

Phenomenological Body Schema as Motor Habit in Skill Acquisition – Intentionality is in Action

By Maria Kosma*

The purpose of this concept-based paper was to showcase the importance of Merleau-Ponty's (1945/2014) phenomenological body schema as motor habit in skill acquisition and perception of the world and contrast it with the standard information processing models that are solely based on cognition. Examples of disability cases are used, including Schneider's brain damage and instances of apraxia, to exhibit that difficulty in executing certain motor skills is based on lack of body schema/motor habit and not on some gnostic disorder that inhibits representation as proposed in information processing. Habitual body movement is essential in understanding body schema as motor habit, which is a pre-reflective consciousness, an inter-sensorial unity. Motor skills are learned only via body movement because the body "grasps" and "conceives" movement by throwing itself into meaningful significations without calculating the distance between body parts and external objects. Motor skill execution is done tacitly via body schema that may involve essential external apparatus like a blind man's cane or aerial silks in aerial practice. Constant engagement with concrete, functional movements and different ways to perform abstract movements (e.g., use of preparatory actions and vision), can improve body schema/motor habit, and thus mobility, skill performance, and understanding of the world.

Keywords: *body schema, motor habit, skill acquisition and learning, Merleau-Ponty, phenomenology*

Introduction

The literature in skill acquisition is informed mainly by information processing models, whereby limited pieces of sensed information are stored in short-term memory and based on cognitive capacity, attention, and motivation, they can be encoded in long-term memory to be retrieved when needed (e.g., use of procedural information is considered key to be able to drive a car) (Vinney 2020). The purpose of this concept-based paper is to critique this cognitive and memory-based approach in learning motor skills by drawing on Merleau-Ponty's phenomenological philosophy of body schema as motor habit in acquiring and learning new motor significations (e.g., motor skills) and thus understanding the world (Merleau-Ponty 2014). This embodied approach in skill acquisition can facilitate the development of effective movement programs within diverse activity settings, including sports, exercise, leisure, dance, rehabilitation, and physical theater (Kosma 2021, 2022, Kosma and Buchanan 2021, Kosma and Erickson 2020, Kosma et al. 2021).

Drawing on Merleau-Ponty's (2014) magnum opus, *Phenomenology of Perception*, the paper starts by showcasing that skill acquisition is not achieved via

*Associate Professor, School of Kinesiology, Louisiana State University, USA.

“memory” or “representation” as proposed by information processing models; rather it is accomplished via our phenomenological body schema, which is a pre-reflective, inter-sensorial unity that provides a sense-giving experience (Carman 2009, Dermot 2017, Merleau-Ponty 2014). In the paper, Merleau-Ponty’s (2014) example of Schneider is used – a patient with brain damage from World War I – to show that although he did not have cognitive issues as described in information processing models, he could not perform certain motor tasks because he lacked body schema – his habitual and pre-reflective consciousness (Merleau-Ponty 2014). Schneider could perform abstract movements only if he was allowed to see his limbs and body parts and/or execute a series of preparatory movements to get a “grasp” of his body (“find” his body schema).

In the second and third sections of the paper, the emphasis is on the role of body movement in conceiving body schema as motor habit, which is not a form of “visual representation” or an “automatic reflex”; rather, motor habit is knowledge “in hand.” It reflects tacit understanding without thinking the objective location of one’s body in relation to the objective space of objects in the world (Merleau-Ponty 2014, Tanaka 2011). Only via motor habit can we acquire new motor skills and renew our body schema. Cases of apraxia are presented to showcase that challenges in executing motor skills are not based on gnostic disorders but deficiencies in body schema – motor habit (Merleau-Ponty 2014).

In the final segment of the paper, I discuss how motor habit is also a perceptual habit, which is thus responsible for skill learning and understanding of the world. Certain apparatus used in activities of daily living (e.g., cane of the blind man) or exercise settings (e.g., aerial silks in dancing) have become a part of one’s body schema/motor habit, facilitating the acquisition of new skills and understanding of the world (Kosma and Erickson 2020, Kosma et al. 2021, Merleau-Ponty 2014). The paper concludes with examples in designing effective movement programs for skill acquisition and expansion of existing motor repertoires.

