon a supply of Arterial blood, than are those of animal life; for the heart will continue to contract when the blood in its vessels is entirely venous, and when the circulation in it has come to

a stand. Still the dependence of it's action upon a constant supply of arterial blood is very close; and in all animals, however different the plans of their circulation, we find a provision for the supply by a special arrangement of the Coronary Arteries.

The property of muscular tissue, by which its peculiar functions are exercised, is it's Contractility, through which the Contraction or shortening of muscles is excited by all kinds of stimuli applied, either directly to the muscles, or indirectly to them through the medium of their Motor nerves. This property, although commonly brought into action through the nervous system, we have seen to be inherent in the muscular tissue, and not derived from the nerves. For, first, it may be manifested in a muscle which is isolated from the influence of the nervous system by division of the nerves supplying it; so long as the natural tissue is duly maintained by nutrition; ~~and~~ secondly, it is manifest in a portion of muscle ~~in~~ which, under the Microscope, no nerve fibre can be traced; and, thirdly, it is retained in all the muscles, when it may be supposed that the functions of their nerves is suspended by the inhalation of Ether or Chloroform.

If the removal of nervous influence is long con-

tinued, as by the division of the nerve supplying a muscle, or in case of paralysis of long standing, the irritability, that is the power of both perceiving and responding to a stimulus, may be lost. But this is chiefly because of the impaired nutrition of the muscular tissue, which ensues through it's inaction. But the researches of Physiology have shewn that the nervous system is pre-eminently the first in the order of organized nature; that the ultimate design of the several orders and functional structures of the body appears to be, that they should minister unceasingly to the nourishment and support of that system, and as it were, in return for the perfection of their own functions, in accordance with the laws of unity, the vital stimulus on which depend both their power and activity. The beautiful and instructive theory of the "Germ force" is one which best displays the vital capacities in their general acts, and in their persistence. A careful study of the common course of existence in animal beings, ~~but~~ their developement, perfection, and ultimate decay has led Physiologists three stages in the life of the "Germ". The Germ force, in truth is identical with the nerve force; the Germ partakes either of the strength or weakness of the source whence it was derived, and according to it's own inherent capacity, so will be it's manifestations.

The Youth, as it were, or most active period of the Germ is in its evolutions, during which it developes the animal structure, and by means so subtle and various that they are by far the most astonishing of all the wondrous efforts of prolific Nature. The Germ evolves, and the child developes; and that restless activity which yields its own peculiar delights and sorrows, marks its progress until the middle stage, when developement ceases and the bodily tissues grow by superaddition; remaining stationary at mature age ~~as~~ in the ripeness of manhood, and then a period arrives when the involution is to take place, and the germinal scroll of life written in language that never fails, rolls gradually within itself, and the elements it has collected from inorganic nature to form the organic are returned to their place in the universe, when nought remains of the work but the spiritual life which once dwelt therein, and is gone to render account of its mission.

The laws of the Universe are immaterial but the laws of organic nature are partly material, and in that part their chief duty is to maintain harmony and equilibrium; to make this their grand office and to enlist all functions for its perfection and common purposes. So in addition to the ordinary amount of force in the Germ it has a portion for the

repair of the body, and it is this quantity that during life mainly resists the Chemical laws: for were this not the case, that amount which is necessary to meet the accidents of existence, would not developements share, and the creature form be curtailed thereby in some of its proportions, if not in all. It is by an acknowledgment, and an adherence to these facts that we can rationally hope to assist the organism with prudence and care, when Chronic derangement is found to ensue. Whilst it is upon these checks to developement that the nervous system, upon the integrity of which the functions of all organs and parts rest, is through their errors deprived of its own requisite nourishment, stinted in its growth and abbreviated of its performances: It loses in fact its powers of resisting the planetary laws and is threatened with dissolution, unless that reaction, which is equally a law of nature, come to the rescue. The object of the Medical Practitioner is therefore to gain time (time being the given quantity in the problem before him) by sustaining the powers of life by artificial means. such as shall be directed, in the first case, to the particular seat of the disturbance, to rouse ~~rouse~~ or depress the parts by means of Muscular and nervous Agency, (the Organisms own weapons), and lastly, to lead forward the reactive law by improving the tone of the sys-

tem generally.

Of some of the evils resulting from inactivity of the Muscular System.

Muscular action consists properly in the alternate Contraction and relaxation of the fleshy fibres, a certain degree of permanent contraction being unnatural and impossible; this fact explains very clearly weariness, general debility and injury to health, which invariably follow forced confinement, as is too frequently witnessed in female Seminaries, where the unfortunate occupants are most vigilantly watched and compelled to remain in certain graceful attitudes for so many hours, in order to acquire those female accomplishments considered so essential a part of their education, but which on the Contrary are followed by the most injurious effects. Their tasks being too long and severe, their habits sedentary, and comparatively little exercise being enjoyed, we cannot be surprised at finding many of them suffering from all the miseries of dyspepsia, Curvature of the spine, general muscular debility and great nervous irritability.

The incessant restlessness observed after the second or third hour of Common School confinement, shows the earnest Call of Nature for a little Wholesome exercise; and the quiet that ensues, when it is granted,

indicates clearly enough that the restlessness springs more from bodily than mental weariness.

Instead of so many weary hours being devoted to close application to study and to Books, the employment of the young ought to be varied and interrupted by proper intervals of Cheerful and exhilarating exercise.

The healthy vigour of all the functions of the body and mind is best maintained by their equal and moderate exercise; and the torpor of inactivity renders them incapable of resisting the causes of disease. The mucular functions, resulting from a defective circulation of the blood, are the first to suffer, hence first sluggish movements, and ultimately weakness of the heart and other Muscles. The defective circulation of the blood is felt most at parts at a distance from the heart - hence cold extremities; dry skin; congested liver, with its' frequent concomitants; haemorrhoids; torpid bowels, and indigestion; whilst the heart itself, and the organs near it, may be depressed and injured by the load of blood in them, especially if the subject is plethoric. - hence palpitation, dyspnoea headache, vertigo, somnolency, dulness of the senses &c. In nervous subjects Convulsive affections may be promoted by the same inequality of the circulation. The respiration being little

Excercised, the task of decarbonizing the blood is imperfectly performed or falls more on the liver, hence the accumulation of fat in the testures, and the occurrence of bilious derangements. From this statement it is obvious that sedentary habits when extreme, may be ~~equivalent to produce~~ capable of producing disease, and when existing in a less degree they promote its occurrence from other causes, such as irregularities of diet, exposure to cold, violent exertion &c. From such a combination of influences arise various disorders of the degestive organs heart, lungs, and brain; Catarrhs, Gout, Rheumatism, Calculous Affections, diseases of the Skin &c. &c.

