The eyes and the primary control

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About the author

Kathleen Ballard gained a PhD degree in Zoology in 1965. From 1967 to 1981 she was a member of staff in the Department of Physiology of the University of Glasgow, leaving to train as an Alexander teacher 1981-84. From 1987 to 1993 Kathleen taught at the Carrington's teacher training school in London. She was a STAT representative on the ATEAM back pain trial and the subsequent ATLAS neck pain trial and liaised with the research staff and teachers involved in the SEAT pain clinic study.

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Abstract

Increasing the habitual range and readiness of eye movement by employing thoughtful intention, initially while semi-supine, can improve co-ordination and sensory perception and enhance our practical understanding of the primary control. The functions of the extra-ocular muscles are discussed and reference is made to the insights of Bates and Wielopolska. The personal experiences of the author are described in relation to activities such as stand-to-sit. Repeated observations have indicated that a freer, more balanced and co-ordinated condition can be attained, associated with a marked improvement in the accuracy and completeness of perception of 'egocentric' space centred on the self, of the 3-D location of objects within this space and of the 3-D appreciation of oneself in relation to the immediate environment. Confirmation of these personal experiences has been gained through teaching both teachers and pupils. The earlier observation reported by Wielopolska has been confirmed and extended.

INTRODUCTION

During my Alexander training I read of the interactions between the extra-ocular muscles of the eyes*, the vestibular organs of balance, the neck muscles and the postural support reflex systems, all somehow integrated by centres in the brainstem[1]. I knew, at least in theory, that all these elements are of special significance for the functioning of the primary control and for our work as teachers of the Alexander Technique. However, it was not clear how these systems could be explored in a practical way without recourse to the experimental laboratory equipment normally employed in neuroscience.

Not long afterwards, at the First International Alexander Congress (1985), I was intrigued by a presentation by Catharine Wielopolska concerning directions for the eyes[2]. She described the experience of sitting and observing herself in a mirror and then introducing the thought 'eyes to widen'. To her surprise she noticed small widening releases throughout her body, although the eyes themselves did not move apart, and wondered why the general widening happened. Pazzaglini, a medically trained pupil, explained that the muscles which move the eyes are foremost in the series of somatic muscles† and come before the sub-occipitals: why not direct attention to these first muscles, the extra-ocular muscles of the eyes?

Sometime later I found diagrams and accounts of these muscles and their nerve supply in my old university textbooks[3,4]. How satisfying to consult them and to be able to make practical use of the information in the context of the Alexander Technique.

Searching further led me to the conclusion of Bates[5], that mental strain and eyestrain are accompanied by abnormal tension in the extra-ocular muscles, distortion of the eyeball and sight defects. At much the same time Alexander had noted[6] that 'the sense of sight, for instance, is greatly affected by the "muscle pulls" of the organism in general…' These statements taken together and added to the finding reported by Wielopolska, indicated that

* Extra-ocular muscles are attached to the outside of the eyeball and move the eye in the orbit.

† Somatic muscles are those involved in body support and movement, i.e. mainly the skeletal muscles. They are distinguished from muscles of the internal organs, e.g. heart, gut, and the face.

interactions between extra-ocular and skeletal muscles should be readily observable and suggested a rationale and a practical means for experimenting on my own.

FINDINGS

Without knowing details of the Bates eye exercises I gradually found that using and moving my eyes, in the ways described below, improves the distribution of muscle tone throughout the whole body. This can be observed in the face, neck, feet and elsewhere. Changes in refraction probably occur but have not been looked for.

Repeated observations have indicated that a freer, more balanced and coordinated condition is attained. This is associated with a marked improvement in the accuracy and completeness of perception of 'egocentric' space centred on the self[7], of the 3-D location of objects within this space and of the 3-D appreciation of oneself in relation to the immediate environment. Transient proprioceptive illusions occur during this process of change, particularly when semi-supine..

