

Alexander Technique Science

Peer-reviewed Research on Mind, Movement, and Posture

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Glossary of Scientific Terms

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Categories: Overview

This post contains a glossary of some of the relevant scientific terminology for Alexander Technique and science with links to relevant articles and websites.

<i>Acceleration</i>	<i>Change in speed or velocity. Caused by an imbalance in forces.</i>
<i>Adaptable tone</i>	<i>Muscle tone that changes its distribution automatically when position is changed. This occurs when muscles automatically reduce their tone/tonic activity when they are stretched so that they “let go” and increase their activity when they are shortened so that they “take up the slack”.</i>
<i>Alien hand syndrome</i>	<i>A neurological disorder characterized by the loss of control or agency of one’s arm. For instance, the accredited arm may reach out to grab objects automatically. Sometimes patients have to use their unaffected arm to prevent unintended actions by physically wrestling with it. Alien hand syndrome can be caused by damage to pre-SMA which contributes to executive inhibitory control.</i>
<i>Anticipatory postural adjustment (APA)</i>	<i>A planned postural correction that occurs before a disturbance. This occurs when the brain predicts a disturbance and stabilizes in advance. This is in contrast to a postural reaction where the brain detects and then reacts to a disturbance. APAs can be phasic or tonic and commonly occur before a movement takes place, for example, stabilising the legs and back before pulling on a heavy door that would otherwise pull the body forward.</i>
<i>Attention</i>	<i>Increased brain monitoring of a specific spatial region, sensory input or</i>

	<p>neurological process. This can occur without awareness.</p> <p>https://journals.sagepub.com/doi/abs/10.1177/0956797611419302</p>
Awareness	A conscious registration of a stimulus or mental process.
Axon	The output portion of a neuron. It consists of a long thin tube that conducts impulses to signal other neurons. Axons are sometimes covered in myelin to increase the speed that impulses travel. Many axons bunched together are called a nerve.
Balance	The behaviour concerned with preventing the body from toppling over due to gravity by keeping the centre of mass of the whole body above the base of support. More strictly, this requires the center of mass to be above the centre of pressure within the base of support.
Basal ganglia	A collection of nuclei that form a loop through the cortex concerned with the initiation of actions. Parkinson's disease damages one of these nuclei causing, among other things, difficulty initiating actions and slow movement.
Basic research	Research aimed at understanding the mechanism of phenomena. In the biological sciences basic research is generally performed by different researchers, using different types of studies and published different journals than clinical research.
Body image	Perceptions attitudes and beliefs concerning one's body. Unlike body schema this is not directly involved in the control over action.
Body Map.	A colloquial term used to refer to the application of the study of anatomy on the AT. This term does not have a specific scientific meaning like body image and body schema.
Body schema	A central representation of the body in the brain that is in some sense independent of sensory input. People experience phantom limbs after amputation because their body scheme still registers the missing limb even though there is no sensory input from it. The body schema is directly used for motor control.
Brainstem	The region just above the spinal cord that consists of the medulla, pons and midbrain and controls many automatic behaviours including muscle tone, breathing, and coughing. The brainstem is difficult to study in part because of its relatively inaccessible position deep within the brain.

<i>Camptocormia</i>	<i>A disorder where the spine bends forward when standing upright, sometimes known as “bent spine syndrome”. There are many possible causes of camptocormia including Parkinson’s disease and weakness.</i>
<i>Central parent generator (CPG)</i>	<i>A collection of interconnected neurons that generates the basic timing for a rhythmic motor behaviour. For instance there is a central pattern generator for walking in the spinal-cord and central pattern generators for breathing and chewing in the brainstem.</i>
<i>Centre of gravity</i>	<i>Like the centre of mass except in a gravitational field.</i>
<i>Centre of mass</i>	<i>The midpoint of the mass of a body, which is where the body would balance if supported from below. The centre of mass is not a fixed point and changes as the body changes shape. In fact it can lie outside the body. The centre of mass of the human body is often around the pelvis.</i>
<i>Centre of pressure</i>	<i>The midpoint of the pressure exerted by the floor on the region of contact. The centre of pressure for each foot lies somewhere within the foot’s boundary and can be moved through muscular action. For instance, contracting calf muscles pushes the toes down and moves the centre of mass towards the front of the foot.</i>
<i>Cerebellum</i>	<i>A structure protruding out the back of the brain that acts tune feedforward motor programs based on sensory error. For instance, consistent reaching to the left of a target will cause the cerebellum to tune the movement program to the right.</i>
<i>Clinical research</i>	<i>Medical research dealing with health, ailments or conditions. Clinical research differs from basic research and uses mechanisms such as randomised control trials.</i>
<i>Cocontraction</i>	<i>Activating muscles on both sides of a joint. As the forces are counterbalanced there is no movement but the joint becomes stiffer.</i>
<i>Cognitive flexibility</i>	<i>An executive function concerned with flexibly altering actions or thoughts in non habitual ways.</i>
<i>Complex system</i>	<i>A system where there are many interconnected parts in parallel. Typically it has elements of feedback, nonlinear behavior, and spontaneous organization. A computer by this definition is not a complex system as the working is such that it executes one instruction at a time in a predictable, serial fashion.</i>

