

The Primacy of Movement in Development

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Introduction

Autism, now called Autism Spectrum Disorder (ASD), was first mentioned by Kanner [1]. He described 11 children in his clinic who lacked the social instinct to relate towards other people, who were mostly focused or even obsessed with objects, and who had a “need for sameness” or a “resistance to (unexpected) change”. Kanner coined the term “infantile autism” as the name for this newly described condition. His article made medical history. The phrase: “The Primacy of Movement” was coined by Maxine Sheets-Johnson in her book of this name.

Over recent years there has been a dramatic increase in the reported incidence of ASD. In a USA report from 2014, 1 in 68 US children has an autism spectrum disorder (ASD), a 30% increase from 1 in 88 two years ago [2]. This report does not say why the incidence of autism is rising, however, raised awareness amongst school staff, and parents, might influence referrals for diagnosis amongst children who were earlier described as ‘difficult’.

The diagnostic criteria for ASD are [3]:

- A qualitative impairment in reciprocal social interaction;
- A qualitative impairment in verbal and non-verbal communication;
- A markedly restricted repertoire of activities and interests.

All three of these criteria must be present and must have been apparent from early childhood. ASD is a spectrum condition including both low and high functioning individuals and they are all different, as anyone familiar with individuals who fall into this definition knows: “if you have seen one child with autism you have seen one child with autism” (anon). The latest official definition of the Diagnostic and Statistical Manual of Mental Disorders [4], includes Social Communication Disorder (SCD), which is defined as persistent difficulties in the social use of verbal and nonverbal communication, as a separate category. This removes perhaps 20% of individuals who suffer from SCD and who were previously included under autism in DSM 4 2000. But DSM 5 then goes on to establish the SCD severity level of a person diagnosed with ASD.

If DSM cannot be consistent even with such an apparently simple question as to who has ASD and the role of SCD in the diagnosis, it is unlikely that we will find a single cause or to be able to establish a simple diagnostic test which could lead to early diagnosis leading to screening and effective early therapies. Amongst the spectrum of behaviors associated with ASD it is not clear which are causal and which are consequential. The failure to identify a single cause leads us to believe that there is no single aetiology for the condition.

The UK National Health Service states that ASD is a difficult condition to define: “The exact cause of autism spectrum disorder (ASD) is currently unknown. It is a complex condition and may occur

as a result of genetic predisposition (a natural tendency), environmental or unknown factors”.

Many researchers believe that certain inherited genes could make children more vulnerable to developing ASD. Cases of ASD have been known to run in families (younger siblings of children with ASD sometimes also develop the condition, and it is not uncommon for identical twins to both develop ASD).

No specific genes linked to ASD have been identified, but it may be a presenting feature of some rare genetic syndromes, including Fragile X syndrome, Williams syndrome and Angelman syndrome.

Some researchers believe that certain people are born with a genetic vulnerability to environmental triggers and that ASD only develops if they are exposed to a specific environmental trigger, such as being born prematurely or being exposed in the womb to alcohol or to certain medications. No conclusive evidence has been found linking pollution or maternal infections in pregnancy with an increased risk of ASD [5].

The Primacy of Movement in Development

The role of movement in the development of cognitive, emotional and social development was relatively neglected until recently. “My aim has been to point out that motor control, which one may argue lies at the heart of the science of mental life and behavior because it joins the two, has had a surprisingly modest presence in psychology. “Only recently have psychologists come to appreciate that acting and knowing are inseparable” [6,7].

The young child’s motivation to reach is at the foundation of a perception action cycle, which creates new skills and hence new opportunities for cognitive development [8]. Failure to move in a typical manner in early childhood is a predictor of difficulties later in life [9]. “Infants who were more motorically mature and who explored more actively at 5 months of age achieved higher academic levels as 14-year-olds.” “The developmental cascade” arising from the child’s movements, leads to “perceptual, cognitive and social development”.

A research topic ‘Autism: The Movement Perspective’ opened up in *Frontiers in Integrative Science* 2013 and was followed by over 30 scientific research articles on the topic from research institutions around the world.

An editorial for the research topic: ‘Autism: The Movement Perspective’ wrote that movement could be “our best ally in autism, at all fronts.”

Studies of human movement demonstrate the intentionality of movement even as early as the second trimester in utero [10]. ASD has its origin in early prenatal failure of movement, timing and coordination. Foetuses that move in an atypical manner may, post-partum, display a problem in qualitative and temporal-dynamic

control, i.e., flexibility in affective response and precision in motor timing. This is associated with delay in cognitive development and language, which in turn is associated with a diagnosis of ASD.

