

## BALANCE AS A FUNCTION OF INTELLIGENCE

W. H. M. Carrington

It has become fashionable of late to speak of Man as an Animal, to consider him from a zoological point of view, within the setting of the primate group to which his species belongs. In this way, the study of animal behaviour, the work of the comparative ethologists, has been drawn upon to afford fresh insights into human problems and new methods of self-scrutiny and self-appraisal.

When he is thus regarded as an Animal and considered in the light of the genetic inheritance of his evolutionary past, Man is seen to be distinguished from all the other mammals by two features: his Upright Posture and the exceptional size of his Brain. He has the biggest brain of all the primates.

These two features are closely linked together; for as Darwin pointed out in *The Descent of Man*, our progenitors were transformed into human beings by the ability to stand firmly on their own two feet. Without this ability their hands could never have become free and our skilled use of tools and instruments could never have developed. In the words of J. B. S. Haldane, "You can't make fine use of your hands until you can balance efficiently". Even at a primitive level, to use stones or bones for attack or defence, to use weapons to obtain food, requires a high degree of co-ordination between hand and eye, and between hands and eyes and the rest of the body, that can be achieved only by means of a highly complex brain.<sup>1</sup> Such a brain can only exist as a result of the prior development of these faculties, a response to the need created by them. The physical skills that have led to the growth of our culture and way of life are not due to some fortuitous increase in the size of our brains; quite the contrary, the enlargement of the brain and the development of skills was due to the freeing of the hands and so, to the adoption of Upright Posture.

What is meant by this term is not often appreciated exactly. The alternation between a horizontal and a vertical stance is a sight so common amongst animals—apes standing, horses rearing, dogs begging—that we take it for granted that we know what it is. But our human Upright Posture, the phenomenon to which Darwin referred, is a unique accomplishment scarcely to be compared with anything to be seen in the animal world. It involves two distinct features: first, there is the process of rising up against gravity, which requires intense muscular effort; but then there is the substitution for this effort of a most delicate poise and balance, an equation of forces brought about by an interplay of the sensory and motor mechanisms, by which all muscular effort is practically eliminated. The unique quality of the whole performance lies in this reduction of effort. The rearing of the horse takes much effort to sustain and the attitude is precarious and unstable. The hallmark of our Upright Posture, however, is that once established it is both reliable and effortless. People have sometimes made the mistake of referring to it as stable, which it is not; for it can easily be disturbed and indeed, as we

shall note, this is one of its inherent advantages. Not all human beings are successful in mastering this art of balancing to any high degree. Those who do not, habitually make up with muscular effort what they lack in poise and inevitably become mis-shapen, clumsy and awkward in movement. They achieve stability at the expense of mobility. Those who do succeed, however, enjoy lightness and freedom as well as a dependable balance that, once it was evolved, made possible the subsequent human achievements of which Darwin wrote.

However, it is Man's second distinguishing feature, the size of the human brain, that has always fascinated students. The brain has been regarded as the organ of the intellect, and it is taken for granted that to the growth of intellect all our human achievements must be ascribed. In early times, the study of the mind itself was a major preoccupation of the philosophers; but as means of observing the brain improved, principally with the invention of the microscope, it was realized that a philosophical enquiry that failed to take into account the neurological substratum of the mental processes was totally inadequate. Thus a physiological psychology came into being, an exploration of brain structure and function that led to the emergence of a detailed science of neurology, a study that pays more regard to the neural and bio-chemical functioning than to the mental processes.

The investigation of human behaviour has continued, however. Although what is regarded in some quarters as the over-enthusiastic approach in this field of the comparative ethologists, has led to the complaint that they tend to discount the significance of mind altogether. Indeed the term intellect is rarely used in reference to the lower animals. Nevertheless, whatever the premises on which the study is currently based, it has failed so far to afford those practical insights that are badly needed into many of the problems of living today. This would suggest that some change in approach is needed and perhaps that the brain alone, or even the intellect as a faculty of mind intimately associated with it, is not the only attribute deserving investigation. Upright Posture probably merits at least an equal amount of study and consideration, not merely because of its evolutionary role in the genesis of the brain, but because it is a unique feature of Man's behaviour, the significance, potentialities, and practical consequences of which have almost been forgotten since the Stone Age.