Confirmation of these personal experiences has been provided by observations gained from teaching both teachers and pupils. Examples of the various activities employed are described in the Activities section below.

The earlier observation reported by Wielopolska has been confirmed and extended.

SCIENTIFIC BACKGROUND

The findings are consistent with scientific understanding of the ways in which muscle tensions are linked with brainstem functions[8]; and also with the way that our internal body map, and our map of surrounding space, are influenced by sensory signals from the retina and from proprioceptors, including muscle spindles in extra-ocular and skeletal muscles[7]. When it is realised that these sensory signals reach and influence the cortex, it is not surprising that sensory appreciation can be distorted by inappropriate and uncoordinated psychophysical tensions.

The complex neural connections between eye, trunk and limb muscles, the retina, the organs of balance, other sense receptors and the brainstem motor control systems, are of ancient lineage. We are endowed with a sophisticated version of the original control system which evolved about 400 million years ago in bony fish. Because the primary control described by Alexander includes the functioning of this fundamental brainstem system[9], we can profit by knowing more about it.

Each extra-ocular muscle contains muscle spindles that relay sensory data to the brainstem centres (and to the cortex in primates). The signals are interpreted in terms of eye position in the orbit and allow the motor systems to move the organism toward the object of interest, as for example in a fish hunting food.

The extra-ocular muscles are themselves influenced by organs of balance (the semi-circular canals), in a way that tends to keep the eyes horizontal when the head tilts slightly. In animals with mobile necks, a similar system adjusts neck and limb muscle tensions, keeping the head attitude steady as far as possible when the body is moving.

These systems play an important role when, for example, a cheetah is racing after its prey and needs to keep its eyes steadily on the target, or a sportsman chases after or strikes a ball. One might say that the eyes lead, but in reality it is clear and steady intention leading and the brain and body functioning in a free and coordinated way. This, of course, is what particularly interested Alexander.

He understood that sub-occipital muscles are the most anterior of the spinal muscles but it is important to recognise that the extra-ocular muscles come first in the complete series of axial somatic muscles[2,3,4]. Significantly, the three pairs of extra-ocular muscles are innervated by cranial rather than by spinal nerves and, moreover, by the first three pairs of exclusively motor cranial nerves: III, IV and VI. These are the most anterior typical motor nerves in the organism. (Cranial nerves I and II are entirely sensory while V, the trigeminal, is mainly sensory and contains atypical motor fibres supplying the jaw muscles; they originate from gill arch musculature and are not somatic.)

The finding that the quality of coordination of muscle tone throughout the whole body, both at rest and in activity, can be favourably influenced by the purposeful direction of the eyes while the head remains still, an activity requiring brainstem coordination of the functions of the most anterior somatic (ocular) and suboccipital axial muscles, has considerable appeal and practical significance.

PRACTICAL CONSIDERATIONS

When the motor control system is provided with appropriate precise thoughts and intention and enough time, 'the right thing does itself.' The control system is thought to bring about subtle release and the appropriate lengthening of extra-ocular and skeletal muscles whose current length would interfere with easy, fluid movement of the eyes and/or of the whole body toward the object of interest, while muscles that need to become more active to bring about the movement in a smooth, coordinated manner are subtly toned.

These specific changes and the associated general improvements in overall neuromuscular coordination bring one to a point of clear choice, not of 'how' to move but simply 'whether or not' to do so. The time needed for preparation depends on the degree of familiarity with the procedure. With practice the time required becomes shorter. When the activity ends, whether overt movement was allowed or not, the specific neuromuscular preparations fade but the background level of improved co-ordination continues. Transient proprioceptive illusions may be experienced and then it is essential to continue attending primarily to the upward push from the ground, to the crown of the head and to the spine, and to avoid becoming totally distracted by strange sensations; just observe them from a distance with detached curiosity. In this way any tendency to dizziness can be kept in check and the illusions will resolve beneficially in the course of a few minutes.