Atrophy, Considered as a morbid change, is Conspicuous, no less than hypertrophy, in the muscular system. We see it in the voluntary muscles, whenever a limb remains long in a state of inaction, whether from Palsy depending upon disease in the brain or Spinal Cord; or from pain Connected with disease of a joint; or from will as in the self inflicted penance of the Fakir. The law obtains here, that the development of a part is proportional to the activity of its functions. In most cases the atrophy will be found Connected with a defficient supply of healthy ar-

terial blood. Building materials are not provided, or are provided inadequately. Mere inaction will produce atrophy; but it is probable that the inaction operates simply by abridging the flow of arterial blood to the muscles.

If, as some contend, what is called a change in the innervation tends sometimes to occasion it's atrophy — if, for example, the altered state of the nervous influence has some share, beyond the inaction which it produces, in causing the atrophy of a paralysed limb, it acts indirectly and by reducing somehow the supply of healthy arterial blood. The nerves belonging to palsied and atrophied muscles, are said to diminish in size. It is with the Arterial circulation, however, that atrophy is most concerned. It is upon a diminution of the number of the smaller, and perhaps also of the capacities of the larger arteries, that Senile Atrophy often depends.

We find Atrophy of the Brain accompanying certain diseased conditions of it's main arteries. So, also the Testicle withers, when the Spermatic artery is tied for the cure of Varicocele.

Of the advantage of Combining Mental with Muscular Exercise.

Nature requires amusement and sprightliness of mind to be combined with, and be the source of muscular exercise; and that, when deprived of this healthful condition, it is a mere evasion of her law, and is

not followed by a tithe of the advantage resulting from its real fulfilment.

How wearisome and disagreeable, and how listless a walk is, when taken against the inclination and merely for the sake of exercise, Compared to the same exertion made in the pursuit of an object on which we are intent. In the former case the unwilling muscles are called upon to work, without that full nervous ~~influence~~ impulse, which the Physician Nature has deemed to be essential to their healthy and energetic action; in the latter case nervous impulse is in full and harmonious operation. So powerful indeed is the nervous stimulus, that examples have occurred of strong mental emotion having instantaneously given life and vigour to paralytic limbs. This has happened in cases of shipwreck, fires and fights, and clearly shews how necessary it is to have the mind engaged and interested along with the muscles. The health of a ship's crew has often undergone marked improvement when in pursuit of an enemy, which must be attributed to the influence of exercise and the exciting passions of the mind.

In the retreat of the French from Moscow, when no enemy was near, the Soldiers became depressed in courage and enfeebled in body, and nearly sunk to the Earth through exhaustion and cold; but no sooner

did the report of the Russian Guns sound a warning note in their ears, or the gleam of their bayonets flash in their eyes, than new life and vigour seemed to pervade them, and they wielded powerfully the arms which, a few moments before, they could scarcely drag along the ground. No sooner however was the enemy repulsed, and the nervous stimuli, which animated their muscles, withdrawn than their feebleness returned. The fable of one of the Eastern Kings, is also a good illustration, proving the necessity of combining mental influence with muscular action. A Physician brought him a racket, and told him that the remedy was concealed in the handle, and could act on him only by passing into the palms of his hands, when engaged in playing with it, and as soon as perspiration was induced, he might desist for the time and that would be the proof of the medicine being received into the general system. The effect, it is said, was most marvellous.

The condition of thousands of almost every species of the human race assembled at the Gold Diggings, also illustrates in a most striking manner, the wonderful effects of combining a mental stimulus with corporeal exertion. They must, of necessity, have suffered from innumerable privations, which under different circumstances could not have been borne; but being stimulated to increased exertion, by the fondly cherished hope of ultimately realizing their Golden Anticipations, they

seemed to endure all with impunity.

Of the Rules for Muscular Exercise.

If exercise be resumed frequently, and at moderate intervals, the increased action of the blood vessels and nerves becomes more permanent, and does not sink to the same low degree as formerly; nutrition rather exceeds waste and the parts gain consequently in size, vigour and activity. Active exercise raises the temperature of the body. This may be partly ascribed to the fact, that every muscular contraction is attended by the developement of a certain amount of heat in the acting muscles, and that the heat is increased according to the number and rapidity of these contractions, and may be quickly diffused by the blood circulating from the heated muscle. But if the exercise be resumed too often or carried too far, so as to fatigue and exhaust the vital powers of the part, the result becomes reversed: waste then exceeds nutrition, and a loss of volume and of power takes place, accompanied with a painful sense of weariness fatigue and exhaustion. When, on the other hand, exercise is altogether refrained from, the vital functions decay from the want of their requisite stimulus; little blood is sent to the part, and nutrition and strength fail in proportion. A limb which has been long under the influence of disease becomes weak and shrivelled from this cause, and its muscles present an unusual paleness and flabbiness

strongly contrasting with the florid redness and rigid fulness of the muscles of a well exercised limb.

The quantity of exercise must vary, according to the constitution and previous habits of the individual; as is well exemplified in training for pedestrian feats — for the Ring — and for Racing. A person accustomed to daily activity, will feel invigorated by a walk of four or five miles in the open air, whereas the same distance will weaken another, who has not been in the habit of walking at all. From this however, we are not justified in inferring that exercise in the open air is positively hurtful to the latter; reason and experience Coincide in telling us that he has erred only by exceeding the powers of his system, and that, to acquire strength and activity, he ought to have commenced his labours with one mile, and to have gradually extended his walks in proportion as the muscles became invigorated by the increased nutrition Consequent on well regulated exercise. A person recovering from fever, begins by walking across his room, perhaps five or ten times a day, and gradually extends to twenty or thirty times, until he gains strength to go into the open air; On going out, a walk of ten minutes or less proves quite sufficient for him at first, but by degrees his strength and flesh increase and his exercise is prolonged till he arrives at his usual standard.

People of sedentary habits do not argue thus, but suppose that, if a walk of half a mile does them good, one

of a whole mile will do them more; and when they suffer from the error, they shelter their ignorance under the general assumption that exercise does not agree with them.

