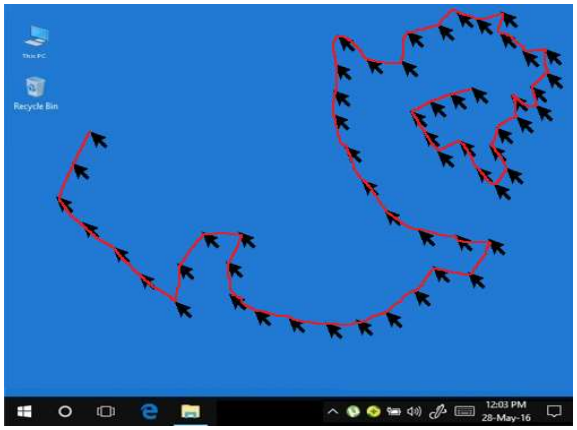
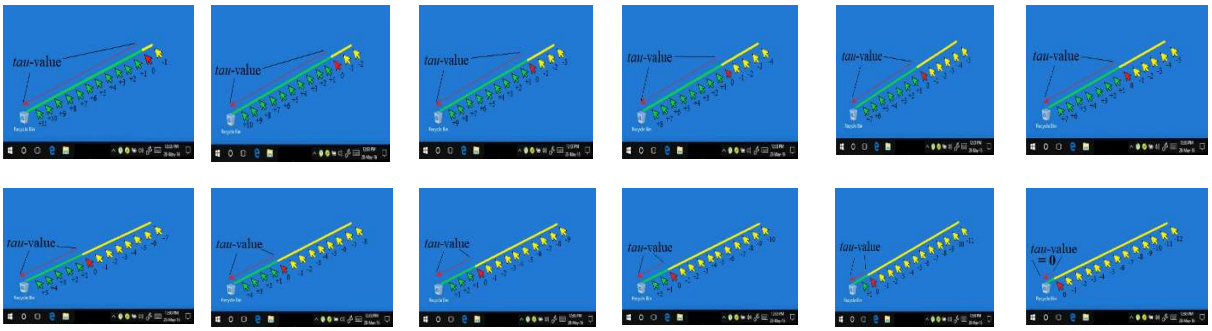
# Transitioning from random motor activity to the execution of intentional actions demands shifting the internal and external focus; The origin of two autonomous foci and how their roles have evolutionarily reversed in relation to moving a pointer to an icon




*Caught In A Line*

The explanatory model of all motoric movement actions

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## Introduction

The explanatory model of the motoric movement action is capable of delineating all functional perception processes within any conceivable action. Nevertheless, challenges are encountered in its implementation within the scientific community due to the intrinsic nature of a new paradigm within a complex dynamic system. The explanatory model demands the simultaneous integration of multiple innovative mind steps.
In order to facilitate those necessary subsequent steps in science, a series of new articles is introduced, each time focusing on a different motoric action which will be assessed within the complete spectrum of (general) motor activity. The aim is to provide a broader perspective on specific motor activity required for goal-directed actions. Additionally, they universally demonstrate that motor activity always leads to the simultaneous autonomous perception of both internal and external movements, which can be appointed as primary or secondary, and finally, they elucidate all elements underlying the explanatory model of the motoric movement action.
This article centers around the common computer task where, using a computer mouse, one must move a pointer to an icon. The explanation consists of three parts. The first part exclusively focuses on general motor activity and not on specific actions. Here, an action is defined as conscious motor activity aimed at performing a specific task as a result of an egocentrically formulated intention. At the end of this part, the computer task is fully explained in relation to general motor activity. In contrast to the first part, the second part addresses deliberate c.q. specific actions where an egocentrically formulated intention is created to move a pointer to an icon. Two action strategies are highlighted in this part, logically stemming from the general motor activity mentioned in the first part. The concluding part emphasizes the relationship between the discussed motor activities and the explanatory model of the motoric movement action.

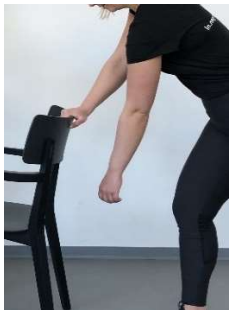
## Part 1 - Internal motor (movement) activity when no deliberate goal-directed action is involved

The explanatory model of the motoric movement action identifies all functional perception processes within any conceivable action. In which the fundamental assumption encompasses that the action arises from explicitly formulating a particular egocentric will. However, in this paragraph, we do not assess a specific motor action with an egocentric intention yet. In here we solely focus on general motor activity. The distinction between mere motor activity and conscious actions provides valuable insight into the broad spectrum of motor (movement) activity.

