# Developing our potential to learn

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Modern research can provide many insights into the human being and in particular, when we combine it with our own observation of a child - how it interacts, behaves and responds to the world around it, it can enhance our interactions with the young child.

The young child is often keen to experience as much of the new world into which it has been born as it can. Through a range of sensory impressions, it begins the formative journey towards self consciousness.

One area of research that can contribute to our understanding of the young child is that of neuroplasticity - that the brain "fires and wires" itself based on experiences; and that these can change over time depending on the nature of the experiences. Any sensation (sense impression) whether it be sight, sound, movement, taste, temperature, touch, and so on; anything we do or experience reinforces a neural pathway. The more these sensations are experienced, the more these neurons are likely to fire in a similar way thus creating stronger neural pathways.

In utero, neurons are constantly being created, with axons [the nerve fibres that send electrical signals away from a neuron], and dendrites [the nerve fibres that carry signals back to a neuron] (see Fig. 1)

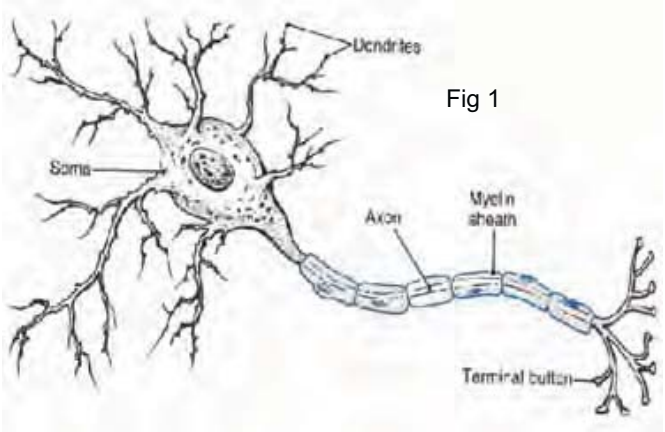
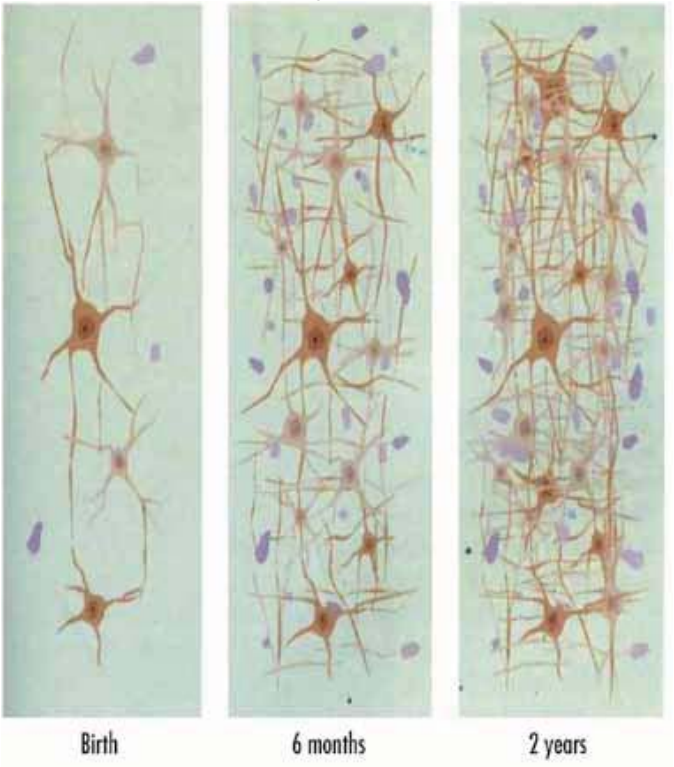



Fig 1

This forms the complex neural circuitry - the nervous system that allows communication along neural pathways – that provides a way to integrate experiences. Whilst the newborn infant has trillions of neurons, and has already started making connections, it is through the first few years of life that these connections rapidly increase (see Fig. 2)