<i>Concentric contraction</i>	<i>A contraction of muscle where the muscle shortens when activated. This occurs when the muscle force is greater than the forces opposing it.</i>
<i>Connective tissue</i>	<i>One of various types of noncontractile tissues that adheres across body organs. Is it typically compliant (ie not stiff) and doesn't generate substantial force. An example of connective-tissue is the fascia surrounding muscle.</i>
<i>Consciousness</i>	<i>Awareness of one's body and environment. The neurological basis of this is not understood currently. https://blogs.scientificamerican.com/brainwaves/does-self-awareness-require-a-complex-brain/</i>
<i>Contact force</i>	<i>A force that is generated through physical contact between two bodies. Contact actually generates two forces that are equal and opposite to one another, according to Newton's third law. For instance, jumping off a rowboat produces a force that propels you forward and another that propels the rowboat backwards.</i>
<i>Corticospinal excitability</i>	<i>A state of readiness in the motor cortex and spinal cord. It is often measured by stimulating a specific area of motor cortex with TMS and measuring the resulting twitch in muscle.</i>
<i>Craneo cervical flexion test</i>	<i>A validated test for assessing the use of deep neck flexors vs superficial neck flexors (sternocleidomastoid).</i>
<i>Decerebrate</i>	<i>Removal of the brain's higher centres. This used to be used for eliminating voluntary behaviour and exaggerating muscle tone. It is difficult to interpret how observations in decerebrate animals relate to normal animals.</i>
<i>Dendrite</i>	<i>The part of the neuron that receives input from other neurons.</i>
<i>Eccentric contraction</i>	<i>An activation of muscle as it lengthens from external forces that exceed the muscle's force. Eccentric contractions are used to slow or break an action.</i>
<i>EEG</i>	<i>Electroencephalography. Measurement of brain activity with electrodes. It has the advantage over fMRI in that it measures quickly changing neural activity but has poor spatial resolution.</i>
<i>Elasticity</i>	<i>The ability of a material to resume its original shape after being stretched.</i>
<i>Electromyography</i>	<i>Measurement of muscle activity with electrodes. At the present time it is only</i>

(EMG)	<i>possible to measure a limited number of muscles. While it is difficult to determine a muscle's absolute activity, EMGs clearly indicate changes in activity.</i>
<i>Executive attention</i>	<i>The process concerned with controlling attention at will as opposed to being drawn to something in the environment. Sometimes executive attention is considered an executive function.</i>
<i>Executive function</i>	<i>A set of cognitive processes that act at the highest level to flexibly control and monitor behaviour. These include working memory, executive inhibition, cognitive flexibility and sometimes executive attention.</i>
<i>Executive inhibition</i>	<i>An executive function which is responsible for stopping the initiation of undesired automatic actions and thoughts.</i>
<i>External force</i>	<i>Forces that act between the body and external objects. The two types of external forces are contact forces and gravitational force.</i>
<i>Fascia</i>	<i>A type of connective tissue that encloses muscle and other organs. In most cases it is very thin and does not exert much force.</i>
<i>Feedback</i>	<i>Monitoring the result to tune control in real time. An example would be moving a mouse to point the cursor to a very small button.</i>
<i>Feedforward</i>	<i>A pre-planned action that doesn't use feedback but merely executes without adjusting the plan.</i>
<i>fMRI</i>	<i>Functional magnetic resonance imaging. Different from a regular MRI in that it detects neural activity in the brain as opposed to tissue composition.</i>
<i>Force</i>	<i>An interaction between two bodies to push or pull. Forces occur in equal and opposite pairs, one acting on each body. For instance pushing on a wall exerts a force on the wall and the wall exerts an equal and opposite force on your hand.</i>
<i>Force plate</i>	<i>Equipment that measures the ground reaction force. A scale is a simple force plate however it only measures the vertical force and often very slowly.</i>
<i>Galvanic skin response</i>	<i>A change in the electrical resistance of the skin caused by emotional stress and effort.</i>