Information Processing vs. Phenomenological Body Schema in Skill Acquisition

Before embarking upon Merleau-Ponty’s philosophy of the role of body schema (as motor habit) in learning motor skills and perceiving them – and the world – I will provide a brief overview of his critique of the information processing theory in skill acquisition. The hypothesis to view skill acquisition in an entirely cognitive way, whereby our minds process sensed information like computers do, was coined in the 1950s with the emergence of the first computers (Vinney 2020). Since then, there have been several information processing models in cognitive psychology, including Miller’s (1956) Information Processing Theory, Atkinson and Shiffrin’s (1968) Stage Theory, Craik and Lockhart’s (1972) Level of Processing Model, and Rumelhart et al.’s (1986) Connectionist Model. The main premise of all those information processing models is that limited pieces (“chunks”) of sensed information are stored in short-term memory,

which, based on cognitive capacity, focus, and attention, can be encoded in long-term memory to be retrieved when necessary (e.g., procedural information is considered key to learning how to drive a car) (Vinney 2020).

In his seminal work, *Phenomenology of Perception* – a critique of the Cartesian body-mind dualism – Merleau-Ponty (2014) criticized this Cogito (Cartesian) oriented information processing model by showcasing that motor skills are learned via motor habit, which is our body schema that perceives the world. Instead of viewing movement solely as the result of cognitive elements, a Cogito – the superior mind – Merleau-Ponty emphasized the role of the body and bodily movement as the main source of skill acquisition. Based on the Cartesian philosophy, the body is erroneously objectified to be no more than a “machine” emitting meaningless sensations (Kosma 2021, 2022). Instead of viewing the body as an object like all other objects in the world, Merleau-Ponty elevated its essence to a subject, *The Lived Body*, that acts (e.g., dances, climbs, bikes, swims, runs, senses) and informs the mind (Kosma 2021, 2022, Kosma and Buchanan 2021, Kosma et al. 2021, Merleau-Ponty 2014). The body is always with us throwing itself toward an action. It is not an object like “an assemblage of organs juxtaposed in space” (Merleau-Ponty 2014, p. 100).

“I am not in space and in time, nor do I think space and time, rather, I am of space and of time, my body fits itself to them and embraces them. The scope of this hold measures the scope of my existence; however, it can never... be total. The space and time that I inhabit are always surrounded by indeterminate horizons that contain other points of view. The synthesis of time, like that of space, is always to be started over again” (Merleau-Ponty 2014, p. 141).

Body spatiality is situational based on how the body is engaged with its tasks. Unlike the theories of information processing, the body does not form a positional spatiality by calculating the position of different body parts and how they are organized with each other (Stanford Encyclopedia of Philosophy, 2016). We are not looking for our body parts and how they move; we just know via praktognosia – a constant motor experience with actual tasks in different settings, which allows us to reach and understand the world and its objects (Stanford Encyclopedia of Philosophy 2016).

“If I am standing and if I hold my pipe in a closed hand, the position of my hand is not determined discursively by the angle it makes with my forearm, my forearm with my arm, my arm with my torso... my torso with the ground. I have an absolute knowledge of where my pipe is, and from this I know where my hand is and where my body is, just as the primitive person in the desert is always immediately oriented without having to recall or calculate” (Merleau-Ponty 2014, p. 102).

This sense-giving experience is because of our body schema, which is “a spatial and temporal unity... an inter-sensorial unity, the sensorimotor unity of the body that is not limited to contents associated in the course of our experience... it rather precedes them and makes their association possible” (Dermot 2017, Merleau-Ponty 2014, p. 103). Our body schema, which is originary, determines

our body space – without body schema there would be no body space. Body schema exists primarily via our existence in the world. “Body schema is a manner of expressing that my body is in and toward the world” (Halák 2018, Merleau-Ponty 2014, p. 103). “Descriptions of oriented space (e.g., on, under, or next to the table) have no meaning if the person cannot be situated by his body in front of the world” (Merleau-Ponty 2014, p. 103).

Contrary to information processing approaches, this *tacit* understanding of the world via one’s body does not occur through “representation” or a “symbolic function” (Carman 2009, Merleau-Ponty 2014, p. 141); rather, it is the motor experience, “motricity”, which “possesses the elementary power of sense-giving” (Merleau-Ponty 2014, p. 143).

“If bodily space and external space form a practical system, the former being the background against which the object can stand out or the void in front of which the object can *appear* as the goal of our action, then it is clearly in action that the spatiality of the body is brought about, and the analysis of movement itself should allow us to understand spatiality better. How the body inhabits space (and time, for that matter) can be seen more clearly by considering the body in motion because movement is not content with passively undergoing space and time, it actively assumes them, it takes them up in their original signification that is effaced in the banality of established situations” (Merleau-Ponty 2014, p. 105).