To be beneficial, therefore, it follows, first, that exercise ought always to be proportioned to the strength and constitution of the patient, and not carried beyond this point, (easily discoverable by experience) at which waste begins to succeed nutrition, and exhaustion to take the place of strength; secondly, that it ought to be regularly resumed after an interval of rest, a sufficient interval in order to insure the permanence of the healthy impulse given to the vital powers of the muscular system; and, lastly, that it is of the utmost consequence to join with it a mental and nervous stimulus. To be happy it is necessary that we be occupied, and without our thinking of the happiness which results from it. Nature has given us a constant desire of occupation. We must exert our limbs or we must exert our thoughts; and when we exert neither, we feel that languor of which we did not think before, but which, when it is felt convinces us how admirably our desire of action is adapted for the prevention of this very evil, of which we had not thought; as our appetites of hunger and thirst are given to us for the preservation of health, of which we think as little during the indulgence of our appetite, as we think during our occupation of the languor, which would overwhelm us if wholly

unoccupied. How wretched would be the boy, if he was to be forced to lie, even on the softest couch, during a whole day, while he heard at intervals the gay voices of his playmates without, and could distinguish by these very sounds the particular pastimes in which they were engaged. How wretched is man himself, and what fretfulness do we perceive on brows of more deliberate thoughts, on brows too, perhaps, that in other circumstances are seldom over cast, if a few successive days of wet and boisterous weather, have rendered all escape into the open air, and the exercise, which this escape would afford, impossible. Without the knowledge of the pleasure that is thus felt in mere exertion, it would not be easy for us to look with satisfaction on the scene of human toil around us, which assumes instantly a different aspect when we consider this happy principle of our mental constitution, though we are apt to think of those who are labouring for others, as if they were not labouring for themselves also. And though unquestionably, from our natural love of freedom, any task that is imposed cannot be as agreeable as an occupation spontaneously chosen, we yet must not think that the labour itself is necessarily an evil, from which it would be happiness for man to be freed. But leaving this slight digression we have to consider the effects of excessive bodily exertion, which of various kinds

is a common exciting cause of disease. General muscular efforts as in running, walking up hill, rowing &c hurry the movements of the blood back to the heart and resist its distribution through the arteries in such a degree that the heart, the lungs, the brain and other organs have unusual pressure of blood upon them.

The heart excited to unordinate action is often strained and distended, and its functions or even its structure, and that of the great vessels may be impaired in consequence. This is especially apt to happen if there be anything already imperfect in the structure of the organ, its valves or its vessels: and there are naturally very various degrees of perfection and strength in these parts.

The brain is particularly liable to suffer from violent exertion, especially if joined with a stooping or constrained posture, for its vessels are not, like those of the limbs, and trunk, supported by muscular pressure upon them; and the excited heart can therefore send its blood into them with more force. Hence giddiness, noise in the ears, deafness, defective vision. Convulsions, palsy, and apoplexy have been brought on by violent exertion.

The lungs are also apt to to suffer; for the blood being returned to them faster than they can arterialize it, they become greatly congested; hence cough, dyspnoea, haemoptysis & inflammation

of the lungs may ensue: And the texture of the lungs may also sustain injury in consequence of the violent strain to which it is subjected by the increased exertions for breath.

Other internal organs sometimes are disordered by the blood thrown or returned in their vessels by the pressure of external muscular action. Derangement of the liver hæmatemesis, hæmorrhoids, hæmaturia, have been brought on by such a cause. The sharp pains or stitches felt in the sides or abdomen on running fast are probably spasms of the intestines - temporary colic - produced by irregular pressure on them when their sensibility is raised by the the blood unduly thrown into them. Bodily exertion, long continued may also cause disease by its exhausting effects; in extreme degrees this exhaustion may amount to syncope and even death; short of this, it may cause great weakness of the muscles and of the heart, with corresponding depression of other functions, with congestion of the viscera, defective assimilation and excretion; hence arises the low typhoid or adynamic fever which sometimes follows prolonged fatigue. In slighter cases, we have giddiness, fainting nausea, loss of appetite, indigestion, costiveness, amenorrhœa, and other varieties of impaired function.

When exercise is carried on so long or to such a degree as to impair the organic functions, it thereby induces disorder in them, in addition to the weakness, prostration

and actual suffering in the animal functions.

Thus exercise is beneficial to both body and mind, but when, in degree or continuance, it exceeds what the strength can bear or the rest can recruit, the animal functions are exhausted and lose their balance. Muscular tone is impaired, nervous excitability takes the place of strength, the circulation fails, Congestions ensue, the blood is not properly purified, and the various organs are on the brink of disease.

It is thus, that the fatigued mind or body is peculiarly prone to suffer from causes of disease; want of sleep has similar effects, and when the body is extremely exhausted, even sleep, which is nature's best restorer is disturbed by the imperfect performance of circulation and respiration, in the excess of weakness; hence liability to insomnia, and nervous excitement from exhaustion. When the motions of all parts of the body are free, as in health, any prudent amount of exercise is harmless, safe and invigorating, but when local disease shall have supervened, and even, when no more than one important organ or part is involved, no success but rather danger can attend the practice, which is not based upon sound Medical knowledge. Even simple exercise may be and is hourly, altho' barely heeded, through ignorance of the laws of the organisms, injurious and debilitat-

ing; and it is so, because the nervous force is thereby called into undue activity. A man is recommended to walk much, in some cases, and the result is, that instead of feeling the stronger therefrom, his own senses inform him, that he is much weaker, and for this reason, that the Nervous fluid, if I may so speak, is as readily expended as the sanguineous, and the weakness he feels is not purely muscular, for that is greatly benefited, but some other tissues or organs are deprived of a required share of stimulus necessary to their persistency, and in due consequence the harmony of the whole machine is deranged.

Of the Effects of Exercise on some of the Principle functions of the body.

Man, being destined for a life of activity, all his functions are constituted by nature to fit him for this object, and they never go on so successfully as when his external situation is such as to demand the regular exercise of all his organs. When the muscular system is duly exercised, increased action in its vessels and nerves takes place; but the effect is not limited to the mere organs of motion. The principle blood vessels of all parts of the body lie embedded among muscles both for their protection and aid which the latter afford them. Every Contraction of the muscles compresses the diameter of the vessels, and as the blood contained

in them cannot retrograde in its course, it is propelled in the arteries from the heart towards the extreme parts; and in the veins from the latter towards the heart with greater velocity and force than before. This is well exemplified in the operation of bloodletting from the arm. Muscular action is unquestionably one of the powers for effecting a regular circulation, and consequently, when it's assistance is neglected, as it is by those who take no active exercise, the life-giving stream begins to flow ~~tardily~~ less freely, till at last it finds some difficulty in returning against the laws of Gravitation from the depending parts, which in consequence gradually swell. Persons engaged for years in sedentary pursuits are thus subject to varicose or dilated veins and swelled feet.