### a. Basic exercise (passive arm without a spoon)

The entire explanation is built upon a basic exercise, involving a forward-leaning posture with one arm hanging passively downward. This posture is often used in physiotherapy exercises to allow isolated

movement of the arm. That is strenuously not the intention of this exercise. It is essential to keep the arm entirely passive during the execution of the basic exercise.



Images: The basic exercise illustrates a forward-leaning position with a passive arm. Despite the apparent action in the images, the primary goal is to develop and observe other body actions and notice how they laterally influence the movement of the passive arm.

Although the hanging arm is prominently present, you are now asked not to focus on it specifically. Conversely, the emphasis must be put on developing other than arm activities (knee, torso, head, foot action, etc.) and observing whether the passive arm is going to move.

Conclusion of the basic exercise (passive arm without a spoon)

It can be conclusively observed that you are capable to (secondarily) perceive movement of all separate positions P of the outside of a passive arm by directing (primary) attention to an entirely different internal motor activity. This observation carries the following factual conclusions:

1) While there is nothing predictable about where the passive arm will move, as random internal motor activity will always result in random or chance movements of the passive arm, there is, on the other hand, a very essential fact to note. All individual points/positions P of the arm will always have to be connected or will always have to emerge from each other. If we, for example, were to focus on three points of the arm, such as the fingertips, knuckles of the fist, and the elbow[1], you cannot escape the factual conclusion that all those points always move in a line segment shape and that it always involves only one (!) line segment shape[2]. So, this applies to all places on the arm, and within there it can also factually be established that each position P of the arm will move like a marble in a marble run. The current position P (0) of each piece of the arm will always mark the separation between the manifest positions P (-x) and the future positions P (+x).
2) The second very essential conclusion encompasses the fact that the two movements have a causal connection, but the perception of the movement of internal motor activity (knee, torso, head, foot action, etc.) has absolutely nothing to do with the perception of the movement within the linear form where all separate parts of the arm become part of[3].

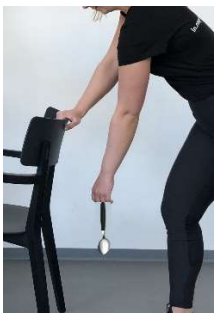
b. Basic exercise (passive arm with a spoon)

[1] Hence, you must also realize that when grasping a coffee cup, where we typically focus on the movement of the fingertips, all other mentioned body parts also move in linear forms. This demonstrates that the related perception processes are entirely subjective and depend on the chosen focus.

[2] Indeed, you can factually ascertain that your own body, from birth to the end of life, is also confined within one extensive line segment shape. Your body at every position P(0) is, in fact, bound to the penultimate position P(-1) and the subsequent position P(+1). There is, in fact, simply no escaping it.

[3] The explanatory model of the motoric movement action demonstrates in numerous articles that the two perceptions of two types of movements are autonomous because they belong to the incompatible worlds of inside and outside the body. Therefore, there can never be a blending of the two.

A crucial aspect of the preceding conclusion involves the fact that internal sensorimotoric movements implicitly lead to a movement of, for example, the fingertips over an external line segment shape outside the body. There is, therefore, a direct causal relationship between these two movements, with the remarkable phenomenon that, without internal motor activity, an action trajectory shape of the fingertips is just not capable to occur. However, it is essential to establish that the perception of the movement of the fingertips over an action trajectory shape outside the body, in spite of this crucial causal relationship, has no connection with the perception of internal sensorimotoric movements. To further clarify this intriguing duality, the basic exercise is repeated, with the sole difference that the hand of the passive arm is holding a spoon. The entire exercise proceeds identically to the description above.



Images: In the repetition of the basic exercise, only a spoon is added, while the exercise remains unchanged. It is crucial, once again, not to develop conscious arm action but merely to observe how other bodily actions influence the entirely passive arm with the spoon. Now you can factually establish that all separate positions P of the arm but also all separate positions of the spoon will start to move in line segment shapes. Due to the fact that all those separate positions can only emerge from each other c.q. they will always be interconnected.