When it is compared with the quadrupedal stance of the other animals, Upright Posture can be seen to confer many advantages. Apart from freeing the upper limbs, as already mentioned, with the consequent possibility of developing skill and precision in the use of the hands, there is also a great increase in the range of sight and, as the head and eyes can easily be turned with the body to command a full circle, any blind spot in the field of vision is readily eliminated.

There are also great advantages in the matter of movement; for whereas the stance on two feet, as opposed to four, is relatively less stable, the achievement of a reliable balance in this attitude requires of the body a maximum of straightness and erectness. All movements involving a turning or twisting of the head or the shoulders or the hips or the trunk, or of the entire body upon the tips of the toes, are therefore much more easily accomplished, for this necessary straightness implies a reduction of the moment of inertia around the vertical axis passing through the centre of gravity of the body. Even the instability of this stance confers an important advantage; for as the centre of gravity is

raised to its maximum height, so the store of potential energy in the system is greatly increased and all forms of movement can be undertaken in the most economical way.

In short, Man enjoys a greater freedom and better capacity for all-round movement than any other mammal when he is correctly balanced. By means of his Upright Posture he can initiate movements in all directions with an equal ease; he can move without any preliminary adjustment, other than ensuring that he is first balanced and truly upright; and he can perform any movement with a minimum expenditure of energy.<sup>2</sup>

From a mechanical point of view, therefore, there is no doubt that Upright Posture is of immense advantage. It must be borne in mind, however, that this advantage is for movement; Man is much less satisfactorily adapted for keeping still.

The change from a quadrupedal to a bipedal stance necessitated, in the course of evolution, a great many changes in human anatomy and physiology. It may be worthwhile to mention some of them, because it must be remembered that this transition was no trivial one. Its effect was as profound as of that earlier great migration from an aquatic to a terrestrial environment. In both cases the consequences have been such that the process is not really reversible. In other words, once Man did adopt Upright Posture, there was no going back. He might do it imperfectly, inefficiently, wastefully, using too much muscular effort, too crude a balance, thereby frustrating the whole purpose, losing all the advantage, but he had to go on. Vertical Man is unable to revert to a horizontal existence.

The shape of his spine was changed so that what began in quadrupeds as “the compression member in a weight-bearing compound girder”, in Man “becomes (in the words of Dr. Bernard Campbell<sup>3</sup>) a vertical weight-bearing flexible rod, stiffened a little by rigging, like the mast of a yacht”, a series of curves balanced one on top of the other. At the same time, the shape of the chest changed by flattening, so as to comply with the requirements of balance (a maximum straightness and compactness towards the vertical axis of the body), and by widening, so as to avoid any reduction in size and consequent vital capacity, on which all the cardiac and respiratory functions depend. Similar changes took place in the abdominal wall; and the viscera came to rely less on the support, of the back-bone and more on the fascia around the base of the neck.

But most of all the entire musculature was affected by reason of its being called upon to function in an entirely different relationship within the gravitational field. Movements formerly made with the assistance of gravity, involving little or no energy, now have to be made against it, and require muscular effort to be exerted against the gravitational force.

Thus the whole functioning of the body was profoundly affected, the circulation, the digestion and above all, the breathing now had to function under quite different mechanical conditions. The effect on the eyes and the vision has already been alluded to, but there were also important changes in the proprioceptive system and the mechanism of balance.

At this point it may be useful to recall that although Upright Posture is a unique characteristic of the human species, it has to be acquired individually by each member of the species, not merely as an outcome of the growth and development of the body, but by means of a learning process. Each baby passes through the stages of growth during which the neuromuscular systems are developed; but the precise skills and coordinations

necessary for standing upright have to be learned by a long process involving imitation, trial and error, rehearsal and practice.<sup>4</sup> Nor does this process end when independent standing has been mastered; it continues until such complex movements as the hop, skip and the jump have been perfected; and even this is only a beginning, a basis on which all the other athletic, acrobatic and neuromuscular skills have to be acquired.