Action requires the presence of Arterial blood, and in the case of the muscles, the very fact of their being active favours the circulation and increases the supply. This increase in it's turn enables the parts to which it is sent to act with greater energy & effect; and the augmented action is attended by corresponding waste ~~and exhaustion~~. To replenish the blood thus exhausted of it's nutritive principle, a greater quantity of food is required, and to prompt us to attend to this condition, that local symptom of a constitutional want, hunger, becomes keener and more imperative

and the power of digestion proportionally vigorous. The food taken is more speedily converted into Chyle, and it's absorption from the surface of the intestines, and transmission into the circulating current is more rapid.

That the blood thus improved may be properly and quickly perfected in the laboratory of the lungs, respiration becomes deeper and more frequent, thus admitting a larger quantity of air, and freer circulation through those organs than before; ~~and~~ the blood, thus removed and re-endowed with the Rabulum of life, imparts fresh vigour to all the organs of the body, and fits them for that active exertion, which the proper discharge of duties require from us all.

The inspiratory movements are absolutely necessary to the very existence of the living body, in truth, the vehicles of life. These not only ~~Secrete~~ Oxydize and purify the blood of its Carbonic acid gas and other exhalants, but assist, by the agency of the diaphragm, Combined with the recti and other muscles of the abdomen and Chest- in stimulating the liver, Stomach, intestines and other important organs of the Viscera.

Those persons who seem to luxuriate in sedentary habits invariably suffer from Costiveness and its concomitant evils, the reason of which is obvious. In the natural Condition the faeces are propelled partly by the successive contraction of the muscles

forming the abdominal walls, and partly by the Construction of the muscular fibres which constitute an important part of the structure of the intestines themselves If however exercise be refrained from, and the same position be preserved for many hours a day, the bowels are necessarily deprived of one important source of power, and thus weakened, they are unable to act upon and propel their contents with the same regularity as when assisted by exercise: A slowness of action follows, which no course of medicine, and scarcely any modification of diet can overcome, so long as sedentary habits are indulged in. Females especially suffer much from intestinal debility caused by sedentary habits.

As soon as digestion commences we have seen that the blood flows with increased force to the organs destined for it's completion; whence in delicate persons the operation is frequently attended with diminution in the powers of the senses, and the insensible perspiration is diminished; as the process however proceeds a reaction takes place, and after it is completed the perspiration becomes freer and abundant: When the Chyle enters the blood, the body becomes enlivened, and the stomach and small intestines, having been liberated from their burden, oppose no obstacle to the free indulgence of that desire for activity which

beneficent nature has thus instinctively excited. For their benefit then it is that animals are roused from that repose into which they had subsided during the earlier stages of digestion, and betake themselves to action; then it is that civilized man feels an aptness for exertion, although he mistakes the nature and object of this impulse, and is inclined to regard it as nothing more than a healthy sensation, by which he is summoned to that occupation to which inclination or duty may prompt him. Thus, instead of being bodily active the studious man receives it as a summons to mental exertion; the indolent man, perhaps, merely to sit up and enjoy himself; the libertine to commence his libations; and the votary of fashion to attend the crowded circles of gaiety and dissipation; in short, this feeling of renovated energy is used and abused in a thousand different ways by different individuals without their ever dreaming that bodily exertion, and that alone, is implied by it. The result is, that imperfect assimilation and all its train of consequences take place.

Of the best time for taking Exercise.

Much difference of opinion has existed with regard to the time, at which exercise ought to be taken, its utility or mischief immediately after eating &c.; but in this question as in most others of the like nature, the truth will be found to lie between the extremes. Those

who, from confounding the effects of gentle with those of exhausting exercise, maintain the necessity of rest for the perfect performance of the digestive process, appeal with self satifaction to the experiment of Sir B. Harwood, who took two pointers equally hungry and equally well feed; the one he suffered to lie quiet after his meal; the other he kept for two hours in constant exercise; returning home he had them both killed. In the stomach of the dog that had remained quiet and asleep all the food was found chymified; but in the stomach of the other dog the process of digestion had scarcely commenced. The mere relation of this experiment is sufficient to negative the inference which they would deduce from its results.

Exercise must be measured in relation to the strength and habits of the individual. Those who are in perfect health may engage in it at almost any hour, but those who are not robust ought to confine their hours of exercise within narrower limits. We have daily experience ~~that~~ to prove that the husbandman may return to his daily labour, and the schoolboy to his gambols immediately after a frugal meal, without inconvenience or injury; but the same degree of exercise to a person of sedentary habits or weak stamina, would probably arrest or subvert the whole process of digestion.
So a person in full vigour a good walk in the country before breakfast may be highly beneficial and exhilarating;

there are however exceptions to this, while to an invalid or delicate person it will prove more detrimental than useful, and will induce a sense of weariness which will spoil the pleasure of the whole day. Many are deceived by the current poetical phrases of the "freshness of morning", and injure themselves in summer by seeking health in untimely promenades. Still there is no doubt that with many, walking at this hour agrees well, and is attended with the best effects. There is no question the influence of habit in rendering exercise salutary or injurious is very great and is shown in a variety of instances. A person who would suffer from the slightest exertion after dinner will undertake fatiguing labour after breakfast however solid & copious that meal may have been.

Exercise, in order to prove beneficial, should be resorted to only when the system is sufficiently vigorous to be able to meet it, which according to some is the case after the lapse of from two to four hours after a moderate meal. Should exercise be delayed until some degree of exhaustion from the want of food is felt, it speedily dissipates instead of increases the strength which remains, and impairs instead of promotes the Digestion.

Muscular exercise causes an afflux of blood and nervous energy to the surface and extremities, and if food be swallowed whenever the activity ceases and before time has been allowed for a different dis-

tribution of the vital powers to take place, the stomach is taken at disadvantage, and from want of the necessary action in its vessels & nerves is unable to carry on digestion with success. This is obviously the case where exercise has been severe or protracted; and the consequence is so well known that it is an invariable rule in the management of horses, never to feed them immediately after their work, but always to allow them an interval of rest proportional to the previous labour; and certainly if this rule is so strictly observed in reference to the lower animals surely it merits greater consideration as being applicable to the higher order of Creation.