In the Activities described in sections 2, 3 and 4 below, it can be very strange at first to be looking downward while directing attention toward the crown of the head, to be looking at something and refusing to allow the head and neck alone to be drawn toward it. The functional integrity of the head-neck-spine system must be defended so that it moves as one. These abilities are needed in order to gain self-command and collaborate with the brainstem motor system. They are called for in the directions for moving from 'stand to monkey' or 'stand to sit', and 'intention to see an object leading to whole body movement'. Activities 2(a) and (b) provide opportunities for learning and improving these skills.

The initiation of joint release in 'stand to monkey' or 'stand to sit' may be the result of the brainstem centres interpreting 'purposeful looking down and waiting' as a signal for the whole body to bring the head, mouth and hands closer to the visual target. It seems likely that a combination of inputs from intention, the retina, the extra-ocular muscles and the whole proprioceptive system is involved in setting off this response. The horizontal semi-circular canals do not need to be tilted forward beforehand, as was suggested earlier[10].

Allowing the neck to move forward relative to the rest of the spine prevents the response; so does staring or defocusing. It is interesting to observe that these forms of misuse are incompatible with clarity of intention and coordinated action. These statements can easily be tested.

ACTIVITIES

The basic Alexander Technique skills of inhibition and the projection of the fundamental directions are assumed to be employed throughout.

1. Following Around Shapes With The Eyes; Head And Body Remaining Still

Sit on a firm seat, facing something interesting with irregular curves, such as drapery, clothing, a person, an animal, houseplant, or foliage outside the window. Attend to the upward push under your sit bones. Focus on and follow continuously around the profile or shape, breathing normally, your head still but not held, only your eyes moving, minimising jumps and gaps, following the details of each curve as if you were planning to draw the object. Continue until the eyes return to the starting place. Repeat in the opposite direction.

Observe the calming effect of this activity, the difficulty in commanding smooth eye movements, the acquisition of more skill with practice and the advantage of beginning an Alexander session with this 'game'. An appropriate attentive mood is achieved. People with a tendency to stare are challenged to maintain focus and this is essential for normal motor function. It is said that the eyes are continually in motion, but staring prevents both this and the ability to see what is being stared at. It seems to freeze the whole body*.

With your hands on someone 'going well', ask them to defocus or stare. Observe the change throughout the whole body and ask them to focus again. It is evident that the use of the eyes is intimately involved with the functioning of the brain and control of the musculature.

2. Moving The Eyes With The Head And Neck Stationary

Lie semi-supine to provide the best conditions for attending to the necessary directions and for observing the effects. Understand where the crown of the head (vertex) is and attend to it throughout the activity.

(a) Thinking only

The activities outlined below in (b) are best carried out first in thought only. Think of the eyes looking in a particular direction for about 30 seconds, if this is possible without strain, while actually looking and focusing straight ahead. Work through sections (b) i-iv omitting eye movements. This activity calms and clears the mind. It provides practice in inhibition and direction in relation to the functioning of the brainstem motor control system. Plans for the intended movement are prepared, adverse muscle tensions are released, but the 'executive command' is not given. The value of this thinking exercise is soon appreciated. On a later occasion the full activity (b) can be allowed and with more success.

* It has been observed that when sufferers of Parkinson's Disease enliven and focus the eyes, particularly when intending to move, they find it easier to initiate movement.

(b) Thinking and moving the eyes

Understand where the crown of the head (vertex) is and attend to it throughout the activity while lying semi-supine. Eyes have to be alert.

i) Without allowing movement of the head or the eyes, think of seeing to the left and retain this thought for about 10 to 30 seconds. Then, attending to crown, allow the eyes to move calmly and look far to the left, directing them to continue there for 30 seconds, even a minute or slightly longer if comfortable. Allow eyes to return calmly to centre and re-establish full attention to crown.

ii) In the same way, think of seeing to the right, but don't do it. After about 10 to 30 seconds allow the eyes only to move calmly and look far to the right, directing them to continue there as before. Allow eyes to return to centre.