But to return to a consideration of that moment when this Upright Posture is first attained, the moment when the whole body weight is taken and supported on two feet: at this moment it is obvious that an intense amount of muscular effort is involved. The structure has to be lifted against gravity to the erect position. But once it is there, and once balance is achieved (particularly balance of the head on the neck, thus raising the centre of gravity to its highest degree), the amount of muscular effort can be progressively reduced. Thereafter the child learns, by a process of trial and error to stand more freely and reliably until, with the delicate sensory-motor interplay of the balancing mechanism functioning at its best, with the level of potential energy in the mechanical system now at its maximum, he is in a situation most mechanically advantageous for doing whatever he wants to do and all the benefits of an Upright Posture can be enjoyed.

So far we have been discussing Upright Posture as if it were synonymous with standing on two feet; but there is also the sitting posture to be taken into account. Sitting is one of the commonest of all civilized activities and whereas most of the considerations that apply to standing apply to sitting also, there are important differences. For instance, whereas standing is often a prelude to movement of some kind and especially, locomotion, sitting implies keeping still or at least staying in one place. But the human organism is very poorly adapted for keeping still, as we have previously observed, and therefore the act of sitting needs to be particularly well performed if it is to meet the requirements of our anatomy and physiology. It demands a high standard of balance and co-ordination if stiffness and rigidity are to be avoided, and likewise slumping with its consequences of distortion and harmful pressures within the frame.

Since sitting, like standing upright, is the outcome of a learning process, the standard of accomplishment varies enormously from individual to individual. If the whole concept of Upright Posture is called in question, it will be found that people's ideas and assumptions about it are extremely vague.<sup>5</sup> They range from concern for what is aesthetically pleasing—the Greek ideal, as exemplified in statues—to subjective judgments about comfort and convenience. Enquiry has established that whereas almost everyone will unhesitatingly claim that they know what it is, the majority will freely admit that, for a number of reasons, their own performance is both poor and inadequate. But when the problem is reviewed in mechanical terms it will be seen that there is a simple objective criterion that must be applied. Energy must not be wasted; unnecessary work must not be done. We are dealing with a dynamic system in which balance is the paramount factor; efficient Upright Posture therefore demands perfect balance with a minimum of muscular effort.

This is no easy thing for anybody to accomplish and it is little wonder that our standards of attainment vary so much. Under primitive conditions of life, when attack and defence were matters of stones and clubs, perfect balance was a prime essential for handling a weapon; its possession conferred a selective advantage for survival and no doubt it was attained without much conscious thought. But in a civilized state only a few individuals achieve it, athletes, acrobats and others where it is demanded by the nature of

their work. They work hard for it; for if it is an outcome of genetic endowment, it also requires long practice and experience.

In any case, with the onset of old age, performance inevitably deteriorates until, at last, the degree of muscular effort needed to compensate for a defective balance becomes quite excessive, and recourse must be had to walking sticks or the wheel-chair and finally the attempt has to be abandoned altogether.

Of course, the majority of us are forced to recognize our deficiency long before this stage is reached. Accidents, illness and resultant incapacity bring it home to us. But frequently we are made aware of it much earlier still: even in early childhood, the fear of falling, manifested as a feeling of insecurity can exert a hidden influence to curb the spirit of adventure and exploration. We become 'bad at games', acutely aware of our physical limitations, inhibited by the clumsiness of our bodies, poor performers in all activities demanding balance and agility. This undermines our self-confidence and we live in an all-pervading atmosphere of anxiety. Learning, both mental and physical, is greatly impeded. The conscious acquisition of some skill or technique is found to be very difficult, if not impossible, and as we are forced to recognize our limitations in this respect we over-compensate by trying to concentrate on 'mental' learning. However, our success in this direction is often impaired by over anxiety and nervous apprehension. Waste of effort and physical strain make for tiredness and inefficiency. The whole physical condition tends to deteriorate under stress. Illness and disease may result, and where illness occurs, the recuperative powers of the body are very much hampered by tension and the dissipation of energy.

In the light of all these considerations it can be seen that the maintenance of an efficient Upright Posture cannot be a matter of indifference to anyone; it is fundamental to the health and well-being of the individual.

Possibly it will be argued that this is an exaggeration, that although the general standard prevailing today is so low Man's achievement in the world at large indicates that he does not do too badly. It might be said that however important Upright Posture obviously was under more primitive conditions, the world has now changed and Man's condition with it. Admittedly, human muscle used to be our principal source of power, but now we have machines at our disposal for almost every purpose so that the demands on our physical energies are minimal. Upright Posture may indeed have led to the evolution of our modern brain, but now this brain itself can provide us with facilities that render the body largely superfluous. Already some people tend to regard it almost as an encumbrance. Perhaps in time means will be found to rid us of its tedious requirements for postural adjustment. The process of Natural Selection was responsible for both our Upright Posture and our large brain; perhaps it can solve our current problems also.

