The explanation of the emergence of the cortical streams - We can only guide the boat towards the pillars of a bridge with a zigzag movement, yet the ingenious mediation by the cortical streams creates the delusion of a straight action trajectory shape

Caught In A Line
The explanatory model of all motoric movement actions

N.J. Mol
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Introduction

The explanatory model of the motoric movement action provides a profound understanding of all functional c.q. behavioural perception processes occurring within any conceivable motoric action. Nonetheless, challenges arise in its implementation within the scientific community, given the intrinsic nature of a new paradigm within a complex dynamic system. It necessitates the simultaneous integration of several innovative mind steps, including:

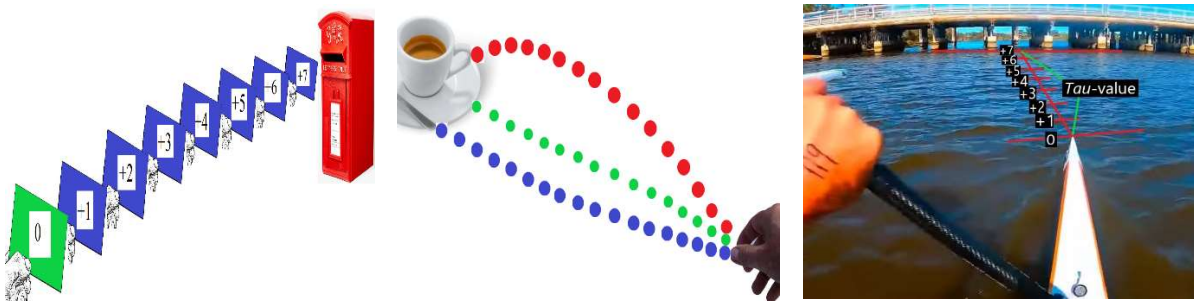
1. The scientific evidence showing that, as part of a tactical (ecological) consideration, we always first create a perceptual image of a latent action trajectory shape before we actually move a boat from A to B.
2. The understanding of the necessity of a compelling collaboration between an internal and an external focus in every motor action. During rowing the movement of the boat within the action trajectory shape can only be perceived outside the body and is solely caused by perception of movements within the body extending only to the outer surface of the oars/paddles. Due to their exclusive domains these perceptions are incompatible.
3. The assumption of the crucial role of the movement of the boat over the action trajectory shape as the essence of the task within rowing, wherein the external focus must be hierarchically considered primary. This assigns a secondary status to the internal focus and demonstrates that no motor plan is ever conducted.
4. The explanation of how the primary focus generates the *tau*-value and how the secondary focus needs to obediently follow the development of that *tau*-value within a strict *tau*-coupling process, providing the first ecological explanation for anticipating all unexpected events during an action.
5. The insight that when we move the boat on water towards the pillars of a bridge it is mostly a subjective choice from the perspective of the boat's bow. With the same motor action, all other components of the boat and all parts of our body also move in a unique action trajectory shape[1]. This demonstrates that in rowing, there is a causal relationship between the perception of internal and external movements, but an explicit relationship only emerges when we (subjectively) "choose" the front part of the boat when rowing.

As a concluding step, this chapter delves into the functioning of the cortical streams when we aim to manoeuvre a boat towards the pillars of a bridge. It provides a comprehensive understanding of why they must play such a pivotal role c.q. why they are ecologically/evolutionarily developed. Additionally, it is precisely explained how they mediate two autonomous deviation processes within every motor action, namely the zigzag process and the accordion process[2].

[1] When navigating a whitewater course with a competition canoe, it is essential to manoeuvre through gates in such a way that no part of the canoe or the paddler touches the pillars of the gates. Although this will largely be determined in the tactical movement action beforehand, during the actual execution, the process will begin at the tip of the boat. Once it has passed the pillars, all points up to the end of the canoe and the paddler will then be traversed, with each of these points sequentially chosen as the action object relative to those gate pillars.
[2] In previous publications, this has been referred to as the harmonica process.