"Motor deficits are present very early in development and may become more pronounced with age. All too often motor skills are not considered important enough when verbal, behavioral and social deficits take preference for parents" [11]. "Movement analysis in infancy may be useful for early diagnosis of autism: All of the 17 autistic children studied in the present paper showed disturbances of movement that with our methods could be detected clearly at the age of 4-6 months, and sometimes even at birth" [12].

The Nature of Autism Spectrum Disorder

We propose that ASD is not a primary syndrome but may be a multi-stage process and suggest that there are four stages in the development of ASD:

- 1) Impaired brain development, which is associated with;
- 2) Movement disturbance, associated with;
- 3) Cognitive, emotional and social disturbance, associated with ASD type behaviours;
- 4) ASD type behaviours.

Children with cognitive difficulties or delays confronted with having to understand and function in the world around them may be pressured by their adult carers, or their peers, to perform as their neuro-typical peer group. They may in response, adopt typical ASD behaviours such as avoidance; including having a tantrum, stiffening the body, averting the gaze, running away to a safe place or behaving in a socially inappropriate manner. Or they may adopt self-delighting behaviours such as rocking, spinning, hand flapping, and other self-stimulating activities, which provide the child with the greatest feedback for the least amount of effort.

Geoffrey Waldon MD [13-16] understood these behaviours not as the primary impediment, which may reflect one or more of a whole range of aetiologies, but as secondary impediments – behaviours adopted to avoid or escape external pressures. The child adopts them as a diversionary mechanism or to provide simple and undemanding pleasures in a world, which is confusing to him and hard to comprehend.

The Waldon Approach

Waldon was a neurologist practicing in the UK in from the 1960s until his death in 1989. He developed his approach from the careful observation of thousands of young children in his practice, in his family and in the park. He observed that if infants do not make full use of their movement in play, this would affect the development of understanding. The Waldon Approach aims to restart a cycle of movement and learning to increase motivation and adaptability, reduce anxiety and foster the growth of General Understanding.

How does (basic) 'General Understanding' derive from movement of the upper part of the body in space and how does this understanding serve as a directive for intervention in helping a student with a developmental problem?

The development of cognitive skills is based on movement. Movement itself is the source of sensory grasp and experience, and forms the sensory-motor basis of thinking. When the baby moves,

even in utero, he vastly and continuously expands and increases the information transported to his brain. His brain begins changing from the moment he begins to move. New neurons and additional nerve cell connections are formed every moment and the existing network of connectors is constantly reinforced.

The typically developing baby moves his hands and feet in space in movements that seem meaningless, random or pointless to the naked eye. However, this early movement is crucial for movement development in the future. It initiates a chain of responses in the brain, which in turn forms the basis for motivation and for the capability to perform more complex movements. The baby waves both his arms in the air, and in time these movements become more repetitive and flowing. This experience allows the baby to gradually gain control over his movements.

Motivation - the drive to move - necessarily precedes movement: along with the structural framework of the baby's body which defines and shapes movements, and the postural reflexes, which mean that certain movements cause certain other movements to happen, it is necessary for learning-development to occur. Motivation is continuously topped up by movement.

The baby increases his range of movements and in this way he experiences his body and the space around him. These early stages provide a tremendous amount of information. Through the senses and the experience of movement, as well as the constant interaction between the movement and the physical experience and the development occurring in his brain, the baby achieves physical integration and understanding of his body and his environment.

Soon he becomes sufficiently mature to pick up objects and drop them, bang or scrape objects on surfaces and against other objects, and later he will be able to place objects as he pleases – on top of each other or next to each other, to move them from place to place etc. He learns the qualities of the world that surrounds him and the materials and objects he encounters: their weight, shape, texture, color etc. The amount of information that he gathers and transfers to his brain becomes over a hundred times greater. These movements are made with both hands in the space surrounding him. The typically developing baby devotes most of his time to these actions of exploration and experimentation of his body and environment. There is a constant cycle of feedback from his actions and experiences to his developing brain, and this motivates him to new movements.

Although the developing skills are physical, from the very first moment they form the basis of his cognitive, emotional and social abilities. Without these initial stages of experiencing movement in space, full broadly based intelligence will not develop. The sensory messages from the body – from the muscles, joints and ligaments participating in the movement – are transmitted as neural impulses to the central nervous system. As time passes and the movement varies, all the neural information is organized in a way that enables the developing child to understand the world surrounding him. This kind of understanding is what Waldon defines as 'General Understanding', as opposed to Cultural Particular Understanding, which is taught to the child by the adult carer.

General Understanding is essential to any more complex understanding of qualities and connections in the world. It is universal to all of humanity, and applies to every child and person. The baby who experiences his environment as facilitating [17] begins to understand the qualities and connections of objects around him, widens his scope of action; he begins to understand the regularity of the world – cause

and effect, similarity and difference, and relationships between the ability to define, the ability to communicate with others and phenomena [18]. This is the basis of logical and inferential thinking, understand codes and symbols (Table 1).