Perhaps indeed it ultimately may; but at this point we must consider Man as an Individual, rather than Man as a Race. Looking back over the history of our species can enable us to understand much about our present state; but to look forward, to try and foresee the future, involves far too many imponderables. We cannot hope to predict the course of Natural Selection; it would possibly be cold comfort for us if we could. It is therefore to our present situation that we must look, to try and assess it, and to see what, if anything can be done about it.

As individuals, the majority of us, whatever our knowledge, have very little practical understanding of how the body works. The detailed working of all the

mechanisms concerned with ordinary bodily functioning, heartbeat, circulation, breathing, digestion, balance and coordination, lies beyond the range of conscious awareness. Bodily actions are highly complex affairs that involve the neuro-muscular system as a whole. Muscles do not work in isolation from each other or just at choice, their action forms part of elaborate patterns of co-operation, preselected and determined by the nervous system. The conscious brain does not dictate the function of the individual muscles concerned, rather does it take the over-all decisions to control actions and movements.

Thus, even with an extensive knowledge of anatomy and physiology, with some detailed knowledge of body mechanics, with considerable experience in athletics and acrobatics, a direct conscious intervention in order to improve one's postural adjustment is very hazardous. As we have seen, efficient Upright Posture is attained by muscular effort and balance, and balance is the paramount requirement. Any form of muscular effort that we make is likely to be misapplied, for the whole system is expressly designed to make conscious effort unnecessary, in fact, to conserve energy by eliminating effort.

Physical balance and psychological balance are bound up closely together. Equipoise and equanimity go hand in hand; and if fairness of judgment demands imperturbability and a capacity to be undisturbed by emotion, many physical actions involving skill and co-ordination demand the same. The more we learn of how the organism works, the more we begin to appreciate its vast complexities, the more obvious it becomes that we cannot hope to achieve much by means of direct cortical intervention. The control that can be consciously exercised is a control of choice, a decision to act or not to act in a certain manner, in a certain direction, at a certain time. More often than not it is a decision to do nothing, to leave well alone; for the functioning of the body is continuous, it goes on in a continuous stream of action and reaction so that if the whole process is not interfered with, actions almost seem to perform themselves. Control is then a matter of volition, of will. Our conscious intelligence, the faculty of understanding, often instructs us that it is better not to act than to act, not to intervene in a process which can be relied upon to regulate itself.

It is evident that the whole neuro-muscular mechanism of Upright Posture, including the machinery of balance, is capable of working with remarkable efficiency if it is permitted to do so. This is scarcely surprising when one remembers that it is the product of millions of years of evolution. Our aim must therefore be to oversee this working, to protect it from interference or to find ways of eliminating this interference where it has already occurred. But how to do this is evidently a very big problem. It is a problem requiring a great deal of thought, but not merely theoretical and reflective thought. It requires an experimental approach consisting both of study and observation and after that a process of surveyance that has been brilliantly described by Professor John Dewey as "thinking in activity".<sup>6</sup>

The most important work in this field was done by F. Matthias Alexander (1869-1955)<sup>7</sup> out of whose original experimental approach and observations developed the Technique and instructional method that bear his name. In addition to his practical procedures, Alexander contributed some valuable new concepts, one of the most important of which arose from his initial concern with the faulty performance of his own vocal mechanism. He was not interested in the anatomical or physiological aspects of the problem in an academic sense, nor in its pathology, except in so far as recurrent

hoarseness hampered the achievement of his vocal aims. His approach was practical: quite simply, it was a matter of how to use his voice to the best advantage.

To speak of “using” the voice is a natural form of expression, so obvious as to be unremarkable. Yet we must remark on it for a moment; that we have voluntary control over the vocal mechanism is undoubted; that we can use the voice badly or well is obvious. In spite of the force of habit, we do have a large measure of choice, and although a degree of skill enters into it, and both training and practice have their effect, we can observe such criteria as suitability for the purpose, success in realizing the intention, efficiency or otherwise as regards the amount of effort involved, and harm to be done to the vocal organs by misuse.