Conclusion of the basic exercise (passive arm with a spoon)

Like in the first version of the basic exercise it can be factually established that you are capable to (secondarily) perceive movement of all separate positions P of the outside of a passive arm, now holding a spoon, by directing (primary) attention to an entirely different internal motor activity. This observation carries the following factual conclusions:

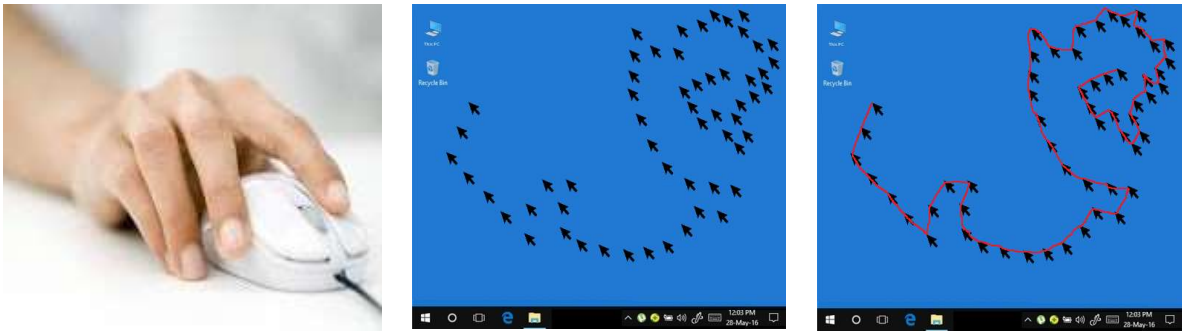
1) While there is nothing predictable about where the passive arm with the spoon will move, as random internal motor activity will always result in random or chance movements of the passive arm with the spoon, there is, on the other hand, a very essential fact to note. All separate points/positions P of the arm and all separate points/positions P of the spoon will always have to be connected c.q. will always have to emerge from each other. Once again, the three previously mentioned arm positions (the fingertips, the knuckles of the fist, and the elbow) will create a line segment shape, but also all the separate positions of the spoon also form separate lines. If you focus, for example, on the handle or the bowl of the spoon, you cannot escape the factual conclusion that all those points always move in a linear form, and that, too, always involves exact one (!) entire line segment shape[4]. So, all separate positions of the arm and of the spoon are going to traverse a linear form and within there it can also factually be established that each position P of the arm and of the spoon will move like a marble in a marble run. The current position P (0) of each piece of the arm and spoon will always mark the separation between the manifest positions P (-x) and the future positions P (+x).
2) The second highly essential conclusion, as mentioned in the first version of the basic exercise, remains fully intact here as well. The perception of the movement of internal motor activity (knee,

[4] Hence, you must also realize that when eating soup, where we typically focus on the movement of the spoon-bowl, all other mentioned body and spoon parts also move in line segment shapes. This demonstrates that the related perception processes are entirely subjective and depend on the chosen focus.

torso, head, foot action, etc.) has absolutely nothing to do with the observation of the line segment shape that all parts of the arm and now the spoon become a part of. However, the new aspect introduced by the spoon concerns the fact that a spoon is an inanimate object. What leads to the astonishing factual conclusion that, for instance, we can observe the movement of the spoon's bowl over a line, but we can only generate motor activity up to the handle of the spoon[5].
The perplexing aspect of this realization may be the fact that the movement of the spoon's bowl over a line segment shape is entirely dependent on a completely different internal motoric movement. Without this source of action, the spoon's bowl will never move. Additionally, the confirming aspect of this realization may concern the conviction that the perception of the movement of the spoon's bowl over a line has absolutely no connection with the perception of internal motor movement activity.

c. <u>The basic exercise in relation to computer activities in which a mouse moves a pointer</u>

If we define an action as a conscious motor activity in which a specific goal is pursued from an egocentrically formulated will, the explanation in this paragraph falls outside the scope of actions. Within the basic exercise, the focus is solely on motor activity, and it is now translated into a computer environment where one moves a pointer on a screen using a mouse.



Images: The basic exercise can be translated to the current clicking task. Your primary attention should mainly be pointed at moving the mouse c.q. you should primarily concentrate on proprioceptive perception process which will let the computer mouse move, and only incidentally (secondarily) notice how the pointer moves across the screen.