General Understanding	Cultural Particular Understanding
No right or wrong	Lots of rights and wrongs
Rules are created by the child	Rules are externally imposed
No adult teaching	Adult directed
Full of experimentation	Full of directed learning
The long effortful way is best for the gain of maximum experience	The shortest route is best for maximum efficiency
Powered by child's own 'motivation'	Powered by adult direction
Reinforced by pleasure gained directly through child's own effort and activity	Reinforced by adult
Adult approval not required or expected	Adult approval is provided but is unrelated to the child's efforts but rather to its social acceptability

Table 1: Showing the differences between General Understanding and Cultural Particular Understanding.

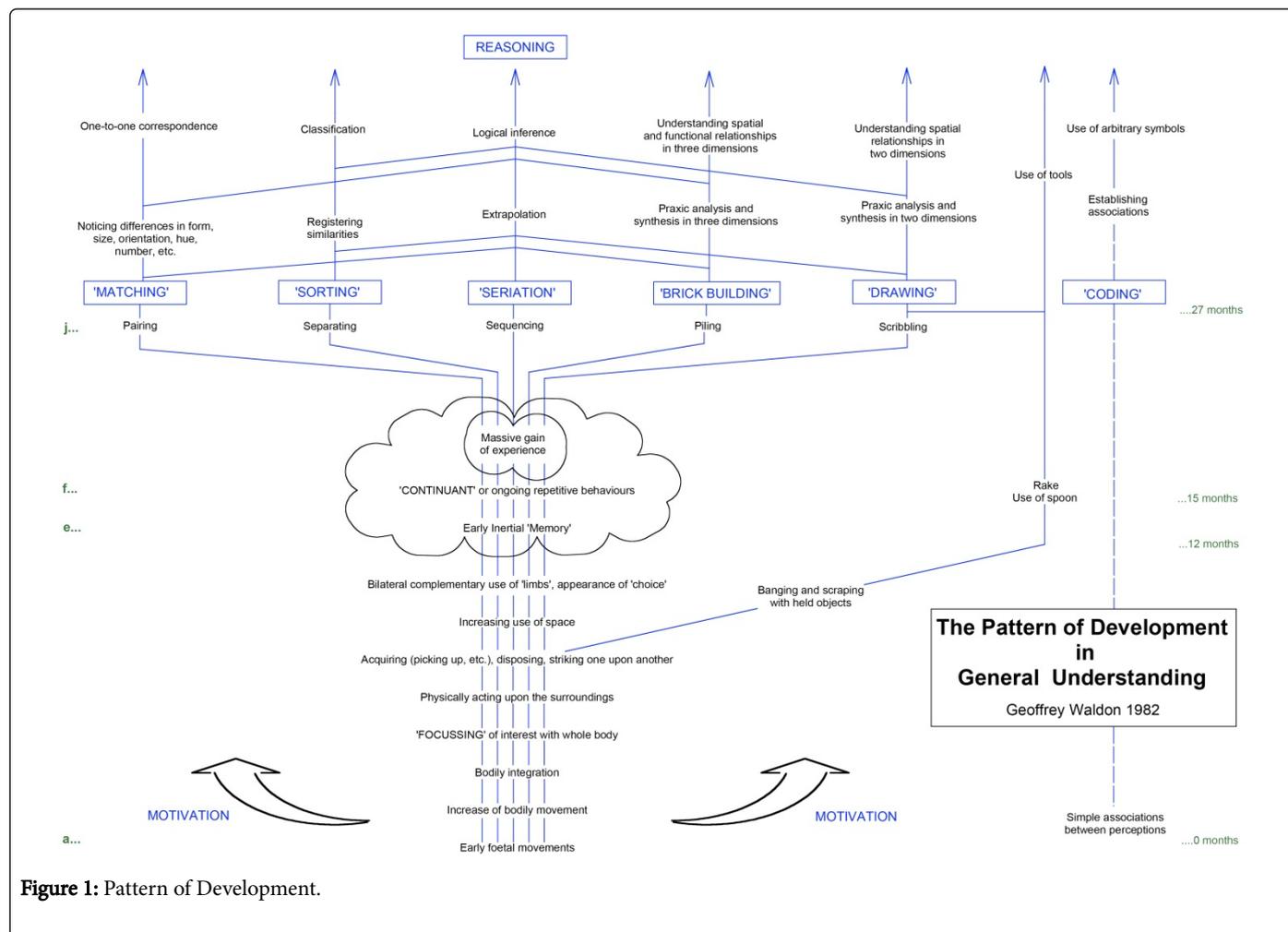


Figure 1: Pattern of Development.