1. The main goal of the tactical movement action (TMA) encompasses the construction of a perceptual image of a latent action trajectory shape between the current position of the boat and the pillars of a bridge

Supported by scientific evidence[3] the explanatory model delineates that the execution of any motor action involves two distinct sequential phases: the tactical movement action (TMA) and the actual movement action (AMA). The tactical movement action is focused solely on planning the upcoming action and must be finalized before any actual execution occurs. An essential aspect of the tactical movement action when rowing is to create a perceptual image of a latent action trajectory shape between the current position of the boat (position A) and the desired destination (position B). In this case it involves guiding our boat towards the middle of the pillars of a bridge. The explanatory model demonstrates that during this phase, we are indeed largely focused on all physical dimensions of the bridge, aligning with much scientific research. However, with the recognition that a perceptual image of a latent action trajectory shape is being created, the explanatory model also arrives at a conclusion that is not yet recognized within the scientific community. The formation of a perceptual image of a latent action trajectory shape between the current position of the boat and the bridge ahead also indicates that we strategically determine beforehand whether the space between the boat and the bridge (in the very near future) can be filled or bridged by a continuous trajectory shape of all dimensions of the boat (and the passenger). The explanatory model provides unequivocal scientific evidence, and you can quickly conclude from your own empirical experiences that a completely different action trajectory shape is created when obstacles are present in front of the boat, and that no action trajectory shape can be created when the boat is shielded by a huge shop window.



Images: Within letter posting and grasping we also construct a perceptual image of a latent action trajectory shape during the tactical movement action (TMA) like in any conceivable motoric action, over which *all dimensions* (!) of the action object (i.e., the letter and the fingertips) will enable the action to succeed. During the actual execution within the actual movement action (AMA), akin to the boat within rowing, one must perceive the movement of the action object during the bridging process, as only the boat, the letter, and the fingertips are going to move c.q. can be moved egocentrically. Within the images, it is particularly noticeable that we actively perceive whether the entire path through all dimensions of the fingertips, the boat, or the letter can be filled in a continuous action trajectory shape c.q. we mainly perceive the "nothingness" in the vista in front of us. Because only in that void there is (empty) space to successfully execute an action.

In addition to unveiling this novelty, it is also revealed that when the tactical movement action has been finalized, we are primarily going to focus on the movement of the boat towards the pillars of the bridge. This contrasts with the traditional perspective of science, which remains constantly focused on the bridge itself. During the actual movement action (AMA), our main concern is the egocentric bridging process of the boat, guiding it over the perceptual image of the latent action trajectory shape which is exclusively determined during the tactical movement action. So when the factual execution starts

[3] https://www.researchgate.net/publication/372992904_Rowing_versus_a_rowing_machine_-_Rowing_encompasses_the_obligatory_linking_of_a_secondary_internal_focus_to_a_primary_external_focus_A_rowing_machine_solely_requires_a_secondary_internal_focus

the bridge itself is not any longer the focal point, but rather the movement of the boat towards it c.q. the bridging of the void (!) between the current location of the boat and the bridge forms the essence of the action.
Another revolutionary novelty aligns with the previous thought. Although reaching the end of the action trajectory shape will eventually lead us to the completion of this task, the explanatory model, supported by scientific evidence, demonstrates that we also tactically determine beforehand whether the entire (!) space between the boat and the bridge can be filled by a continuous line of all dimensions of the boat (and the passenger). This means that all positions P between the current location of the boat and the pillars of the bridge are observed as actively and as crucially as the endpoint of the action trajectory shape. This realization provides a solid foundation for the fact that during the actual movement action (AMA), we are solely focused on traversing the latent positions P associated with the action trajectory shape. This implies that upon reaching position P(x), for example, somewhere midway along the action trajectory, we are mainly focused on the perception of three positions: position P(x-1), where we just came from, position P(x), where the boat is now, and position P(x+1), the perception of the next position where we need to move the boat. In this phase, we are primarily engaged in the aforementioned bridging process and only monitor whether the gap between the boat and the bridge is closing. This also reveals another essential ecological novelty, showing that during the actual movement action, we are indeed not concerned with the bridge itself, but only with reducing the number of latent positions P between the boat and the bridge.