To challenge classical psychology and its reliance on information processing, Merleau-Ponty (2014) provided as an example the case of Schneider, who had a brain damage from World War I. Although Schneider did not have an intellectual disorder and he knew the positions of his limbs and body parts, he was unable to perform abstract movements with his eyes closed (e.g., “extend or flex a finger upon command”) ... “unless he was allowed to see his limb in question or execute preparatory movements involving his whole body” (Merleau-Ponty 2014, p. 105). Although he could not point to or verbally identify the location of his leg touched by a ruler, he could scratch his leg where a mosquito had bitten him. He could also perform habitual movements for his employment (e.g., “make wallets by trade” with great speed and efficiency or “take a match from a matchbox and light a lamp”) (Merleau-Ponty 2014, p. 105). Even though Schneider could not point to his nose upon command (abstract movement), he could “grasp” or “touch” his nose or take a handkerchief from his pocket to blow his nose, which are actions that constitute concrete and functional movements. His pathology had nothing to do with lack of memory or symbolism or representation (positional consciousness) – as hypothesized by classical psychologists based on information processing models. Schneider knew where his nose was; thus, behaviorally, physically, and cognitively it should make no difference if he pointed to it (abstract action he could not perform) or grasped it (concrete action he *could* perform). The need for the patient to implement preparatory movements to find his limbs and body parts to execute abstract movements signifies that the issue was in his consciousness of body schema as an intersensory whole that “catches” and “understands” movement pre-reflectively in a habitual matter – the body is a power that holistically performs any kind of movement based on the milieu in which it finds

itself (Merleau-Ponty 2014). In dancing and aerial dancing, the dancer “thinks on their feet” (Snowber 2012, p. 55) and the aerialist learns and improves their motor skills by sensing the silks while climbing, inverting, and posing (Kosma and Erickson 2020). It is the patient’s “phenomenal hand” that reaches to the place of the mosquito bite, and it is the patient’s “phenomenal hands and fingers” that use the scissors and needles to execute his employment tasks. The patient does *not* move his objective (scientific) body in objective space (e.g., looking for his hands and fingers to perform concrete and functional tasks), but his *phenomenal body*.

“The body is but one element in the system of the subject and his world, and the task obtains the necessary movements from him through... the phenomenal forces at work in my visual field... without any calculation... In concrete movement, the patient has neither a thetic consciousness of the stimulus nor a thetic consciousness of the reaction... he is the body, and his body is the power for a certain world” (Merleau-Ponty 2014, p. 109).

The normal subject or the actor can assume various imaginary roles like different characters to be performed because their body has the “power of action” like “virtual action.” However, the patient needs to execute a series of preparatory movements to perform abstract actions (e.g., make a circular motion with his hand); thus, the patient’s “gesture itself loses the melodic character that it presents in everyday life... and becomes a sum of partial movements laboriously placed end to end” (Merleau-Ponty 2014, p. 107).

“Whereas for the normal subject each motor or tactile event gives rise in consciousness to an abundance of intentions that run from the body as a center of virtual action either toward the body itself or toward the object, for the patient, on the contrary the tactile impression remains opaque and closed in upon itself” (Merleau-Ponty 2014, pp. 111–112).

Schneider did not lack memory or mental representation as proposed in information processing models, but a pre-reflective, habitual body schema. Therefore, it is showcased below how motricity (movement) is “original intentionality” (Merleau-Ponty 2014, p. 139) resulting in habitual motor acquisitions that form one’s body schema.