The basic exercise can be easily transferred to a computer task. If you focus solely on internal motor activity, you can effectively observe that the pointer moves randomly across the screen. Once again, you can only factually determine that the actual position P (0) of the pointer must always stem from the preceding positions c.q. all positions P of a pointer are always connected in one line. However, two essential omissions should be noted in the animations: 1. Only a limited number of positions P of the pointer are shown. If you were to engage in random mouse motor activity for a brief period, the entire screen would fill rapidly with pointer positions. 2. The connection of successive positions P of the pointer cannot be captured in an animation. The perception of the pointer's movement is, in reality, a continuously flowing line of pointers. The red line represents that continuous connection but, at the same time, does not show the pointers. Therefore, you need to create a hybrid representation of the two pointer images, which you only can perceive live when you see a pointer moving across a screen during an actual computer task.

<u>Conclusion basic exercise in relation to computer activities in which a mouse moves a pointer</u>

[5] https://www.researchgate.net/publication/375289869_The_tau-coupling_process_within_eating_demonstrates_that_we_absolutely_do_not_need_a_motor_plan_Executing_an_external_action_trajectory_shape_over_which_the_bowl_of_the_spoon_moves_dictates_all_intern

In tasks of this nature, where motor activity occurs far from the screen, it becomes evident that you can (secondarily) move a pointer by solely focusing on an entirely different (primary) motor activity. This observation carries the following factual conclusions:

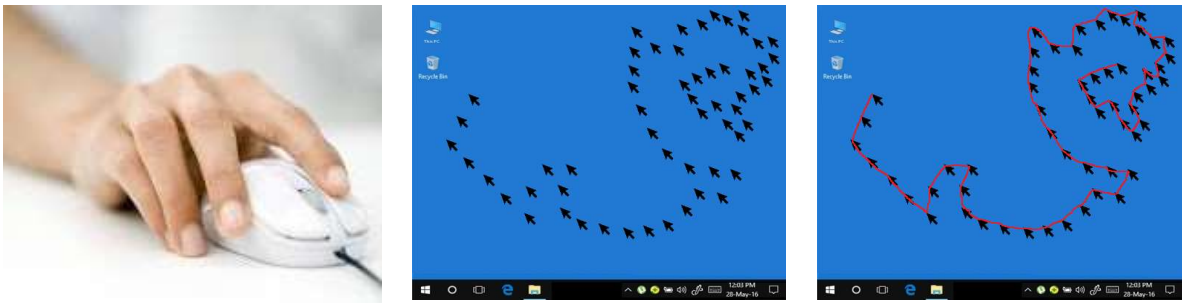
1) Although there is nothing predictable about where the pointer will move, as random internal motor activity will always result in random or chance movements of the pointer, there is, on the other hand, a very essential fact to note. All separate points/positions P of the pointer will always have to be connected or will always have to emerge from each other. Due to which one can conclude that all those points always construct a line, and that, too, always involves exact one (!) entire line segment shape. The pointer will move in that linear form in the same universal manner as a marble moves within a marble run. In which the current position P (0) of the pointer will always serve as the precise separation between all manifest positions P (-x) and all future positions P (+x).
2) Once again, the second highly essential conclusion follows the explanation as in the case of the other basic exercises. The perception of the movement of internal motor activity has absolutely nothing to do with the perception of the movement of the pointer within the line segment shape that all positions of the pointer become a part of.
   The perplexing aspect of this realization may be the fact that the movement of the pointer over a line segment shape is entirely dependent on a completely different internal motoric movement solely reaching the outer surface of the mouse. Without this source of action, the pointer will never move. Additionally, the confirming aspect of this realization may concern the conviction that the perception of the movement of the pointer over a linear form has absolutely no connection with the perception of internal motor movement activity.