Fig 2




In this way, the nerve -sense system (localised in the brain) is the great synthesizer of everything that is going on in the organism.[1]

The phrase 'use it or lose it', often bandied about in reference to brain function and skills, refers to neural pruning. Neural pruning is the reduction of neural pathways – specifically those connections that are weak. It is a natural process which happens with age and a necessary process which

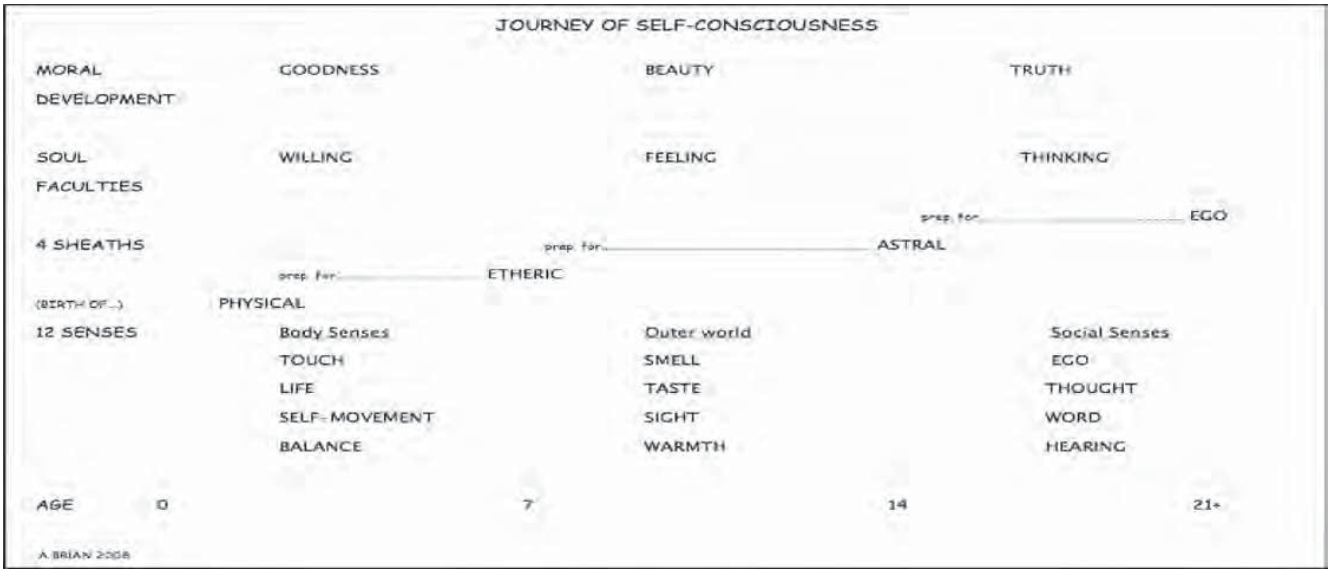
1 Steiner, R. (2005) Education for Special Needs. Rudolf Steiner Press, Lecture One. (previously known as Curative Education).

enables the more effective pathways to become even more efficient and established. The more that pathways are strengthened by conscious repetition and continued use, then the more likely it is that these pathways will be maintained.

Both nature – the genes – and nurture – the environment – play a role in processes to do with neural pathways. The main caregivers are very influential as the infant is not yet able to attend to its own needs and consequently is dependent on them to provide such things as food and care that ensure its well-being. The caregivers provide for the infant the environment from which it will receive many sensory impressions as well as providing routines, rhythms and boundaries between what is acceptable and what is not. Furthermore, the caregivers model responses and daily activities which the infant will imitate. A glimpse into how this may work can be seen in the recent discovery of mirror neurons. A mirror neuron is a neuron that fires both when a person observes an action performed by another and when it does that action itself. Though we are still in the early stages of understanding their role, mirror neurons are increasingly recognized as a crucial participant for many developmental processes, including imitation and social learning.[2] This is, as we know, a fundamental part of the early childhood experience according to Steiner's indications which involve imitation.

