Development of Motor Skills During the First Year of Infancy

The Dynamical Systems Theory includes multiple perspectives, those being maturational, behavioral, developmental, and psychosocial. Maturation suggests that the development of an infant is biologically driven, and the required motor skills come naturally to the infant over the course of their first year of life. The development of those skills cannot be accelerated by training, and they take place in a fixed sequence, at varying times unique to each individual. For example, the grasping, sucking, and swallowing will always be the infant's first natural motor skills that develop before locomotion, manipulation, and posture (Newell, 1986). In simple terms, maturation suggests that the infant naturally develops motor skills as time passes, all driven by genetic factors, which serve as a foundation for the next milestone of motor skills to be developed.

The behavioral perspective indicates that any individual is reactive to stimuli, and regarding infants, a good example would be the walking or stepping reflex. When an infant is held upright over a surface, he or she will elicit an organized walking manner as it stimulates the motor response on the sole of the foot. Another example would be that of breastfeeding when the infant naturally positions its lips to suck when placed in contact with the mother’s breast, i.e., the sucking reflex (Clark, 1994).

Neonates interact with the environment solely via reflexive actions, and don’t think about what they are going to do; instead, they follow their instincts and involuntary actions to get their message across, for example, simply yelling or moving their hands around as a sign to ask for food. As they begin to enter infancy, according to the cognitive perspective of this theory, they become active learners and extremely observant of their surroundings and the environment

they are in. Infants learn about their environment through their senses and begin to carry out behaviors or actions with an intention or a goal, where they think about what they want and go ahead to acquire it. For example, they point at their mouth with the intention of asking for food. It is at this stage that infants also develop object permanence, where they understand that an object or another human exists even though they cannot be seen in that very moment (Infancy cognitive development, n.d). For example, if you place an object that the infant is familiar with in a location out of the infant's sight, then an infant who has achieved object permanence will know that even though he or she cannot physically see that object, it does actually exist, which requires the ability to form a mental representation of the object, also known as a schema. The attainment of object permanence usually indicates the transition from the sensorimotor stage to the preoperational stage of development (Object permanence, 1970). The sensorimotor stage is where infants understand that objects exist, and develop the thought that events occur, whereas the preoperational stage is the second stage of development in Piaget's theory, where infants begin using symbols and create an understanding of the things around them, and essentially carry out actions with a thought behind it, and not just as a mere reflex or involuntary action, such as using a broom to represent a horse, or imitating the way someone talks or moves (Mcleod, n.d).

The psychosocial perspective indicates that the social experience of the infant is what shapes their future behaviors, as early life experiences are important building blocks and fundamental to future development. For example, an infant who is made to wash their hands before eating anything and would make that a behavioral habit as they grow up, or experiencing their family say grace before any meal, would make them acquire that as a habit or behavior as they grow older.

The reflexive period of an infant's motor development journey begins at birth and lasts for the first 2-3 weeks. Shifts from the womb to the outside world indicate environmental constraints, such as adaptations to gravity, temperature fluctuations, etc. Internal body changes take place. The amniotic fluid inside the lungs is now replaced with air being inhaled, and the circulatory system undergoes important changes. The neonate is capable of movement at birth; however, they are all involuntary movements for the first two weeks, which are reflexive in nature, or take place in case of stimulation. An example of involuntary movements could be a random jerk of a limb or mouthing while the neonate is asleep, whereas an example of a reflex would be the palmar grasp when the child's hand is touched, or the sucking, rooting, and swallowing reflex. When the neonate's head is brought closer to the breast, the rooting reflex causes the head to move in the direction of the breast, and the touch of the nipple to the lip of the baby excites the sucking reflex for the baby to attain the nourishment required. These reflexes majorly assist with the survival of the baby and are inhibited by the constraints set by the central nervous system (Clark, 1994).

A neonate is still dependent on their parent for transportation and being fed, but for independent survival, the infant must overcome barriers of locomotion, manipulation, and posture, with the help of biological constraints, namely neuronal, muscular, and skeletal, to give shape to a set of preadapted behaviors. For the infant to have an orientation of the world, she needs to keep her hands free for manipulation and feet free for locomotion. Coordination of various body parts is key, such as keeping the head and trunk vertical, and the core stable for balance, to move around freely. However, before the child can reach that level of coordination, it goes through multiple motor milestones, which build the foundation for coordinated walking (Clark, 1994).

At two weeks, the infant is incapable of holding its head up without physical support. If held vertically, it would be evident that the child cannot maintain its head vertically. A possible reason for this could be the environmental constraints that the body needs time to adapt to. The gravitational pull outside the womb is two and a half times more than the inside, and so it could be a challenge for the neonate to have its spine and neck adapted to that kind of force instantly, hence the first two weeks see the baby having to need support with the same. Organismic constraints, such as muscular and skeletal strength, can also be a factor restricting them from lifting their heads during their first few weeks.

After three months, however, the baby can not only hold its head up while lying down but can also push its body up on its arms while lying on its tummy. They can also open and close their fists, bring their hands to their mouth, and lift their legs off the surface when excited. This period is almost relatable to when a young teenager gets a new phone for the first time, they're intrigued by it since it is something new, and keen to learn how to use it and its benefits, similarly, when a baby is learning how to function its hands, legs, and fingers, and learn about the things that they can be best used for independent survival. Glimpses of coordination can also be seen during these first months when the baby waves their arms and kicks their legs up.