<i>Gaze</i>	<i>The period when are eyes are fixed on a target.</i>
<i>Global inhibition</i>	<i>A form of executive inhibition that aims to prevent any action.</i>
<i>Ground reaction force</i>	<i>The external contact force between a body and the ground, typically occurring under the feet.</i>
<i>Guy wire</i>	<i>A diagonally oriented wire that acts to stabilise a mast or radio tower through tension.</i>
<i>Head forward posture</i>	<i>Forward posture of the head where it is carried in front of the body and the neck is inclined forward. Back and down in Alexander terminology.</i>
<i>Ideomotor theory</i>	<i>A theory that actions are represented in the brain by their perceivable effects. For instance, if you push a key that generates a sound the theory would suggest that the action is triggered by the thought of the sound itself, rather than the desire to produce the sound by pressing the key. This theory is not the same as the observation that thought affects action, of which there are countless examples of in modern neuroscience. Instead, Ideomotor theory surmises that the thought of the sensation in the end state itself triggers the plan. Ideomotor theory exists within the field of psychology and is not explored in modern neuroscience or motor control. Some researchers have recently considered it as unfalsifiable.</i>
<i>Inertia</i>	<i>The resistance of an object to changes in motion. The greater an object's mass the greater its inertia.</i>
<i>Internal force</i>	<i>A force that occurs within the body. Muscular and ligamental forces are internal forces.</i>
<i>Internal model</i>	<i>The representation within the brain of an object or process. For example, you have an internal model within your brain of how a car drives. The internal model of the body in space is called the body schema.</i>
<i>Interneuron</i>	<i>A neuron that is neither a sensory or motor neuron, and therefore in the middle of a neuronal circuit. Most neurons in the brain by far are interneurons.</i>
<i>Isometric contraction</i>	<i>Muscular activation that occurs without a change in position. Isometric contractions occur because the contractile force from activating muscle is exactly counterbalanced by an external force.</i>

<i>Kinaesthesia</i>	<i>The senses that signal body motion (as opposed to position). It can be assessed by one's threshold to detect motion of a joint.</i>
<i>Kinetic chain</i>	<i>A series of body segments linked to one after the other in a chain. Kinetic refers to forces being transmitted across the chain.</i>
<i>Kohnstamm phenomenon</i>	<i>The most typical example of this phenomenon on is pushing your arms against the wall or doorway and having them rise involuntarily afterwards.</i>
<i>Ligamentous spine</i>	<i>The spine with only ligaments attached.</i>
<i>Lurch</i>	<i>The speeding up of forward motion when leaving the chair. This is accompanied by a fast weighting of the feet just before a lift off.</i>
<i>Magnus reflex</i>	<i>A reflex that occurs when turning or flexing and extending the head. There are two types: the asymmetric tonic neck reflex where the limb in the direction of the head turn is flexed and the opposite extended, and the symmetric tonic neck reflex where both limbs are flexed when the head is flexed and both limbs are extended when the neck is extended. These reactions only minimally occur in healthy adults but are pronounced with brain damage or in infants.</i>
<i>Mass</i>	<i>Quantity of matter.</i>
<i>Matching</i>	<i>The ability to oppose an external force precisely to maintain body position or only change it very slowly. The game of push hands in Tai Chi is an example of matching.</i>
<i>Millisecond (ms)</i>	<i>1/1000 of a second.</i>
<i>Mirror neuron</i>	<i>Neurons in the brain that are active both in action planning and action observation. For example, some mirror neurons are active when you perform a certain gesture or observe someone else performing it.</i>
<i>Momentum</i>	<i>The tendency of an object to continue in motion. Momentum increases with both greater speed and greater mass.</i>
<i>Motor control</i>	<i>The field of science that studies the control of muscular activity. There is a large overlap of motor control with biomechanics and neuroscience.</i>
<i>Motor cortex</i>	<i>The part of cortex that is concerned with regulating muscular activity. Much of</i>