Exercise ought always to be avoided immediately after a heavy meal. In such circumstances the functions of the digestive organs are in their highest state of activity; and if the muscular system be then called into considerable activity, the withdrawal of the vital stimuli of blood and nervous influence from the stomach to the extremities, is sufficient almost to stop the digestive process. When, therefore we are aware that we shall be forced to exertion soon after eating, we ought not to indulge freely but rest satisfied with a moderate meal, to avoid setting the muscles and stomach at variance with each other and exciting feverish disturbance.

It is the custom with many to take the young people out to walk about the close of the day, than which, nothing can be more injurious, for. in the first place, exercise once a day is very insufficient for the young; and even supposing that it were enough, the air is then more loaded with moisture and proportionally more unhealthy than at any other time; and the absence of the beneficial stimulus of the light, diminishes not a little its invigorating influences. When the muscular system is duly exercised in the open air early in the day, the powers of mental application is considerably increased: while by delaying till late, the efficiency of the whole previous mental labour is diminished by the restless and most natural craving for motion, which is evinced by the young of all animals.

To render exercise as beneficial as possible particularly in educating the young it ought always to be taken in the open air, and of a nature to occupy the mind as well as the body. A formal walk – a walk of duty – is odious and useless especially to many of the fair sex, who would be invigorated and delighted by spending three or four hours a day in spirited exercise and useful employment. Did those overfond and anxious mothers who are afraid to trust to nature for strengthening and developing the limbs and spines of their daughters merely attend to facts, their natural fears would quickly vanish. It is notorious that a majority

of those girls, who, in opposition to the laws of Nature are encased in Stays, and get insufficient exercise are extremely liable to become deformed, and also by the diminishing the cavity of the Chest Phthisis may be induced. The Stomach and liver are also confined and the important functions of digestion thereby disordered; and defective nutrition, of all other impaired functions, undoubtedly ranks first as the predisposing Cause of Tuberculosis. Deformity is an occurrence which is comparatively rare in boys, who are left in conformity with the design of Nature to acquire strength and symmetry from free and unrestrained muscular action.

Different Kinds of Exercise

Different kinds of Exercise suit different kinds of Constitutions, the object being to employ all the muscles of the body, and to strengthen those especially which are too weak, and hence Exercise ought to be often varied and always adapted to the peculiarities of individuals. Much might be said regarding the varieties of exercise both passive and active, but I shall confine my remarks (which must necessarily be brief) to the following.

1. Raising the Trunk by means of the Arms

This affects those muscles which are attached to ~~or chiefly inducive~~ the Chest, or chiefly inducive of the respiratory motions, causing in a great measure the equalization of the circulation within the lungs, which again results in a more perfect Chemical effect on the Constituents of the blood, leading also to improved growth and developement as well in the muscles of the shoulders and breast as those of the arms. It enlarges the Chest-in fact, and increases the Vital Capacities of those who labour under the Contraction set up by disease, or proceeding from sedentary modes of living or natural deformities.

2. Drawing or Bending the Trunk backwards.

If a support be applied to the lower part of the back the feet fixed, and the upper portion of the body pulled backwards the motion affects the muscles and fascia of the abdomen and front of the thighs; and this acts upon the superficial vessels of the Anterior and lower part of the body. But it does more than this, for by acting upon the Recti and oblique muscles and partly on the Psoas and Iliacus, as result brought about by the resistance offered by the operator to the patient in raising himself up, the arterial circulation within the abdomen and Pelvis is manifestly augmented, at the same time that pressure is exercised

by these muscles upon the intestines and portal vein and its branches, alike stimulates the one and increases the absorption within the other.

It is therefore invaluable in Chronic torpidity of the bowels and other organs of the same region.

3. Walking.

Walking generally agrees with most persons, but as it brings into play Chiefly the lower limbs and the muscles of of the loins, and affords little scope for the play of the arms and muscles of the chest- it is insufficient of itself to Constitute adequate exercise and hence the importance of Combining with it movements performed by the upper half of the body, as rowing, various gymnastic exercises and many other useful sports. Such Exercises have the additional advantage of animating the mind, and by increasing the nervous stimulus making exertion easy pleasant and invigorating. Our Physical developement is such that nature appears to have shewn her intention that the upper parts of the body should always partake in the exercise of the lower, by rendering it impossible for us to walk gracefully without the arms keeping time as it were with the movements of the legs.

Pedestrian excursions in pursuit of botanical speci-

ments, or in search of Scenery &c, combine in their results all the advantages which well conducted exercise is capable of yielding, and in some Semenaries are much resorted to for the purpose of developing the mental and physical powers. In many Institutions a regular system of useful manual occupation is substituted for play with the greatest advantage. For not only is the physical organization thereby strengthened and developed but the mental energy and dignity of character are increased, and the mind becomes better fitted for independent action.

I have been tempted on several occasions to join a fellow Student in a walking excursion to the Highlands during the Autumn Months, which I have no doubt would prove highly invigorating, strengthening both mind and body if duly regulated according to the constitution and previous habit of each. I feel assured that those who spend part of the vacation in this manner return with greater Zeal and energy, and are better enabled to undertake and endure the severe duties of another Winter Campaign, than those who spend the time in Towns, where the same amount of exercise cannot be, or seldom is taken; and where the same pure and invigorating atmosphere is seldom if ever breathed.

But health is not unfrequently sacrificed and life

lost by persons exceeding their natural powers and undertaking journeys for which they are totally unfitted.

Young soldiers whose growth is scarcely finished are well known to die in great numbers, when exposed to long and heavy marches, particularly when food is at the same time scanty.

Violent exercise is not less pernicious. Many Aneurismal affections of the arteries in early life are forced to take their origin in violent exercise, or sudden over exertion, when age ~~or~~ ~~[illegible]~~ ~~ation~~ and ossification are not concerned. Even a single day of excessive fatigue will sometimes suffice to interrupt growth and produce permanent bad health. Many predisposed to Phthisis hurry on the ~~unrelenting malady~~ premature development of this unrelenting malady by excessive fatigue during the shooting season, in cases where, by prudent management they might have escaped it for years, if not altogether. At page 25, I enumerated other evil effects of excessive exercise which need not be recapitulated.

4. Riding.

Riding is a most beneficial exercise and where the lungs are weak possesses a great advantage over walking, as it does not hurry respiration. It calls into more equal play all the muscles of

the body and at the same time engages the mind in the management of the animal, and exhilarates by free contact of air and more rapid change of scene.