In the following couple of months, the baby is seen using their hands for support while seated. They also develop advanced coordination to roll around from tummy to back and vice versa, whilst lying down. When made to stand up vertically, their legs seem to accept their body weight and help them stand upright. During these months, the baby acquires a successful reach and grasp, with a lot of effort, followed by putting their hands to their mouth as they tend to put whatever they get their hands on in their mouth, indicating that they are now capable of feeding

themselves. Whilst lying on their back, they can reach their hands to their feet, as well as transferring toys from one hand to another.

Around the nine-month milestone, the baby can now sit up without using any kind of arm support and can reach out to toys without falling or dropping them. Alternate arm and leg coordination is seen often around this period in the form of creeping and crawling as they partially overcome the problem of locomotion. As they get more cognizant, the child starts turning their head around and following things as they move, such as a puppy around the house or a ball being thrown side to side. The infant is also capable of imitating a certain action, for example, folding hands together, or throwing an object behind their body over the head. They are also able to manipulate tinier objects with the help of their thumbs and fingers.

Finally, at the time of their first birthday, infants have progressed to using a surface as support to stand up, and cruising along walls or furniture, and taking a few steps ahead. They can maintain balance whilst seated upright and throwing things, and clap their hands, showing all possible signs of a well-developed coordination between the several body parts (Developmental milestones for all ages, n.d).

The reason infants go through various stages or milestones of development is for their bodies to process information one at a time and take their time to grasp things and learn. Skills and experiences acquired in the preceding period serve as a foundation for later skills (Clark, 1994). If you compile an entire year's physical work and demand it be done inside one month, it would be practically impossible. Similarly, the reason we start any new course with the first chapter and progress up to the last is that every new chapter adds to the base or foundation needed to understand what is going to be taught in the next chapter. And so, with infants, they first start with just lifting their head, and using their arms as support, so that their body can

overcome the organismic constraints of musculoskeletal strength, and instead use that for locomotion in the future. Coordination needs to be developed before the baby can take its first steps, hence they start slow with just lifting their upper body as they lay down, and slowly progress to more coordinated activities such as moving their arms up and down, touching their feet, then sitting up with support, alternating arm and leg movements to crawl, and then finally coordinating different parts like the trunk, vertebrae, and each limb to move forward as they stand up vertically. Going through milestones can also be looked at as an update for the parents of the child to know that the infant is developing as they should.

From the standpoint of a maturationalist, infancy could be perceived as a set or an order of physical barriers being overcome step by step, without any external input towards the baby. In other words, if a baby were provided with nothing but food and care, he or she should be able to figure out the basics of locomotion, manipulation, and posture, without the benefit of practice. The maturation process elicits that the development of motor skills at the infancy stage is something that is processed within the infant's body and is genetically passed on. Another characteristic of the maturation process is that the process of developing motor skills will be seen in all infants; in other words, there will be consistency in these new patterns of behavior across subjects within the same species (Newell, 1986). And finally, the process of developing these behaviors as infants always takes place in the same sequence for reasons explained previously, and this sequence is invariant. Although the rate at which it happens may vary from one individual to another (Gesell theory, n.d).

Constraints can be defined as a restriction, boundary, or something that limits a specific action. They may be time-dependent or time independent, which means that the rate at which the constraints change may vary. As described by Newell (1986), organismic constraints are of two

types: structural, which are time independent, and functional, which are time dependent. Height, weight, and shape are structural organismic constraints. For example, someone who is short might be restricted from reaching a certain object stored in a higher location, such as on top of a six-foot cupboard, or someone extremely tall might not be able to fit in smaller places, or a heavier person might fatigue earlier than a lighter or leaner individual. Functional constraints refer to the synaptic connections of the body, such as anxiety, motivation, or attention span. In short, organismic constraints are those restrictions that come from within the body. In humans, the knee hinge joint permits only a forward-backward motion, and so can be looked at as a constraint for lateral motion. Different experiences affect these constraints; for example, all humans have muscles, but the strength and endurance of everyone varies due to their individual experiences. Similarly, in neonates, when they are first born, they barely possess any muscular strength to hold themselves up without any support due to the organismic constraints of muscle strength, which, of course, in time serves as help to those babies to hold themselves up. In children's growth, the change in collective size of body parts leads to changes in biomechanical constraints on the system, such as posture and locomotion, which are both affected as the infant grows larger in size.

Environmental constraints, per Newell (1986), are those constraints that are outside the body. They are constraints that are not manipulated by the individual and are generally time independent. Gravity, temperature, and light are examples of environmental constraints. A newborn baby finds it difficult to keep its head upright without support, not only because of a lack of muscular strength, but also the excess pull of gravity, which is two and a half times more outside the womb compared to the inside, as mentioned earlier. These environmental constraints, in some cases, can be manipulated by the individual by performing the task in a different

environment. An example of this would be water, where infants display coordinated movement patterns much before they can support themselves on land, which is possible due to the sudden change in environment from a fluid-filled womb to land in the outside environment.

According to Newell (1986), task constraints pertain to three categories, namely, the goal of the task, rules constraining certain movements for task completion, and machines or implements constraining movements for task completion. All tasks have a goal that needs to be achieved, but the manner in which the goal needs to be achieved is not always specified. Task constraints differ based on the performer's interpretation. Task rules aren't limitations that physically restrict any kind of movement, but they influence the pattern of coordination in which the task goal is to be accomplished. For example, in ping pong, the rule specifies that the ball has to bounce off the paddle and bounce on the opponent's half of the table, and this rule influences the way we hold the paddle and connect with the ball in order to make it land on the other side of the table. Another example would be that of darts, where the task goal is to gain maximum points by sticking the dart to certain locations on the dart board, which influences the way a performer would hold the dart and position his or her body and release the dart to impale the board at the desired location (Newell, 1986).

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