2. <u>The reciprocal dependency between the internal and external focus results in absolute deviations of the boat within the perceptual image of the latent action trajectory shape</u>

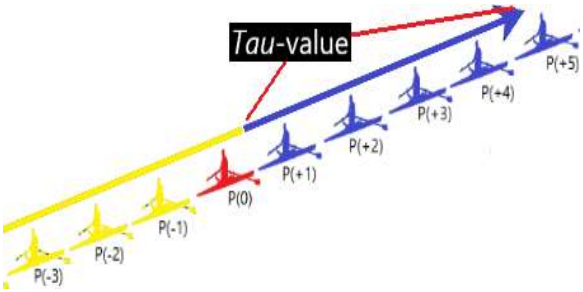
The explanatory model of the motoric movement action illustrates within the context of rowing that two foci always arise. We can only guide the boat along an external action trajectory (from A to B) with a focus on internal movements. These foci are autonomous because the (perception of) movements occur strictly separated inside and outside the body, rendering them incompatible.
However, as the explanatory model now demonstrates that the movement of the boat within the external action trajectory shape is going to fulfil the essence of the task, an intriguing phenomenon of reciprocal dependency emerges. Only internal motor movements can lead the boat externally along an action trajectory shape, yet the progression of the boat within that trajectory will, as the primary focus, dictate those internal motor movements. The inevitable consequence of this observation encompasses that it is not a matter of whether the boat will deviate within the perceptual image of the latent action trajectory shape, but rather that this is an absolute certainty. In which this absoluteness logically stems from the factual nature of the autonomous perception of both foci.

3. <u>Within the actual movement action (AMA) the cortical streams will have to mediate the continuous flow of absolutely emerging deviations</u>

If we now combine the two preceding paragraphs and proceed to actually move the boat from a position A to a position B, our main endeavour will primarily become to initiate the bridging process of the boat in which the perceptual image of the latent action trajectory shape serves as an open yet compelling guiding[4] phenomenon. This means that we aim to *step by step* (!) reduce the distance between

[4] Upon perusing the explanatory model, one will start to realize that the construction of a perceptual image of a latent action trajectory shape is necessary to initiate any motor action, but it doesn't need to be followed precisely. That's the essence of a highly economical system. In the initial stages of an action trajectory shape, it's not a problem at all if the boat deviates, as long as the boat comes closer to the endpoint. However, without a (precisely global) perceptual image of a latent action trajectory shape, motor actions cannot commence and the explanatory model introduces the term "*precise global*" in this context. The perceptual image of the latent action trajectory shape must precisely indicate the global (fluctuation boarders of the) direction it should take.

the current position of the boat and the pillars of the bridge, starting with the first step of moving the boat from position P(0) to position P(+1).



Images: The explanatory model of the motoric movement action provides a tangible example with the marble in the marble run, illustrating the continuous reciprocal perception-action coupling within any conceivable motoric action. From the perspective of the marble's current position, one can perceive the relationship within the entire marble run, and vice versa, one can perceive the relationship with the marble's current position from the perspective of the entire marble run. Although all this remains invisible when rowing, it is present in an equivalent manner. Because in our worldly dimensions, it is just a mere fact that all positions P of any moving object, including a boat, must emerge from each other, meaning that the perception of the boat's movement is always captured in one single line segment shape within rowing. In which the current position P(0) of the boat will always form the precise separation between the already manifest positions P(-x) and the still latent positions P(+x). In which could be further added that the perceptual image of the still latent action trajectory involves future projections that must arise from the observation of the movement of all subsequential manifest boat positions prior to the current position P(0).

The perceptual image of the entire latent action trajectory shape thus also represents an image of its very beginning, and at the outset of the action, we will try to guide the boat to follow that beginning. However, even during the bridging to this first position, due to the aforementioned mutual autonomous dependency of the internal and external focus, the boat will inevitably deviate[5] from the perceptual image. It is an absolute factual given that cannot be avoided, and it would quickly lead to chaotic action trajectories[6] if there were not a system capable of mediating these deviations.