There is no cognition in the absence of perception and action. Understanding the connection between movement and the development of skills and basic understanding offers some guidelines for instructing students with developmental issues. The Waldon

Development Chart below outlines the development of understanding in the typically developing child (Figure 1). The physical stages shown from birth to five years are shown in a UK Ministry of Health [19].

The Waldon Lesson

Through regular, short but intensive 'lessons' the Waldon Approach aspires to replay the baby's and young child's initial movements, and to simulate the infant's actions in as many aspects as possible [20].

First and foremost, the Waldon Approach encourages the child to move just for the sake of activity, exploration and experience, without concern for an impending goal, or completion of a task. The emphasis is on the enjoyment of the movement itself, focusing on the activity itself and not on the results of the activity. A large part of each session is devoted to the most fundamental actions - the movements that the baby makes in the first months of life: banging, scraping, picking up and putting down objects, as this is the foundation for all of the subsequent stages. Piaget noted that in the first sensorimotor stage, from 0-2 years children learn "entirely through the movements they make and the sensations that result" [21]. Any lack of or gaps in these actions will inhibit and disrupt the development of movement and consequently of all other abilities as these are all grounded in the early movements. The child will be encouraged and if necessary assisted to engage in large sweeping and effortful arm movements crossing the midline moving from left to right and vice versa. These large arm movements on both sides of the body and in all directions in space are encouraged to reinforce the connections between the two sides of the brain and help to ensure full 'bodily integration'. These movements will be effortful, moving the entire arm from the shoulder as much as possible. Effortful movements intensify the sensory and neural messages, facilitating brain activity. The brain is plastic, each experience creating new or strengthening existing pathways. A baby is born with about 86 billion neurons and about 50 trillion connections, which multiply up to 20 times in the first three months. By one year there are about 1000 trillion connections. Brain impulses are carried along axons and dendrites and the synapse is the junction between the neurons. Basic synaptic connections are set up early in life by either electric or chemical neuro-transmitters creating the foundation for the brain to participate in information processing as the child grows. As Hebb [22] famously said: "If two neurons often fire at nearly the same time, then the synapse between them should be strengthened, wiring the two neurons together. 'Cells that fire together wire together'".

Repetition of movement is the key to the construction and reinforcement of new neural connections and to strengthening the network of existing connections, increasing the impact of the movement activities on the brain development. Accordingly, in the Waldon lesson, mimicking the baby's actions, constant and ongoing repetition of all movements is encouraged. The same movement will be repeated multiple times in different ways, aspiring to reach a point where the child repeats these actions and movements on his own in free play [23]. Repetition of movements with variation are appropriately scaled up versions, depending on the age of the child, of the typical movement of a baby.

The child will progress to more complex and more cognitive behaviors once he has experienced and acquired confidence with the foundation movements. These activities are what Waldon termed 'the Learning to Learn Tools': matching, sorting, scribbling, piling and brick building. These will be introduced into the lessons, starting with a small number of objects and proceeding to more numerous and varied objects.

Waldon practitioners will not instruct through verbal communication or eye contact during (and only during), the Waldon Lesson. They try to facilitate, in the child they are working with, the

movements of the child who is able, and is self-motivated to play for his own pleasure. They provide support when necessary, holding the arms of the child from behind, directing lifting and putting down and other movements, with their own hands. They try not to impinge on the child, so stand behind or by the side of the child, out of sight. The practitioner will indicate the desired movement, either by moving the child's arms or hands from behind, or by lightly touching his hand, arm or shoulder or by pointing at an object or in a direction. The practitioner aims at the minimum control necessary hoping to stimulate the child to move independently. This practice, repeated daily, becomes internalized by the child, who begins to make the movements of his own accord. The child experiences and learns direct sensory experience. The Waldon Approach "has proved effective in helping young children overcome the confusion and isolation of autism in a way that makes productive and progressive motor learning possible" [24].

Summary

The multi causal aspect of ASD has been explained above. The primary condition can lead to the disruption of movement commencing in-utero and continuing in the early years. We have shown an association between disruption of movement and the adoption of ASD type behaviors. The movement-based activities as practiced in The Waldon Approach to Education, may fill the gaps in movement development and consequently lead to a development of General Understanding and the reduction of ASD behaviors at any age. Started early enough, The Waldon Approach practiced in a daily lesson given by the parents from 20 to 40 minutes, and demonstrated weekly by the practitioner, may even prevent the onset of these behaviors.

A pilot study is under review (Princess Basma School, for Children with Disabilities in Jerusalem) and a Helsinki based study is needed to validate this concept.

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