Taking a very simplistic view, the young child comes with a genetically inherited physical body that is accompanied by an energy/habit (etheric) body. Together, these two will form a body that the child's soul (astral) and spirit (ego) will come to know as its own. At first however, it is tricky to know this body - it is like when a young child first puts on a glove: it doesn't quite fit in the way that it should with some fingers cramped too tightly into part of the glove whilst other bits of the glove are not filled and are yet to be discovered! It is the task of the first 7 years for the child to begin to acquaint itself with life on earth, through all the sensory experiences that this entails, by getting to know this physical/etheric body and transforming it to make it the child's own.[3]

Rudolf Steiner's concept of twelve senses provides a way to understand this intricate picture of development. Whilst all the senses are present at birth, they progressively evolve and develop in alignment with the seven year phases of child development coinciding with the births of the physical, etheric and astral bodies. Each seven-year phase contributes to the preparation for the birth of the subsequent body, culminating in the birth of the ego at around 21 years of age. See table below for an overview of these concepts.




2 Del Giudice, M. Manera, V & Keysers, C. (2009) Programmed to learn? The ontogeny of mirror neurons Developmental Science. Oxford: Vol. 12, Issue 2.
3 Steiner, R. (1995) The Kingdom of Childhood. Anthroposophic Press.

The following discussion will provide a simplified focus mainly on the first group of senses[4].

This first group (known as body senses) are those that provide the child with an experience of its own body and are thus to do with the birth of the physical body and preparation for the birth [emancipation] of the etheric body. Touch allows the child to perceive the boundary between itself and the rest of the world, giving an experience of both connection and separation. The life-sense is very much about the child's state of well-being. Self-movement provides a distinction between whether the child is still or in movement. Balance provides the child with a relationship to gravity – it is described by Sally Goddard as providing the child with a sense of 'centre' in relationship to space.[5] These lower senses when fully permeated by the child provide awareness of spatial orientation and body geography.

The senses of smell, taste, sight and warmth provide soul experiences of the outer world and may be thought of as discriminatory senses that evoke a judgment. The social senses of hearing, word, thought and other-ego-sense provide a possibility to comprehend another human being. These senses involve higher cognitive capacities and come about through a metamorphosis of the body senses. Thus, it is that 'the whole motor system in the human being should become a servant of the intellectual system'.[6]

### *Importance of the Reflexes*

The infant begins its experiences via the body senses through a set of primitive reflexes which have developed in utero as part of its early survival patterns. These reflexes are innate, stereotyped movements that are directed from the brain stem and do not come under conscious awareness or control. The primitive reflexes are fully present at birth and are thought to play a role not only in the birth process but also in early motor skills. By six to twelve months after birth, the primitive reflexes are inhibited or controlled, because pathways to higher brain centres are being established.[7]

Also at this time, the infant's body consciousness progresses from the head through the trunk and limbs to the periphery of fingers and toes.[8] Starting with the head, the eyes begin to fix their gaze and head control develops. It will continue to lift its head upright when placed on its tummy or back and it begins to involve its hands and arms in order to push up and to eventually roll over. As its muscle tone (strength) improves and it discovers its hands, it will reach for objects whilst steadying itself with one hand or just its trunk. And in time, it will move its own body in order to get to that which is not in its immediate grasp. The movement of its body forward and sometimes even backward, begins with the whole body being in contact with the floor (whether it be on tummy or back) as it propels itself using arms, legs or both and with wriggling movements of the trunk. With continued muscle tone, it will eventually pull itself up into crawling on all fours, sitting and the culmination of all this, is standing leading into walking upright! Persistent practice of these various skills enables the infant to succeed in gaining control over its movements and inhibiting these primitive movement patterns.