Even at a walking pace a more gentle but universal and constant action of the muscles is required to preserve the seat & adapt the rider's ~~seat~~ position to the movements of the horse; and this kind of muscular action is extremely favourable to the proper and equal circulation of the blood through the extreme vessels, and the prevention of its undue accumulation in the central organs. The gentleness of the action admits of its being kept up without accelerating respiration, and enables a person of a delicate constitution to reap the combined advantages of the open air and proper exercise, for a much longer period that would be otherwise impossible. From the tendency of riding to equalize the circulation, stimulate the skin, and promote the action of the bowels, it is also admirably adapted as an exercise for dyspeptic and nervous invalids; but unfortunately in this country, it cannot be enjoyed without considerable expence thereby being beyond the reach of many.

5. Dancing.

Dancing is a cheerful and useful exercise, but has the disadvantage of being used within doors, in confined apartments, and not unfrequently dusty rooms

and generally at most unseasonable hours. Practiced in the open air and in the day time as is common with the Highlanders and our Neighbours the French, dancing is certainly an invigorating pastime; but in heated & crowded rooms and often at late hours it is the very opposite, and often does harm

6. Gymnastic and Callisthenic Exercises.

Many of the common gymnastic exercises are fit only for robust and healthy persons, and not at all for those who are delicately constituted and who stand most in need of a well planned training. Injury to health may be prevented by carefully avoiding great fatigue and always adapting the kind, degree, and duration of every gymnastic exercise so as to produce the desired results of increased nutrition and strength. It must be remembered that the points at which these results are to be obtained is not the same in two individuals, and can be discovered only by experience and careful observation.

7. Shuttlecock

As an exercise which calls into play the muscles of the chest, trunk and arms, is also very beneficial and would be still more so were it transferred to the open air. After a little practice it can be played with the left as well as the right hand, and is

therefore very useful in preventing curvature and giving vigour to the Spine in females.

8. Dumb Bells

When not too heavy, and the various movements gone through are not too Eccentric or difficult are very useful. They may produce harm occasionally from their weight being disproportioned to the weak frames which use them, in which case they pull down the shoulders by dint of mere dragging. When this or any similar Exercise is resorted to in the house, the windows ought to be thrown open, so as to make the nearest approach to the external air.

9. Reading aloud and Recitation

Are more useful and invigorating muscular exercises than is generally imagined, at least when managed with due regard to the natural powers of the individual so as to avoid effort & fatigue. In forming & undulating the voice, not only the chest but also the diaphragm and abdominal muscles are in constant action, and communicate to the stomach and bowels an agreeable stimulus. And, Consequently, when the voice is raised and elocution rapid as in many kinds of Public speaking the muscular effort comes to be even more fatiguing than the mental, especially to those who are not accustomed to it; and hence the copious perspiration

and bodily exhaustion of popular orators and preachers. When care is taken however not to carry reading aloud or reciting too far at one time, as to excite the least sensation of soreness or fatigue in the chest, and it is duly repeated, it is extremely useful in developing and giving tone to the organs of respiration and to the general system.

Having thus considered the Physiological actions of exercise including some of the evils resulting from ~~the~~ inactivity of the Muscular system — the advantages of Combining mental with Muscular exercise — its effects on some of the principle functions of the body — the best time for taking exercise — and lastly, the different kinds of exercise. I shall now proceed to the consideration of the Therapeutical influences of Exercise.

II. Of the Therapeutical actions of Exercise.

Simple as it may appear, muscular motion can almost of itself be so applied to any portion of the frame, as to subdue or impart energy to the several movements within; thus these effects, which in health can oftentimes be produced by ordinary exercise, may be equally brought under the course or rule of scientific application; for it is an established fact that muscular motion acts upon all the systems of our bodies after its own inherent fashion, thereby rendering it as powerful in Therapeutics as it is safe in Hygienic results. The very stability and form of the human structure unitedly depends upon the healthy disposition of this all important tissue; the positions of the bones; their directions; the relative extent and situation of their articulations are all amenable to its full control. Even the uninitiated in medical science are cognisant of its effects upon the circulation of the blood, in developing animal heat, and rousing the energies of the frame and we know that no muscular contraction can take place without imbibing from the sanguiferous circle a more than usual supply of blood. We need not refer to the advantages of exercise but we can see by this fact that we have therein the best of all known means for derivating the blood from congested organs or parts.

The lymphatic and nervous systems are, in the economy

of the frame, in a great measure subservient to the operations of this tissue. By muscular motions their tone is increased and heightened, and in the absence of necessary exercise both become manifestly weakened. Pressure, whether muscular or artificial, is a powerful absorbing agent, and it is scarcely necessary to point out those sad states and often almost irremediable diseases which require for their cure the strongest absorbing efforts; anything in fact which can in Spinal or other similar cases rouse the absorbents must be invaluable to the practitioner. It is also obvious that the venous stream, the great Channel of absorption, dependant as it is in the healthy state upon muscular force, can be increased by mechanical pressure used to the extent of which muscular power is itself susceptible.

Exercise is, in a scientific point of view, that which gives to every muscle or tissue of the body just enough exertion to promote the harmony of the entire system, suited to all ages and all conditions It can be made to act, in the highest degree, energetically, or in the lowest degree, mildly.

The ancients, as well as those who flourished in the middle ages, owed much of their success in the field to bodily exercise; and the striking proof of these

effects served to guide the then exciting practitioners in the medical art, to the springs and sources of healthy existence. In the absence of these assistants to health, we cannot fail to observe the frequent source of cachexy, the loss of vigour and elasticity of the animal machine generally, as well as the frequent congestion and clogging of the blood vessels of the body. The root of all may be traced to that condition which is prejudicial to both body and the intellectual faculties of mankind.

Whatever be the relation existing between that immaterial principle of our nature, mind, and matter, there is no doubt of the brain being the medium through which the mind acts, and it is equally certain that the mind is so constituted that certain impressions produced on our organs of senses, by external objects, are followed by corresponding sensations. A medicinal or material tonic produces its effects in a similar manner, except that the sensation is communicated through the ~~nerves~~ nerves of the stomach or of the skin instead of those of the eye.