Part 2 - Internal motor (movement) activity when a deliberate goal-directed action is involved

The explanatory model of the motoric movement action encompasses the clarification of all functional perception processes within any conceivable action, assuming that these are conscious actions driven by an egocentrically formulated will, with a clearly defined specific goal. So, the motor movements in the first part specifically did not involve actions aimed at placing motor activity in a larger context. Conversely within the second part, general motor activity will now be translated towards specific motoric actions. Although the explanatory model of the motoric movement action is emphasized more in this part, the explanation within this section still aims to clarify the entire spectrum of motor (movement) activity.
So, within the second part we do assume deliberate actions where an egocentric will is formulated to achieve a specific goal and in this chapter the movement of a pointer towards an icon, using a computer mouse, encompasses the key issue. The basic exercise clearly shows that two possible action strategies c.q. execution perspectives can be pursued in this regard.

a. Execution perspective 1 – Primary focus on mouse movements and secondary focus on the movement of the pointer

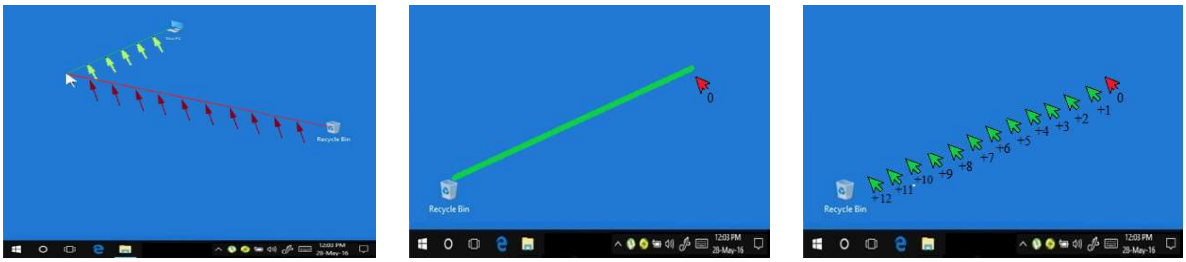
The basic exercise within the first part clearly demonstrates that with primary attention on internal motor activity, focused on the computer mouse, we can randomly move a (external) pointer across a computer screen. However, this random movement becomes a challenge when formulating the egocentrically expressed intention to move a pointer to a specific icon. With primary attention on internal motor activity, we might be able to make the pointer occupy all positions on a screen in a few minutes, but it is far from parsimonious (efficient and effective). And that is even without considering whether, with the many motor mouse activities causing the pointer to move relatively quickly, you could precisely bring the pointer to a standstill on the icon.



Images: Even when, within a deliberate action, one aims to move a pointer to an icon, it always compels a strategy to primarily focus on mouse activity and secondarily observe whether the pointer ever reaches the icon. Although this approach might require a fair amount of luck and patience, it remains a possible action strategy. However, it is not particularly parsimonious within this computer task.

b. <u>Execution perspective 2 – Primary focus on the movement of the pointer and secondary focus on mouse movements</u>

Contrary to the description of random motor activity within the basic exercises within the first part of this article and also in contrast to the previous action strategy, when it comes to the emergence of a conscious action, one can adopt a completely different execution perspective. It would be by far the most economical solution to conceptualize and construct an action trajectory shape between the pointer and the icon.




Images: It is most parsimonious to first construct a perceptual image of an (efficient and effective) latent action trajectory shape, along which the pointer can be successfully moved to the icon, and then to actually execute it.

In the second execution strategy, the roles of attention are reversed. The primary focus now has the goal to track the progress of the pointer within the action trajectory shape, and this must be followed secondarily by motor activity. In which you now have to observe, similar to the basic exercise in the first part, that motor activity passively follows the primary focus.
It would, of course, be by far the most parsimonious execution strategy, but the reversal of roles requires significantly more cognitive capacity. While the first execution perspective allows for a straightforward initiation of the action, the second one demands the following essential cognitive skills:

a. It demands that first a perceptual image of a latent action trajectory shape is constructed over which the pointer can be successfully moved to the icon.
b. There needs a significant complex system to be present which must be capable of mediating the (perception of) the movement of the pointer within the action trajectory shape. While the roles of attention can be reversed, will not change the fact that the pointer can only be moved by (the perception of) a completely different autonomous (internal) phenomenon. Even if we try to enforce that the pointer actually fills in the perceptual image of the latent action trajectory shape, the autonomy of the motor activity will cause the pointer to deviate from that perceptual image of the latent action trajectory shape at every position P.