Alexander’s studies soon brought home to him the fact that the voice cannot be considered in isolation from the rest of the body. The whole body is involved in using the voice; in fact it might be said that we use the body in order to use the voice.

However, the term “use” implies a “user” as well as a thing “used”, and this inevitably leads to a reconsideration of the division that we habitually make between ‘mind’ and ‘body’. Eventually we arrive, as did Alexander, at the concept of using oneself, or as he called it, “the use of the self”.<sup>8</sup>

All our activity is ‘psycho-physical’, however dominant, at a given moment the ‘mental’ or the ‘physical’ may be. Emotion, belief, idea, mood, thought, attitude of mind, all affect our actions, the way in which we use ourselves. Although the concept of psycho-somatic illness is now familiar, and we appreciate to some extent that our thinking, feeling, willing and wishing have an effect on our bodily state, we often fail to realize to what extent the converse is also true, that our bodily state determines our feelings and thoughts. Alexander’s concept of ‘use’ reminds us forcibly of this. It calls into question not merely how we use ourselves to speak or sing or to perform any specific action, but how we mobilize all the resources of our being to fulfil our desires and wishes, to realize our dreams and ambitions.

It leads also to another important concept, “the influence of use upon functioning”. His experimental observations had led him to see that his own use of himself affected not merely the functioning of his voice, in a way that he could measure by its obvious effect on his vocal performance, but also the functioning of his entire organism. In particular, it affected his stance and postural adjustments the way that he stood to speak, and this in turn vitally affected his vocal mechanism. Thus he was brought to see the practical significance of Upright Posture and to consider those unique conditions under which the human organism is required to work. This drew his attention to the role played by the balancing mechanism and he came to realize that it is on the efficient functioning of this that all our other functioning depends.

So he came to consider the majority of the points that we have previously discussed; but furthermore, to see that the adequacy of balance and movement is not fixed by genetic inheritance, but is largely determined by the manner in which the machinery is used. Our choice in this respect is able to affect our functioning profoundly, according to the extent to which it is consistent or conflicts with the design requirements of the whole organism.

But if our general functioning is so much affected by the manner in which we use ourselves, what determines our choice of use? To a large extent the answer must be, “habit”; but there is another possibility, rational intelligence.

Alexander recognized that a satisfactory manner of use of the self is dependent upon intelligence. Intelligence can be applied to the problem in two ways, that is, by thinking it out, by considering all that is known and all that can be known about it and thus making the relevant choices. This is very important and necessary, but it is not sufficient, for one has to go on living with the problem whilst it is being worked out. Additionally, intelligence needs to be applied in process; that is to say, to observe and control and direct as the action goes on, and to see that the decisions are carried out. Quite simply this is what is meant by use; by using the brain and the way that the whole self is used will naturally affect very much the way in which it functions. The effective working of any tool depends on how it is used: if it is used wrongly, then you must expect to get the wrong results.

In his own case Alexander saw that the first step towards establishing an efficient and intelligent use of the self must be a careful and experimental observation to find out what it was that he was doing wrong. This proved to be the primary procedure that is invariably essential; it was also his first practical innovation, for it is quite contrary to normal practice. The usual way is to size up the situation quickly, to decide what needs to be done, and then regardless of how the mechanism is supposed to operate, to try to do it.

Alexander's approach was both more modest and more practical. As we have seen, the possibility is very remote of the ordinary individual ever discovering the detail of how such a complex mechanism as that of human posture operates. But careful observation and experiment can certainly establish what facilitates and what impedes its efficient functioning.

The second step, therefore, having established what he was doing wrong, was to stop it. This was no easy task for it entailed a battle with the habits of a lifetime, constant vigilance, and above all, a constancy of purpose based on a degree of confidence in the rational processes that had determined the nature of the wrong-doing.

The third step was the rational choice and selection of procedures, the selection of means that would be suitable to the chosen ends, and the choice of rational ends in themselves. This would involve a supreme test of intelligence and rationality, for the whole process would be subject to a continuous scrutiny and test, demonstrating at each stage whether or not the outcome was satisfactory.