Travelling. The great advantage of travelling is the constant change of object; the repetition of one salutary impression before the object of a former is dissipated until as in the administration of a

natural tone the effect becomes permanent—

There is no disease, in which the advantage of travelling as a tonic, is more conspicuous than in Hypochondriasis, in which affection the mind is peculiarly apt to dwell on uneasy sensations; there is great irritability of the nervous system, languor, and torpor of the whole body, mental depression &c, in all such the mind exercises an influence through the Pneumogastric nerves or ganglionic system, and there exists a general disordered state of the stomach and intestines. The cure of such a disease is not to be found in Physic, the whole Materia Medica might be exhausted without one being able to relieve these harassing symptoms; but by travelling, change of scene, and change of climate, new and more agreeable impressions are produced on the mind, and the unhappy individual no longer dwells with painful contemplation on those distressing symptoms and numerous ailments which he supposes himself to be labouring under, and which in the height of his imagination ~~he~~ he believes must of necessity soon exhaust the endurance of nature. But by travelling &c all are greatly mitigated and not unfrequently a cure effected; something however, it cannot be denied, must be at-

tributed to the state of the atmosphere, the temperature and other physical properties which distinguish one climate from another: still, much more advantage is produced by moving from place to place than by remaining stationary even in the most favourable climate, and the salutary effects therefore can only be ascribed to the mental excitement produced by the constant change of scene.

It may be argued that the depression of the mind in Hypochondriasis, as it depends on a weakened state of the digestive organs, could be removed by whatever gives tone & vigour to those parts, independent of mental impressions. But this mode of reasoning is fallacious, inasmuch as many examples occur in which these organs are greatly disordered and yet no hypochondriasis follows. There is, therefore, some state of the nervous system which may suffer greatly from disordered functions in particular organs but which, as it cannot be regarded as depending on these derangements, so it cannot be removed by their removal. Some predisposition must exist in the nervous system, or in the mind itself, before such functional disorders can produce hypochondriasis. It is a well ascertained fact that no class of men are so liable to this disease as scientific and literary men; this has been attributed to their sed-

entary habits; but much is due, also, to the excitement which they experience being unvaried, as the disease most frequently occurs in those, who turn their attention into one line of investigation, or to the prosecution of one branch of science.

We know well the force of habit, when the abuse of material ~~excitaced~~ excitants has been long indulged in, as for example, Opium and Alcohol, and the little impression, which even the largest doses produce on the nervous energy. In like manner the constant application of the same mental excitants ceases to rouse the energies of the intellectual principle, and the body suffers in the general apathy which follows; the motion of the blood languishes; the surface ~~of the~~ is deprived of its requisite supply; the stomach and intestines from a certain sympathy, as it were, of these with the state of the mind are debilitated; Congestion in the arterial trunks and in the larger vessels succeed, and hypochondriasis is finally established. It is not surprising, under these circumstances, that the functions of so important a gland as the liver should be disordered, and hence we find that the most common accompaniment of hypochondriasis is imperfect bile. It is no doubt true that this disease is sometime the effect

not the cause, of such a vitiated secretion, but the same circumstances which operate in the production of the one, are likely to influence the other. If this account of the disease be correct, it is evident that the torpor of the mind may at least be regarded as a great part of the malady, and whatever, therefore, can produce new impressions, adequate to excite the attention, must prove useful; and excitants of a mental kind, even although at first irksome and troublesome, yet if they be sufficient to occupy the attention, and to lead to a new series of ideas cannot fail to prove beneficial. It is on these grounds that travelling acts as a tonic in hypochondriasm and even in all cases of debility, if the fatigue be proportioned with judgement to the powers of sustaining it.

Exercise. It is in atonic Dyspepsia that the administration of tonics proves beneficial; they are employed both to relieve urgent symptoms and effect a salutary and permanent change. Two descriptions of tonics are indicated to fulfil these intentions. First those of an immaterial character calculated to excite the functions of nutrition by proper exercise of body and mind. Secondly, those of a material kind adapted to give tone to the relaxed and debilitated organs in fault. We have only

to treat of the first.

In the acute form of atonic Dyspepsia the feet and hands are cold, there is a general feeling of Chilliness over the Skin and sometimes particular Coldness, stiffness or numbness of the fingers. In the Chronic variety the skin is either dry and harsh or it is moist & clammy, sometimes cold and perspiring on the least exertion. There is an inaptitude for exertion, frequent yawning and stretching: torpor in movements which gradually acquire a great effort and are accompanied with a sensation of fatigue and weariness almost amounting to pain, and the greatest sensitiveness of every Change of weather.

Under such circumstances it may be readily conceived that sedentary habits would increase the evil; at the same time, the exercise should be suited to the strength of the Patient, and consequently that form of Exercise which is least likely to bring on fatigue should be had recourse to. Indeed even as the vigour of the body returns, exercise should never be carried to fatigue; if so, it weakens the system, enfeebles the body predisposing it to disease by exciting the circulation, and if there be any local disease connected with Congestion, over exertion will increase that tendency; for example, when there is a tendency to Congestion in the head, Violent exercise, straining &c. might prove most hazardous.

Although it has been stated that nothing aids more the tonic influence of exercise than occupation for the mind, yet when the mind is long and intensely occupied it withdraws power from the nervous system, in the same manner as long continued corporeal exertion exhausts the power of the body. A total mental indolence on the other hand may also cause derangement of certain functions by the absence of the stimulus of pleasurable enjoyments which mental occupation imparts.

It is in consequence of a total inaction of the body, with a fatigued & exhausted state of mind that the studious are so apt to become dyspeptic; and although a complete repose may not be advisiable, yet studies should be varied in order that the different faculties of the mind be brought alternately into exercise. Unvaried study fatigues and exhausts the mind: It is therefore requisite to vary our mental occupation in order to maintain both the health of mind and body.

When dyspepsia and hypochondriasis already exist, the mind is very effectually withdrawn from the morbid feelings which entail misery on the patient, by cultivating the practice of light composition. By thus cherishing the creative faculties of the mind, the nervous irritability the exquisite sensibility, & the busy and restless worrying of the memory and imagination will fade and retire at the approach of their powerful antagonist and ultimately

abandon the field. The influence of intense study in suspending the digestive function is well known, Consequently all close application soon after a meal should be avoided; and under every circumstance a due amount of bodily exercise should alternate with study, since the latter without this produces both sluggishness and indolence of mind.

Travelling is also of the greatest importance in atonic dyspepsia, especially when hypochondriasm is engrafted upon it. The stimulus afforded to the mind operates in two ways; it withdraws the attention from the uneasy sensations of the body, and it gives an impulse to the arterial & capillary circulation by the repetition of moderate excitement to the nervous system, afforded by the new impressions which every change of scene bestows.

Besides the disorders already mentioned there are many other affections in which the utility of Exercise as a Therapeutic agent is very obvious, and in our treatment of these diseases should not be omitted.