## Part 3 – General conclusion

The explanatory model of the motoric movement action is capable of appointing all functional perception processes within any conceivable action. However, its implementation in the scientific world encounters several challenges. It represents an entirely new paradigm and involves an explanation within a complex dynamic system where multiple new conceptual steps must be combined simultaneously. Therefor the goal is to try to enhance the insights around the explanatory model, and for that purpose, the preceding paragraphs zoomed in on the entire spectrum of motor activity. From a generally recognizable image, a translation was made to the core concepts and thought processes demanded by the explanatory model of the motoric movement action.
In the end, within this article, two possible action perspectives were identified based on general motor activity. Without any reasonable doubt it becomes clear that the second perspective, where the primary focus is pointed at the construction and execution of a perceptual image of a latent (external) action trajectory shape, will be far more superior to the first mentioned action strategy. However, this ultimate parsimonious solution also reveals which additional conditions the most superior action strategy should meet:

a. Firstly, an organism must have the cognitive ability to create a perceptual image of a latent action trajectory, over which, in the present action, the pointer can be successfully moved to an icon prior to any actual execution. Regarding this first condition, the explanatory model of the motoric movement action has universally provided scientific evidence that we create such a perceptual image within every conceivable action. This has also been specifically addressed regarding this computer task[6] and it has also been demonstrated specifically in grasping[7] and throwing[8] tasks and can easily be adapted to any conceivable action.
b. Secondly, an organism must have the cognitive ability to mediate the movement of the pointer within that perceptual image of a latent action trajectory. The mere quintessence of this article encompasses namely that motor activity is a completely autonomous phenomenon and although it has a direct causal relationship with the movement of the pointer within an action trajectory shape, the pointer will never be able to move by itself. So, we might be intensely motivated to reverse the roles of the primary and secondary focus and willing to construct and execute an optimal straight, ultimate parsimonious, action trajectory shape between the pointer and the icon, but we will absolutely never be able to execute the action trajectory shape like that perceptual image due to the autonomy of the perception of both movements. The (autonomous perception of the movement of the) pointer will certainly want to follow the perceptual image of the latent action trajectory shape, but the (autonomous perception of the movement of the) mouse will actually ensure that the pointer will deviate at every point P within the perceptual image of the latent action trajectory shape.

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[6] https://www.researchgate.net/publication/372719694_When_moving_a_pointer_on_a_computer_screen_you_are_mainly_attentive_to_where_'nothing'_is_-_The_scientific_evidence_regarding_visual_perception_within_each_motor_action

[7] https://www.researchgate.net/publication/372290282_Grasping_encompasses_two_consecutive_autonomous_phases_-_The_scientific_proof_that_we_tactically_construct_an_action_trajectory_shape_prior_to_the_factual_execution_of_that_exact_same_action_trajector?_sg%5B0%5D=cjBGD1Dj5IxR2T4se38lo9o1z_M-KwSU49eb_oQsTOUjibSgy5M67E9dyDJ2vYL6jmizwVBbPYrgk9NU6pmmALDQpNZJERFlrXLCWSXY.BBjj_0oQKGMN_JQZfSCEjGE1eN9IjRkkPyAjEjWIaxLJGM1U2MeX-LYMQPb3Fz_XmE18jNVnKKf8WfOSPcG4l1w&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6ImhvbWUiLCJwYWdlIjoicHJvZmlsZSIsInBvc2l0aW9uIjoicGFnZUNvbnRlbnQifX0

[8] https://www.researchgate.net/publication/371912704_The_scientific_proof_that_we_primarily_start_with_the_construction_of_a_perceptual_image_of_an_outgoing_ball_trajectory_shape_prior_to_the_factual_execution_-_The_complete_explanation_of_the_free_thro

The explanatory model of the motoric movement action thus concludes that there must be a very heavy significant system to mediate the ever-deviating movements of the pointer within an ever-deviating action trajectory shape each consecutive time frame. Regarding this second condition the explanatory model finds that this very heavy system is present within the processing processes of the perception c.q. is present within the functioning of the cortical streams and, based on current scientific literature, it asserts that there is a double and mutual relationship between the dorsal and ventral stream. In the present computer task, the dorsal stream is mainly related to the processing of perceptions concerning the specific position of the pointer, and the ventral stream is mainly related to the processing of perceptions concerning the perceptual image of the whole action trajectory shape. However, this must be seen as mutual. At any time frame *t* or at any point P (0) of the action, one perceives the pointer relative to the action trajectory shape and vice versa. So, the dorsal stream mainly processes the position of the pointer, but this is always related to the action trajectory shape, and conversely, the ventral stream mainly processes the progression of the action trajectory, but this is always related to the specific position of the pointer.