iii) Think of looking down toward the knees, giving particular attention to crown of head to prevent any downward head or neck movement. After some seconds, allow the eyes only to move. Direct eyes to continue looking in that direction for about 30 seconds while attending to crown of head. Allow eyes to return to centre.

iv) Think of seeing beyond crown, (i.e. behind you when lying down, above you when standing), giving particular attention to crown of head to prevent tilting the head back. Allow the eyes to move and direct them to continue looking 'upward' for about 30 seconds while attending to crown of head. Allow eyes to return to centre.

When neck or other tension is released and the spine lengthens or the atlanto-occipital joint angle changes, allow the body to move and take advantage of the increased freedom by adopting a more open disposition of the skeleton, reducing amount of head support if indicated. Re-establish attention to crown of head.

When working with a colleague or pupil, place hands in contact with their head and neck or elsewhere to observe changing muscle tensions during the activity. Watch the whole individual, notice subtle movements and wait for the reflex interactions to finish. Increased calm, freedom and coordination can be observed.

Considering the range of movements available to the eyeball, looking down might be compared with looking to the South (or to the North), right and left with East and West. Intermediate eye directions equivalent to Northeast, Northwest and any other compass point can be explored using the approach outlined above. Directions that are more difficult to adopt and maintain need more attention.

Find out whether the eyes can move in a perfect circle, both clockwise and anticlockwise. Play with this idea, remembering attention to crown.

Make use of improved eye mobility during teaching and all other activities.

3. Moving From Stand To Monkey Or Stand To Sit

Stand at full height, looking horizontally at something, not staring. Allow rear of heels to make good contact with the floor. Think of the floor sloping a little backwards and down under your feet, as though the heels were lower than balls of feet. The knees should be fully 'lengthened' and firm, but not braced back. Give the usual directions to stand in balance at full stature.

Without changing these conditions, allow the eyes only to move, to roll forward and down within the orbits so that you look down but 'go up'. Focus on something in front of you, such as a teaching table, chair or the floor. Do not allow the neck to move forward relative to the rest of the spine. This activity is rather similar to looking toward the knees while lying semi-supine.

Insist on maintaining your full height, i.e. 'go up', and wait while the focused eyes look 'ahead and down'. Refuse to collapse or 'surrender' to gravity in order to move toward the floor. Height will be gained and then the major joints, ankles, knees, hips, sacroiliac and atlanto-occipital, will be simultaneously and subtly released.

If one so wishes, smoothly coordinated movement to a 'monkey attitude' can take place with the whole spine behaving as one thing. This will be experienced as a 'dynamic monkey' that allows a wide choice of the degree of bending of each joint together with axial rotation of the upper body relative to the feet.

Renewed attention to the heels improves postural support, freedom of movement and the quality of hand contact guidance. This can be recognised by another teacher during shared hands-on work. The quality of dynamic touch can be further improved by increasing eye liveliness and mobility.

The stand to sit movement can be started in the same way as described above, the body continuing to move in dynamic balance to the chair.

When someone is guided to sit in the conventional way, their eyes need to be watched to ensure that they are allowed to move from the horizontal field of attention when standing, to look at something lower down according to the degree of bending of the joints, until the torso is vertical again when sitting. People need to recognise a subtle and fleeting stimulus to allow the eyes to move and to be able to respond to it. If the eyes remain 'stuck' on the field of view when standing and

looking ahead, the head-neck-back relationship cannot be easily maintained during the movement to sit. The neck will be obliged to bend backwards under the head as the torso inclines forward, contrary to intention.

4. Intention To See An Object Leading To Whole Body Movement

Stand at full height facing a table, about six inches away from it. Give the directions for adopting a variable 'monkey' attitude. Finish with forearms on table as in the diagram, palms facing, fingers relaxed, with the ulnas, elbows, wrists and heels supporting your weight. Think 'backward and down' at elbows, as though they were ice-axes digging into the table and think of allowing your pelvis to hang from the secure hold. Re-establish foot, heel, whole forearm, wrist and elbow support. Direct head, neck and back in the usual way.