The treatment of Scrofula is both local and Constitutional; the latter the more important. In most diseases, and especially in this, prevention will be found better than cure. When a child therefore is born of Strumous parents, all those circumstances which are likely to induce development of the disease

a tendency ~~to rot~~ towards which is presumed to be congenital to the patient, should be most carefully avoided and in accordance with the view taken of the cause of the depraved tendency or state of the system it is plain that the line of treatment whether preventative or curative should be ~~toxic~~ such as would tend to promote a higher rate of nutrition. This assuredly is best attained not by the exhibition of drugs, but by a careful selection of food; a due regard to the function of the bowels and skin; and the conjoined influences of air, exercise and climate.

"The most important measure that can be advised" says Prof. Alison, "in cases of threatened, suspected, or incipient Phthisis is a change of climate; either the south of Europe, or Madeira, or strict confinement within doors, in an artificial climate, as near as possible to 60° of Fahrenheit, during at least six months of the year in Britain". According to the suggestion of Prof. Bennett the Crystal Palace might well be ~~adapted~~ appropriated to such a purpose. "The advantage of the former plan" Continues Prof. Alison "is in the gentle exercise and mental excitement which may be secured by it without risk of aggravation of the disease by cold." Although we cannot but admit the many advantages which a change from our country to the South of France or Algeria

may bestows on Phthisical patients, yet Prof. Bennett has shown, most conclusively I think, that the very best results may be obtained, nay, that a positive Cure may be effected and that too in the advanced Stages of Phthisis. When a change from a cold damp district or Town to one more mild & dry, as from Edinburgh to the west Coast of Scotland or South of England, is combined with duly regulated exercise, Congenial pursuits, and a due attention to the Constant use of those articles of diet which the impaired assimilative functions demand. In Diabetes the patient should take as much exercise as possible without causing exhaustion.

After speaking of the difficulty of being certain as to whether some diseases of the Male Organs of Generation really exist or are only "the excitement of vicious practices, or the impotence consequent on vicious indulgences"; and of the mischief caused by Quacks, who are generally first resorted to in such cases. Prof Alison goes on to say - "If the aggravated representations of interested Empirics are prevented from impressing themselves too strongly on the mind — and Excercise, Cold bathing, and other tonic remedies are carefully employed, the Natural functions of these parts may often be successfully though gradually restored."

In Amenorrhoea the remedies we employ should be directed to the improvement of the state of the general health and strength as well as to the alleviation of the secondary affections which may arise during the suspension or obstruction of the discharge. "The articles of the Tonic Regimen most important in such Cases, are exercise on foot or on horseback, as far as can be borne without fatigue and in general gradually extended; pure air Changes of scene, and other means of mental excitement, inciting to exercise; the Saline and Chalybeate Mineral Waters; the tepid shower bath and when the strength will permit the cold bath - more generally the tepid Sponging and diligent frictions: - a light nourishing diet with as much albuminous food and fermented liquors as can be taken without offending the stomach. By the use of these means, the morbid sensibility which is the immediate Cause of many of these symptoms, may often be gradually Corrected, and if the disease is uncomplicated health is frequently restored."

Dysmenorrhoea, Menorrhagia and Leucorrhoea when ascertained to be ~~depen~~ unconnected with organic disease are all more or less amenable

in those articles
to a strict perseverance of the Tonic Regimen
as above described when Combined with a Careful
& discriminate administration of those special
and topical remedies which the nature of the
Concomitant Symptoms may require.

In Apoplexy the most important duty of the
Practitioner is in warding off the attack, rather
than in hoping to Effect a cure when the disease
is Established; ~~and in no class of maladies do~~
~~we meet with more success~~ Persons who are
predisposed to this formidable malady should
always observe a strictly abstemious and well
regulated Course of living. Much may be done
in this way in obviating or at least in diminishing
the tendency to an attack; ~~May~~ we have reason
to believe that many attacks of the disease have
been prevented by a Careful attention to diet.
the observance of Early and regular hours; and
the habit of taking a great deal of regular
moderate Exercise in the open air.

I need scarcely state that I am indebted for
the information regarding the utility of Exercise
in the treatment of these various Affections
to Prof. Alisons Pathology and Practice of Medicine.

Swimming may also be considered as a species of exercise which certainly does not enjoy the encouragement which it deserves. Besides its value as a means of preserving many lives, it is also of great utility as a Therapeutic agent with some Constitutions. Whenever Sea-bathing disagrees, reaction does not readily take place; Afterwards protracted rigors with Coldness, lividity tremors, stiffness of the muscles, debility, langour, and drowsiness, usher in heat and restlessness at night, which if the bathing be continued in may terminate in irregular fevers, and will at all events result in emaciation & weakness. But on the Contrary when it agrees it is ~~fol~~ soon followed by brisk reaction, a glow of the integuments, increased tone of the muscles augmentation of the appetite and alertness of the mind. In many instances, where it seems not to answer, the real cause is its excessive use or the absurd prejudice that it is necessary for safety to cool the blood before going into the water. In such circumstances the temperature usually falls below that which is natural to the human body in health, and it would probably be less hurtful to bathe in the sea immediately after severe exercise, than

to wait until both the animal heat and the force of the circulation are below the natural standard. It is affirmed that if one does remain long in the water, no ill consequences will arise, from a person in vigorous health plunging into the sea when in profuse perspiration. This accords with the practice of the Ancient Spartans and Romans and is confirmed by the habits of the Northern Nations of Europe in modern times, who make an instantaneous transition from a vapour bath at 130° or 140° into ice Cold water, not only with impunity but with great benefit to their health.

Sea bathing is contra indicated when there is a tendency to Plethora, to haemorrhages, to inflammation or to dyspnoea from affections of the heart or lungs; when there is disordered menstruation & during the presence of the menses, or a tendency to dysentery or diarrhoea and generally by all ~~those~~ circumstances in which mischief may arise from the sudden impression of Cold ~~on~~ upon the surface of the body, which is apt to induce internal Congestion.

Sea-bathing is resorted to in a great variety of Cases on account of its bracing and tonic effects: — in convalescence from Chronic diseases or tedious febrile attacks in Chronic Cutaneous eruptions and in indolent ulcers, enlargement of the glands or diseased joints Connected with the Scrofulous diathesis. In no affection is it more conspicuously or frequently useful than in the various forms of Scrofula especially in the Young.

I will now conclude these remarks on the Physiological and Therapeutical actions of Exercise, by observing that among all the active agencies by which the several functions of animal life are performed, the principle one resides in the muscular system. The ordinary routine of our daily existence, the common emotions [of the mind] and the various movements which assuredly result from these emotions are alike the symbols of vitality, the expression of natural requirements in the way of exertion or repose, as well as safeguards of health and monitors against the insidious and rapid inroad of disease