As caregivers supporting the infant through these early developmental milestones we are mindful of letting it achieve them through its own volition. By avoiding things that will bring the infant too quickly into the upright position: baby pouches, walkers, jolly jumpers and some prams; the infant is freer to progress through this archetypical path of development. Other examples of support include: ensuring that the infant has an experience of floor-time on its back and tummy to stimulate sensory experiences of touch, movement, balance and encouraging muscle-tone; and to replicate the experience of breastfeeding, the caregiver switches sides for bottle-feeds to ensure equal stimulation of

4 See Appelli, W. The Care and Development of the Human Senses, and Soesman, A. The Twelve Senses
5 Goddard-Blythe, S. (2004). The Well Balanced Child. Hawthorn Press.
6 Steiner, R. (2005). Education for Special Needs. Rudolf Steiner Press. p309.
7 For a fuller discussion of the primitive reflexes see Goddard, S. (2005). Reflexes, Learning and Behavior: A Window into the Child's Mind. Fernridge Press.
8 Konig, K. (1984) The First Three Years of the Child. Anthroposophic Press.

hand, eye and mouth movements as this is the beginning of hand-eye coordination and fine motor coordination. Furthermore, we are mindful that the young child is eager to imitate the tasks which it sees the adults around it engaged in - stirring the porridge, washing the dishes, pegging the clothes, digging in the garden, and so on. All these activities provide countless opportunities to establish and reinforce neural pathways via repetition and rhythm.

As the developmental milestones of head control, rolling, crawling and walking are achieved, a range of reflexes that are known as postural reflexes begin to unfold and stay with us through our adult life. In very simple terms, they are: the **Righting reflexes** and the **Equilibrium reactions.** Both are concerned with posture, movement and stability, with the former enabling the child to maintain head and trunk in a specific position when the body position is altered in any way; and the latter providing protection when balance is lost or the centre of gravity is altered (e.g. in bike riding).[9] However, the walking infant is still far from mastering these postural reflexes and must continue to have a variety of lower sense experiences in order to facilitate the connection to higher brain centres.

### *Midlines - A Stage of Development*

At around 3-4 years of age, the young child enters the 'symmetry' stage of motor development.[10] With uprightness the child enters even more strongly into the 3-dimensional world - the up/down, front/back and left/right spatial relationships found in reference to its own body. To begin with, these relationships are indistinguishable for the child due to the midline barriers. The midline barriers give the child a mirror experience of each of these relationships, particularly in regards to the up/down and left/right planes of its body. For example, if the young child makes a curling motion with its fingers on its right hand at this stage of development, it is likely that the toes on its right foot will also curl and vice versa. In the left/right plane it is not uncommon for the young child to take up a crayon in the closest hand and draw a line beginning on that side of the page, passing the crayon to the other hand at the midpoint in order to continue it across to the other side.

Some observations that I have made illustrating these midline relationships**:**

- a 4 year-old girl who drew the right side of a butterfly with her right hand and then the left side with her left hand; and
- a 4 year-old boy who held the scissors with his left hand as he cut strips off the left side of the paper – he told me that he needed to use the other hand to cut the other side and proceeded to put the scissors in his right hand to cut the strips off the right side of the paper.

Therefore for the child in this stage, things seem to appear as mirror images and are experienced as identical: for example, 'b' and 'd'; '12' and '21'; 'was' and 'saw'. The child is still grappling with spatial awareness and directionality as well as fine and gross motor coordination. I believe that these are necessary skills to master before being taught the more challenging skills and concepts that are involved in reading, handwriting and mathematics. Research commonly points to strong relationships between retained midlines and primitive reflexes, poor gross and fine motor control in children who have been diagnosed with dyslexia, dyspraxia, ADHD and ASD.[11]

*"A person who uses his fingers clumsily also suffers from a clumsy intellect; he is unable to be mobile in his thoughts and ideas... It is better to train the intellect indirectly by first developing outer skills and faculties. These in turn will stimulate the powers of intellect to ripen in a balanced way so that eventually they will become part of the whole human being."*[12] Rudolf Steiner

9 Goddard, S. (2005). Reflexes, Learning and Behaviour.

10 P. Mesker, a Dutch Neurologist and Neuropsychologist, writes on Motor Development in Chapter 1 of 'The Second Grade Development Observation & assessment': Background and Manual by Els Gottgens, translated by Monica Ellis. Available from Mecurius Australia. [http://www.mercurius-australia.com/]. cost $10.45 code 45760005.