	<i>motor cortex is devoted to planning volitional movements.</i>
<i>Motor neuron</i>	<i>Neurons that are directly connected to and activate muscle. For most muscles these occur in the spinal-cord.</i>
<i>Movement</i>	<i>Change in position. Requires an imbalance of forces to cause acceleration and deceleration.</i>
<i>Muscle activity</i>	<i>Muscle activity is produced thorough impulses from motor neurons and acts to shorten the muscle. However, the muscle will not actually shorten if opposed external forces, such as with eccentric or isometric contractions.</i>
<i>Muscle tone</i>	<i>Unconscious tonic activation of muscle. This persistent activation results in an ongoing state of muscle tension. While clenching your fist tonically activates muscle it is not considered muscle tone because this is conscious.</i>
<i>Nerve</i>	<i>A bundle of many axons from motoneurons and/or sensory neurons carrying information from the nervous system to muscles or sensory information to the nervous system, respectively.</i>
<i>Neural inhibition</i>	<i>A process where a single neuron acts to reduce firing in another neuron. Not to be confused with executive inhibition.</i>
<i>Neural integrator</i>	<i>A group of neurons that turns brief transient (ie phasic) input into sustained (ie tonic) output.</i>
<i>Neuron</i>	<i>A cell that is electrically active and can signal other neurons. Neurons are interconnected in circuits which perform specific functions. A neuronal system generally consists of a group of circuits.</i>
<i>Neuroscience</i>	<i>A fairly recent collective term uniting all the brain sciences, which used to be separately classified as neuroanatomy, neurophysiology, psychology, etc.</i>
<i>Newton's third law</i>	<i>The law that action has an equal and opposite reaction. If you jump off a boat there is a force applied by you to the boat while the boat applies an equal and opposite force on you.</i>
<i>Newtons second law</i>	<i>This law states that the acceleration caused by a force is inversely proportional to the mass of the object (Acceleration = Force/Mass). For instance the same force will cause a large acceleration in a light object but only a small acceleration in a heavy object. In the example of jumping off a</i>

	<i>boat – if the boat weighs twice as much as you, the boat will travel backwards only half as fast as you move forward.</i>
<i>Nucleus</i>	<i>A cluster of interconnected neurons in the brain.</i>
<i>Parietal cortex</i>	<i>The region in the middle back of the cortex that is concerned with sensory and spatial information.</i>
<i>Passive stability</i>	<i>Stability resulting from tension and not requiring specific neuronal responses to disturbances.</i>
<i>Posture</i>	<i>The persistent configuration of body segments. While posture is casually thought of as position, it is regulated by a complex postural system. Thinking of posture as position only ignores the associated postural behaviour.</i>
<i>Peer review</i>	<i>The process where scientific work is submitted anonymously to experts in the field for critical review. Peer review is required for journal publication.</i>
<i>Phantom limb</i>	<i>The perception of a limb or body part even after it has been amputated.</i>
<i>Phasic</i>	<i>Brief or transient. Phasic activation of muscle consists of activating it in brief bursts to produce brief forces as opposed to ongoing tension.</i>
<i>Plasticity</i>	<i>The brains ability to change and adapt as a result of experience. While plasticity occurs by definition during all learning, is not an explanation of what brain processes adapt or how the change. For example plasticity occurs whenever you form a memory as well as when you learn the Alexander Technique but these have different underlying neurological bases.</i>
<i>Postural alignment</i>	<i>The position of body segments. For example the postural alignment of the spine is just the spinal curvature.</i>
<i>Postural frame</i>	<i>The mechanical frame of the body that results from matching or postural stiffness.</i>
<i>Postural reaction</i>	<i>This term refers to postural responses, which are usually phasic, that oppose a disturbance.</i>
<i>Postural set</i>	<i>A state of the nervous system that affects postural reactions. Typically, postural set is used to refer to the setting of phasic postural reactions, as</i>

	<i>opposed to postural tone. A classic example of postural set is deciding whether to yield to or resist an upcoming force.</i>
<i>Postural sway</i>	<i>The path traced out on the ground by the Center of Pressure during quiet standing as the body maintains balance. The term is a misnomer as it really represents balancing activity.</i>
<i>Postural system</i>	<i>The neurological system that regulates posture. It consists of subsystems that control postural tone as well as for counteracting phasic disturbances.</i>
<i>Postural tone</i>	<i>Muscle tone that is directed at maintaining a posture. For example, the muscle tone that supports the body against gravity is postural tone, while the lower level muscle tone that occurs while lying down supported is not.</i>
<i>Pre-frontal cortex</i>	<i>The front-most region of the cortex that houses many of the executive functions.</i>
<i>Pre-SMA</i>	<i>A cortical region near SMA that participates in executive inhibition.</i>
<i>Premotor cortex</i>	<i>A cortical region dealing with motor planning.</i>
<i>Primary motor cortex</i>	<i>The output region of motor cortex. Primary motor cortex has a strong and direct effect on motoneurons in the spinal-cord.</i>
<i>Proactive inhibition</i>	<i>Executive inhibition that acts in advance to eliminate responses. The opposite of this is reactive inhibition, which determines whether or not to inhibit based on the particular stimulus.</i>
<i>Process</i>	<i>A phenomena that undergoes a sequence of transitions or changes over time. Movement of an arm is a process because it requires accelerating the arm and then decelerating it.</i>
<i>Proprioception</i>	<i>Sensory information that signals joint position or joint movement. Proprioception may be conscious or unconscious.</i>
<i>Quasistatic</i>	<i>A quasistatic process is one that can be well approximated at any point by the static (non moving) structure. For example, if sit to stand is performed slowly and smoothly enough, each moment in the movement is approximately stable. In this case the movement can be called quasistatic.</i>
<i>Reflex</i>	<i>This term has a loose and a strictly defined meaning. Colloquially, a reflex</i>