The Role of Body Movement in Understanding Body Schema as Motor Habit

Movement is original intentionality, not because we “think” about the objects we move towards as a “representation”, but because we “can” respond to different solicitations, a milieu that we “hunt” (Kosma and Buchanan 2021, Kosma and Erickson 2020, Kosma et al. 2021, Merleau-Ponty 2014, p. 139). Movement and bodily space are not separated; they are a whole within this world: “we execute our movements in a space that is not ‘empty’ and without relation to them, but which is, on the contrary, in a highly determined relation with them: movement and background are only, in fact, moments artificially separated from a single whole”

(Merleau-Ponty 2014, p. 140). The body needs to be able to capture and understand movement by incorporating it into its world, and this is the only way movement is learned (Kosma and Buchanan 2021, Kosma and Erickson 2020, Kosma et al. 2021). The body gestures toward a real and true object, not its representation: “to be able to move our body toward an object, the object must first exist for it, and hence our body must not belong to the region of the ‘in-itself’” (Merleau-Ponty 2014, p. 140). People who suffer from apraxia have no gnostic disorder. Intellectually, they understand the action to be performed, but they cannot “localize a stimulus upon the body or reproduce a triangle, a v, or an o... The body has its world, and the objects or space can be present to our knowledge without being present to our body” (Merleau-Ponty 2014, p. 140).

The body throws itself – via motricity – towards new (motor) significations in the world, in which case the body “catches” and “understands” movement in a form of habit (Kosma et al. 2021, Merleau-Ponty 2014). Such habitual movements reflect body schema, which can be constantly “renewed and reworked” (Merleau-Ponty 2014, pp. 143–144, Purser 2017). Habit is not a “form of knowledge” (e.g., by visual representation of an object we aim at) or an “automatic reflex”; rather, it is knowledge “in hand”; it reflects tacit understanding without thinking the objective location of our body in relation to the objective space of objects in the world (Merleau-Ponty 2014, Tanaka 2011). When we are habituated to a new dance, we “integrate particular elements of general motricity” (e.g., running and walking, other dances we have learned, etc.) via the sense of “a motor consecration” (Merleau-Ponty 2014, p. 144).

“If I possess the habit of driving a car, then I enter into a lane and see that ‘I can pass’ without comparing the width of the lane to that of the fender, just as I go through a door without comparing the width of the door to that of my body... The automobile has seized to be an object whose size and volume would be determined through a comparison with other objects. It has become voluminous power and the necessity of a certain free space... The blind man’s cane has seized to be an object for him... the cane’s furthest point is transformed into a sensitive zone; it increases the scope and the radius of the act of touching and has become analogous to a gaze... the blind man knows the length of the cane by the position of the objects, rather than the position of the objects through the cane’s length... If I want to be habituated to a cane, I try it out, I touch some objects and, after some time, I have it ‘in hand’: I see which objects are ‘within reach’ or out of reach of my cane. This has nothing to do with a quick estimate or a comparison between the objective length of the cane and the objective distance of the goal to be reached. Places in space are not defined as objective positions in relation to the objective position of our body... to habituate oneself to... an automobile, or a cane is to take up residence in them, or inversely, to make them participate within the voluminosity of one’s own body. Habit expresses the power we have of dilating our being in the world, or of altering our existence through incorporating new instruments” (Merleau-Ponty 2014, pp. 144–145).

The typist knows how to type without knowing the location of each letter on the keyboard. He/she “incorporates the space of the keyboard into his bodily space” (Merleau-Ponty 2014, p.146).

“The subject knows where the letters are on a keyboard just as we know where one of our limbs is – a knowledge of familiarity that does not provide us with a position in objective space. The movement of his fingers is not presented to the typist as a spatial trajectory that can be described, but merely as a certain modulation of motricity, distinguished from every other through its physiognomy” (Merleau-Ponty 2014, p. 145).

The typist can translate the “visual structures” or “wholes” on the keyboard into a “motor response”, “without having to spell out the word or spell out the movement” (Merleau-Ponty 2014, p. 145). This habitual action is part of our body in motion because habit can be acquired *only* if our body “understands” movement – “the power of habit is not distinguished from the one we have over our body in general” (Merleau-Ponty 2014, p. 145).

“To understand is to experience the accord between what we aim at and what is given, between the intention and the realization – and the body is our anchorage in a world” (Merleau-Ponty 2014, p. 146).

To paraphrase Merleau-Ponty, “when we are asked to bring our hand towards our knee, we do so by following the shortest path, without thinking the objective positions of our hand and knee or the trajectory of the movement. Our knee is not an object or an idea, but rather a present and real part of my living body” (Merleau-Ponty 2014, pp. 145–146).

Body Schema – (Motor) Habit to Acquire New Motor Significations

It was showcased above that habitual body movements reflect body schema as motor habit, through which we can acquire new motor significations pre-reflectively or pre-cognitively. There is no need to use mental representations in skill learning and execution; the body *knows* via its existence within the world. The body, via motricity, throws itself into the world (Kosma et al. 2021) – “the body is the mediator of the world” (Merleau-Ponty 2014, p. 146).