11 Two examples of this are:
Taylor, M., Houghton, S. & Chapman, E. (2004). *Primitive reflexes and Attention-Deficit/Hyperactivity Disorder: Developmental origins of classroom dysfunction*. International Journal of Special Education. 19:1.
Reynolds, D. & Nicolson, R.I. (2006) *Follow-up treatment of an Exercise-based treatment for Children with Reading Difficulties*. Wiley InterScience.

12 Rudolf Steiner, *Renewal of Education*.

Just as the early experiences of the infant can be supported and shaped by the caregiver to enable the developmental milestones to unfold as explained earlier, so too can experiences within the early childhood environment (whether it be care in the home, playgroup, preschool or kindergarten) support the young child in these formative processes, in its most simplistic form of building neural pathways. Permeation of the various activities by the consciousness of the caregiver/teacher provides an over-arching rhythm, mood, gesture, love and respect of self, the world and others that nurtures the young child.

For example:

- the rhythms of the day, week, seasons and year which provide security and repetition;
- the tone and quality of the rhymes, songs, stories and verses accompanied by gestures which begin literacy education in a way that is age-appropriate;
- the free play, both indoors and out which provides the child with endless possibilities and potential for creativity[13].

### *Fine Motor Skill Development*

We can bring consciousness into activities such as bees' wax modelling, painting, hand and finger games,[14] drawing, craft and cooking in order to foster fine motor development; to inhibit midline barriers; and to establish dominance and gross motor coordination. For example, this can be done quite unobtrusively by the teacher who consistently positions the implement (whether it is the spoon for porridge, the handle for the mill, etc), the finger-knitting loop (N.B. If encouraging right-handedness the loop should be on the left index finger and vice versa for the left-handed child), the paint brush or crayon basket - to name but a few, in order to reinforce a dominant development of one side of the body.

### Gross Motor Skill Development

In play environments, many opportunities to imitate adults or other children around them: to jump, swing, run, skip, walk, pump, dig, sweep, slide, tumble, roll, balance, ride, and climb in the directions of up, down, forward, back, and sideways. There is an increasing need for the children of our times to be helped to develop their lower senses and strengthen their will, as there are many indications that children individually have a greater spectrum of developmental needs.[15]

The culmination of the first seven years of life is the birth of the etheric body. Up until this point the formative forces associated with the etheric have worked as an inward artist to build up a physical body that the child can use as its own. It is through the sensory - motor experiences that the child transforms the inherited body to express something of its inner nature. This transformation begins with imitation where the foundations for learning are laid. These foundations are aptly described in the following statement by Audrey McAllen: "well integrated senses of touch, life, self-movement and balance are the basis for the maturation of early movement patterns, for 'dissolving' the midline barriers, development of dominance, spatial orientation, body geography, fine and gross motor skills, postural control, eye movement capacities, as well as a sense of rhythm, endurance and healthy breathing."[16] Thus, preparing the child for the next phase of learning: the class teacher period in the primary school. ◆

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13 For a comprehensive exploration of research findings involving play see:
Dr Stuart Brown "Play: how it shapes the brain, opens the imagination and invigorates the soul."

14 Recently I was fortunate enough to have a very brief introduction to the *Hand Gestures* of Wilma Ellersiek which appear to bring to the young child experiences which provide not only fine motor coordination but also encouragement of a dominant side in an age-appropriate manner.

15 Rawson, M. (2004). *Guidelines for School Readiness.* Dornach: International Curriculum Research Group of the Pedagogical Section of the High School for Spiritual Science.

16 McAllen, A. (1998) The Extra Lesson. RSCP.