	<i>refers to an automatic reaction. The strict definition refers to a specific physiological process with a simple and direct connection between input and output, called the “reflex arc”. A reflex redirects sensory information to activate muscles without processing it in a complex way. Once thought to be the building blocks of behaviour they are now know to play a very limited role.</i>
<i>Saccade</i>	<i>A brief movement of the eye between gaze locations.</i>
<i>Selective inhibition</i>	<i>A form of executive inhibition where only some behaviours or body regions prevented from acting.</i>
<i>Set</i>	<i>A state of preparedness of the nervous system to act or react in a specific way.</i>
<i>SMA</i>	<i>Supplementary motor area. An area of motor cortex involved in producing motor plans. SMA is active during motor imagery, such as imagining playing tennis. It’s activity can be used to predict a movement before a person is aware of deciding to move.</i>
<i>Smooth pursuit eye movement</i>	<i>Eye movement that tracks an object traversing the visual field.</i>
<i>Spinal-cord</i>	<i>The part of the nervous system that extends into the spinal canal. It houses motoneurons for most muscles, axon tracks to and from the brain, and simple circuitry such as the walking central pattern generator.</i>
<i>Spreading</i>	<i>The propagation of muscle tension across body segments due to multi-articular muscles that span more than one joint or through neurological mechanisms.</i>
<i>Stability</i>	<i>The property of a structure or system to return to its original state following a disturbance.</i>
<i>Startle reflex</i>	<i>A brief protective response most often triggered by a loud noise. The startle reflex is phasic and cannot be prolonged.</i>
<i>State</i>	<i>Ongoing property of a system. Muscle tone and set are examples of states.</i>
<i>Stiffness</i>	<i>The extent that an object resists deformation by a force. Muscles have increased stiffness when active.</i>

Stress	<i>A state of mental or emotional strain or tension resulting from adverse or demanding circumstances. Stress can be prolonged unlike startle.</i>
Stretch reflex	<i>A specific reflex where stretch receptors act via reflex arc through the spinal cord to activate the stretched muscle. The knee jerk reflex is an example of a stretch reflex. Stretch reflexes require a very fast stretch and only briefly activate muscle, and therefore do not generate muscle tone.</i>
Tensegrity	<i>A mechanical system that consists of 2 types of elements: those in pure compression (struts) and those that in tension. The musculoskeletal system is not a tensegrity structure for various reasons including compressional joints and a lack of crossing struts.</i>
TMS	<i>Transcranial magnetic stimulation. This uses a magnetic field near the head to stimulate inside the cortex. It is fairly localised so that specific cortical regions can be activated. While imaging techniques can detect whether an area is active during a behaviour, TMS can be used to study whether the brain region causally affects it.</i>
Tonic	<i>Ongoing or persistent. Used to describe activity in neurons or muscles.</i>
Torque	<i>A rotational force. Muscles produce works because the whole of the muscle and the resistance act together to produce rotation.</i>
Torsion	<i>Rotation along and axis as opposed to bending. For the spine this equates to twisting.</i>
Twister	<i>A device to measure postural tone in the neck trunk and hips. Twister measures resistance to twisting while subjects support themselves against gravity.</i>
Vestibular ocular reflex	<i>A reflex that moves the eyes in the opposite direction as the head to maintain gaze location during imposed or unpredictable head motion.</i>
Weight	<i>The force produced on a mass by gravity. This is different from mass in that your weight on Mars is different from on Earth, even though the mass is the same, because Earth's gravity is stronger.</i>
Working memory	<i>The executive function that temporarily keeps in memory up to 7 things (approximately) at a time to be manipulated by other brain processes. For example keeping several things in mind to alphabetise them uses working memory.</i>