Look vertically down at table, have something there, A, to focus on and direct head and neck away from it, retaining support from arms and at elbows. Have another object, B, a few inches further ahead so that you can just see it by moving your eyes upward. Look and focus vertically down again at A but form the intention of wanting to see the object B. Refuse to allow the eyes to move toward B, and wait.

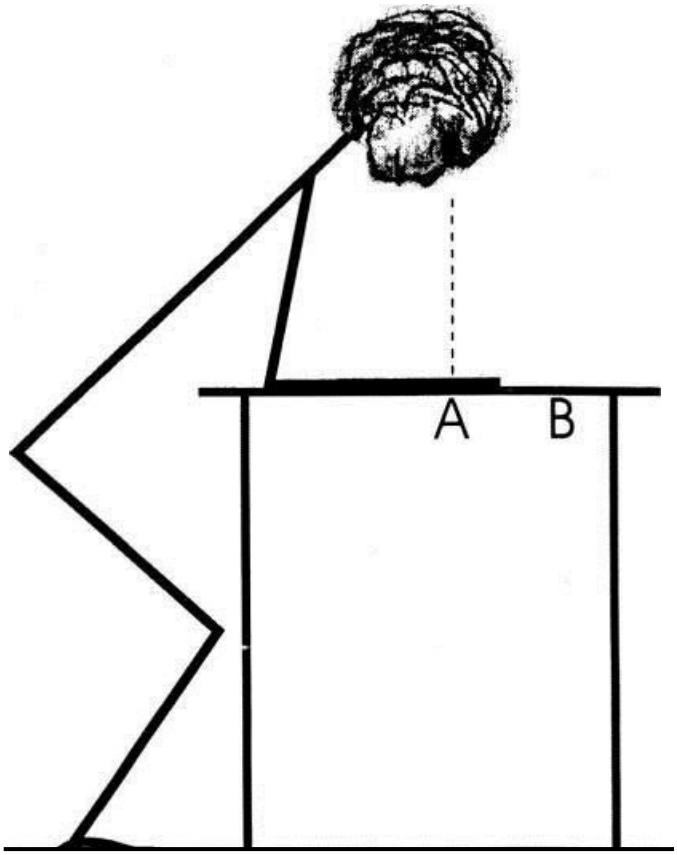

Fig. 1 Intention to see an object leading to whole body movement

Without straining, maintain your directions, alertness and intention for one to two minutes if necessary, while allowing the eyes to be interested in A but intending to look vertically down at B. During this time the necessary neuromuscular preparations are organised. If you are free and not fixed, breathing easily, with good heel contact on the floor, good forearm, wrist and elbow contact with the table, and the head-neck-back relationship in order, the torso will glide forward over the stationary supports, bringing the head and eyes directly over B. Reverse the direction of movement by wishing to see A.

CONCLUSIONS

It has been found that the thoughtful, purposeful direction and use of the eyes and the visual system, as described in this article, can be employed as an integral part of the Alexander work; and that some components of the visual system are an integral part of the primary control.

These activities provide a favourable means for observing: 1. the need for precise intention in preparing nerve and muscle activities in readiness for skilled co-ordinated movement, 2. the time that may be needed for this preparation, 3. involvement of the whole self and 4. that widespread unexpected changes occur in muscle tone. The meaning of 'non-doing' and of 'ideomotor action' becomes clear[11].

Exploration of these eye-related procedures and the sensory feedback has been found to improve mental calm and attentiveness, alertness and neuromuscular coordination and to sharpen sensory awareness and 3-D sensory appreciation.

A better practical understanding of the primary control is gained.

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The writing style has been extensively revised by the author for publication by Alexander Studies Online.

Figures

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