“At times, it restricts itself to gestures necessary for the conservation of life, and correlatively it posits a biological world around us... sometimes, it brings forth a new core of signification... new motor habits, such as dance” (Merleau-Ponty 2014, pp. 147–148).

There is a unity in our body (body schema-habit), whereby our body parts (e.g., “visual, tactile, and motor aspects”) are sensed as a whole; they are “not coordinated” (Halák 2018, Merleau-Ponty 2014, p. 150). “Our body is not primarily in space but is rather of space” (Merleau-Ponty 2014, p. 149). “I am not in front of my body; I am in my body, or rather I am my body” (Merleau-Ponty 2014, p. 131). When I execute different motor significations through my body, I do not “contemplate the relations between the segments of my body and the

correlations between my visual body and my tactile body” (Merleau-Ponty 2014, p. 151).

“I do not translate the ‘givens of touch’ into the ‘language of vision’, nor vice versa; I do not assemble the parts of my body one by one. Rather this translation and assemblage are completed once and for all in me: they are my body itself” (Merleau-Ponty 2014, p. 151).

When a young child first attempts to grasp an object, they do not look at their hand, but the object. When someone reaches to pick up the phone, they can use a combination of different movements like leaning forward or leaning back in their chair while straightening their legs or bending their knees – or getting up from the chair – without thinking about all those combinations – just via their body schema-motor habit (Merleau-Ponty 2014).

In other words, new motor significations are acquired via our body schema as motor habit and not because of thought or representation (Halák 2018, Merleau-Ponty 2014). Body schema constantly evolves – it is reworked and renewed. The experienced organist can learn how to play a new instrument rather quickly, not because of the emergence of “new conditioned reflexes” (Merleau-Ponty 2014, p. 146) or mental representations, but because of her/his body schema – (motor) habit.

“He sizes up the new instrument with his body, he incorporates its directions and dimensions, and he settles into the organ as one settles into a house... the stops, the pedals, and the keyboards are only presented to him as powers of such and such an emotional or musical value, and their position as those places through which this value appears in the world” (Merleau-Ponty 2014, pp. 146–147).

The organist uses the instrument to express herself/himself, and her/his *bodily expression* is “the origin of all other expressive spaces.”

“... his rehearsal gestures... put forth affective vectors, they discover emotional sources, and they create an expressive space... The body is eminently an expressive space... But our body is not merely one expressive space among all others, for that would be merely the constituted body. Our body, rather, is the origin of all the others, it is the very movement of expression, it projects significations on the outside by giving them a place and sees to it that they begin to exist as things, beneath our hands and before our eyes” (Merleau-Ponty 2014, p. 147).

Motor Habit is a Perceptual Habit to Understand the World

As showcased above, motricity (body movement as action and not mental representation – intentionality is in action) can help us realize that body schema is actually a motor habit, which is constantly reworked as new motor significations are acquired. In this way (via bodily, habitual movement), we can perceive the world. Motricity “sheds light on the particular nature of body space” (Merleau-Ponty 2014, p. 153), in that the motion of the body with its own space determines

the space of the external objects in the world. This motor habit helps us understand the world because it is also a perceptual habit at the same time: “every habit is simultaneously motor and perceptual because it resides... between explicit perception and actual movement, in that fundamental function that simultaneously delimits our field of vision and our field of action” (Merleau-Ponty 2014, p. 153). The blind man can explore and perceive different objects by using his cane (example of motor habit) not because he understands the positions of the external objects through the pressure of the cane on the hand – in fact, “habit relieves us of this very task” (Merleau-Ponty 2014, pp. 153–154) – but because the cane has become part of the subject’s “body synthesis”; “the cane is no longer an object that the blind man would perceive, it has become an instrument with which he perceives. It is an appendage of the body” (Merleau-Ponty 2014, p. 154). The external objects explored by the cane are not signs, but appearances. The grasping of their signification is achieved via the body that throws itself into the world. In movement studies, the two pieces of fabric in aerial silks have become part of the aerialist’s body schema – motor habit, through which he/she can acquire new movement skills and expand their motor repertoire (Kosma and Erickson 2020, Kosma et al. 2021). This type of body understanding will happen only via the body’s ability to tacitly grasp motor tasks, to have them in hand (Merleau-Ponty 2014). We can understand new skills and the world via motor habit (Kosma and Buchanan 2021, Merleau-Ponty 2014). “There is an organic relation between the subject and the world” (Merleau-Ponty 2014, p. 154). When the child learns to distinguish between red and blue colors as different categories/significations, he/she does so because the “color category is rooted in the givens” (Merleau-Ponty 2014, p.154). The action (gaze), signification, and perception are all united to “enrich and to reorganize the body schema”:

“As a system of motor powers or perceptual powers, our body is not an object for an ‘I Think’: it is a totality of lived significations that moves towards its equilibrium. Occasionally, a new knot of signification is formed: our previous movements are integrated into a new motor equity, the first visual givens are integrated into a new sensorial entity, and our natural powers suddenly merge with a richer signification that was, up until that point, merely implied in our perceptual or practical field or that was merely anticipated in our experience through a certain lack, and whose advent suddenly reorganizes our equilibrium and fulfills our blind expectation” (Merleau-Ponty 2014, p. 155).

Concluding Comments and Implications

The purpose of this concept-based paper was to showcase the importance of Merleau-Ponty’s phenomenological body schema as motor habit in skill acquisition and perception of the world and contrast it with the standard information processing models that are solely based on cognition (e.g., mental representation and memory). Based on the analysis in the paper, it is clear that habitual body movement is essential in capturing body schema as motor habit – a tacit understanding of the world, a pre-reflective consciousness, an inter-sensorial unity, a spatial and

temporal unity (Merleau-Ponty 2014). Instead of relying on information processing models in skill acquisition and learning, the paper's take home message is that the body grasps and conceives movement by throwing itself into meaningful significations via its body schema/motor habit (Kosma and Erickson 2020, Kosma et al. 2021, Merleau-Ponty 2014).

The body is not in space, but of space. It inhabits space and its spatiality is situational and not positional or calculative. We do not look for our limbs nor do we measure the distance between them and external objects to execute different skills (Halák 2018, Merleau-Ponty 2014, Stanford Encyclopedia of Philosophy 2016). Instead, we do so tacitly via our body schema that may involve essential external apparatus for daily functions (e.g., a blind man's cane; Merleau-Ponty 2014) or actions (e.g., aerial silks in aerial practice; Kosma et al., 2021). Only via the existence of body space can space of external objects exist. When the body moves within a myriad of changing horizons we can speak of objects under, in front of, or above it within everchanging situations and not in a constituted, objective, or measurable way (Merleau-Ponty 2014).

Drawing on this groundbreaking work of Merleau-Ponty (2014) in relation to this paper, important implications in movement programs can be realized. Movement experts must reinforce practical movement experiences among students, exercisers, and certain patients to strengthen their body schema, which can be constantly renewed and reworked. To have something "in hand," constant practice is essential by allowing the body to throw itself into meaningful motor significations for the improvement of already learned skills and the acquisition of new ones (Kosma and Erickson 2020, Kosma et al. 2021, Merleau-Ponty 2014). In rehabilitation programs for patients with certain brain damage or apraxia, it would be a colossal mistake to rely on mental representations and/or memory, partially, because their pathology relates to their lack of body schema and not to a gnostic disorder. Also, reworking one's body schema may improve cognitive functioning because body and mind are not separate entities but a whole within ever changing settings. Emphasis should be on concrete and functional movements that can be easily performed rather than abstract movements that may be meaningless to the patient. That said, if "virtual action" is important like in acting (abstract actions) (Merleau-Ponty 2014), executing preparatory movements may be essential for getting a "grasp" of an imbalanced body schema and achieving some form of equilibrium or Gestalt. A similar example would include the use of mirror therapy in managing chronic pain and phantom limb pain or in improving post-stroke mobility, in which case the patient has a chance to view a holistic body schema as they used to know it prior to their condition (e.g., amputation or stroke) (Gandhi et al. 2020, Lamont et al. 2011, Wittkopf and Johnson 2017).

Future research in movement programs should involve the examination of the effects of different forms of practical movements with or without external apparatus (depending on the situation) on body schema – motor habit and skill learning for people with and without certain disabilities. Constant engagement in concrete movements and different ways to perform abstract movements via for example the use of preparatory actions, vision, and both abstract and functional movements

(e.g., grasping vs. only pointing) can improve one's body schema – motor habit, and thus their mobility, skill performance, and understanding of the world.

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