The fourth and final step, really inseparable from the third, was the employment and operation of the selected means in such a way as to exploit the full potential of all the endowment placed at the individual's disposal both by circumstances and conditions of life and also by genetic inheritance. This would involve the type of intellectual effort, the use of intelligence, that we have already referred to as "thinking in activity".

When our human ancestors first achieved the Upright Stance, when they learnt the trick of balancing reliably on two legs, of standing on two feet, they opened the way not merely for the development of a greatly enlarged brain, but of a greatly enlarged intellect. This process is repeated by each one of us; and as we learn to master the intricacies of balance with greater or less efficiency, we go on to develop our reason and intelligence. The whole process is highly complex and it does not follow that a handicapped child that is unable to stand will fail to achieve a high level of intelligence; but it does follow that the greater the handicap, the greater will be the difficulties of achievement, for the growth of the intellect requires the stimulus of learning, and learning can only be the outcome of experience. Without the experience of a proper and reliable physical balance all of the



body's functioning is upset, for our species has become adapted to a vertical, instead of a horizontal, mode of existence. Without it, we cannot fulfil our design requirements to live efficiently as we should.

Man's development and exercise of his reasoning powers, the growth of his intelligence, has led to many changes in his way of life since the early days of the hunter and the cave-dweller. He has changed his environment and with it, himself. These changes have considerably affected the degree of efficiency and skill of many of his bodily accomplishments, not to mention his athletic abilities. They have profoundly affected his standard of balance and Upright Posture. It is true that he still clings to his customary habit of sustaining himself generally in a vertical plane. He continues to stand on two feet, when he cannot sit down, and to walk when he has to, in the same manner. But he prefers to sit, or rather to slump, with his body propped up as much as possible so as to reduce the effort of holding himself erect. His physical, if not his psychological, poise is thus greatly impaired and he tends to do everything in a mechanically highly inefficient manner.

Quite inevitably we pay a price for this inefficiency in terms of health and well-being, although we have been slow to recognize the fact. So far, our fertile powers of improvisation and adaptability have enabled us to ignore it and to some extent they have masked the consequences from our observation. Sheer intelligence has enabled us, up to a point, to do the things that we want to do and to live the way we want to live without regard for the mechanical requirements of the body. It is true that backaches, 'slipped-discs' and other 'postural' complaints have become increasingly common, but we have combated them with all sorts of palliative measures.

But is not this, after all, an abuse of the function of intelligence? Surely it would be more reasonable to apply our intelligence to a study of how the human organism works, to try and understand the requirements and limitations of its design. Then perhaps we could learn to use it in such a way as to exploit the facilities that it has to offer and to develop its potentialities to the full. As it is, we are like a child who insists on using his chisel for a screw-driver: or do we mean to wait and hope that one day our chisels will be turned into screw-drivers by the process of Natural Selection?

When we apply all these considerations to the study of Man as a Species, it becomes apparent that his Upright Posture, his distinguishing feature that we began with, is as important today as it ever was. But Man's Upright Posture depends for its maintenance on the functioning of his balancing apparatus. Under our modern conditions of civilized life, the balancing apparatus cannot be relied upon to function properly without safeguard. This safeguard can only be supplied by Man's use of his Intelligence, that very faculty to which the adoption of Upright Posture gave rise. Thus Balance must be regarded as a function of Intelligence; a function indeed on which the survival of our Species may ultimately depend.

#### REFERENCES

1. Dart, R. A., *The Attainment of Poise*, South African Medical Journal, 1947, 21, 74-91.
2. Feldenkrais, M., *Body and Mature Behaviour*, London: Routledge & Kegan Paul Ltd., 1949.
3. Campbell, B. G., *Human Evolution*, London: Heinemann Educational Books Ltd., 1967.
4. Delacato, C. H., *The Diagnosis and Treatment of Speech and Reading Problems*. Illinois: Thomas,

1963.

5. Jones, F. P., *Method for Changing Stereotyped Response Patterns by the Inhibition of Certain Postural Sets*, *Psychological Review*, 72, (3), May 1965.
6. Dewey, J., quoted in *The Universal Constant in Living* by F. M. Alexander, London: Chaterson Ltd., 1942.
7. Maisel, E., *The Resurrection of the Body*, New York: University Books Inc., 1969.
8. Alexander, F. M., *The Use of the Self*, London: Methuen, 1932.