[5] As stated in footnote 4, this precisely illustrates an optimal parsimonious model, where nothing needs to be executed very precisely, but only gives a general (albeit compelling) direction. If you were only able to move a boat in an identical manner each time, cycling would become an impossible task. The task, where you only need to reduce the distance, opens up countless more possibilities and shows that the bridging process is just one part of the task.

[6] The description of the cortical streams within the motoric movement action *car driving* is particularly notable in this regard. If deviations from the driving lane on a highway do not lead to corrections the exponential product will soon lead to accidents. Deviation upon deviation will cause an exponential grow due to the fact that they belong to two complex subsystems.

Images: The perceptual image of a latent action trajectory shape, constructed within the tactical movement action (TMA), depicts a smooth line segment shape from the boat toward the pillars of the bridge. However, during the actual execution, the boat, akin to a ring in relationship to a nerve spiral[7], will definitely deviate at every position P within that perceptual image due to the autonomy of the internal and external focus. This necessitates redirecting the boat back to the original perceptual image to prevent a stacking of deviations. In practice, this means that a corresponding adjustment in the remaining part of the latent action trajectory shape must be made from the micro-deviation[8]. Similar to a marble in a marble run, the boat in relationship to the whole action trajectory shape will become a part of a continuous mutual perception-action coupling, in which the dorsal stream primarily monitors the actual position of the boat towards the action trajectory shape, and vice versa the ventral stream primarily monitors the action trajectory shape towards the actual position of the boat. The nerve spiral clearly demonstrates that this double reciprocal coupling inevitably leads to deviations or touches of the ring with the spiral, causing the boat to follow the action trajectory shape in a zigzag movement. However, the ingenious mediation of the cortical streams ensures that the action trajectory shapes appear deceptively straight.

Within there the explanatory model of the motoric movement action illustrates that the execution of action trajectory shapes indeed encompasses the essence of motor tasks, and that success hinges on the meticulous management of deviations of the action object within the action trajectory[9]. Therefore, it ideally presupposes a mutually reinforcing system that continuously monitors the relationship with the action trajectory shape from the current position of the boat, and conversely, constantly monitors the actual position of the boat from the perceptual image of the action trajectory.
The explanatory model thus implies a rather heavy correction system, and based upon current scientific literature, it concludes that the conceptual steps within the explanatory model precisely presuppose what is described (neuro-)scientifically regarding the processing of perceptions: namely, the functionality of the dorsal and ventral stream. At every time *t* or at every position P, all observations are processed by the ventral and dorsal stream in such a way that deviations simply cannot escape attention. The ventral stream primarily processes deviations from the perceptual image of the entire action trajectory to the actual position of the boat, while the dorsal stream does so vice versa, primarily from the actual position of the boat to the perceptual image of the entire action trajectory shape. The mediation of these two processing streams leads to continuous micro-adjustments of the original perceptual image of the latent action trajectory shape, happening so ingeniously and swiftly that the

[7] https://www.researchgate.net/publication/376888581_The_nerve_spiral_demonstrates_that_random_motor_activity_implicitly_generates_an_internal_and_external_focus_and_provides_scientific_evidence_that_the_external_focus_can_guide_the_action_due_to_the_in

[8] You can speak of micro-adjustments or of updating c.q. renewing the perceptual image of the remaining latent action trajectory.

[9] One must be able to stop at the right distance behind the waiting car and not bump into it, one must be able to push away an opponent in a precise *tau*-coupling process at just the right moment, and not a moment earlier or later; one must bring food precisely to the mouth, and the fingertips must also stop precisely at the coffee cup without knocking it over repeatedly.

absolute zigzag and accordion-like deviations barely stand out, making the executed action trajectory shapes appear deceptively straight.

4. The cortical streams mediate two autonomous groups of deviations within every conceivable action

The preceding paragraphs extensively delve into the fact that the action object will inevitably deviate from the perceptual image of the latent action trajectory shape, determined within the tactical movement action, when the action is actually performed. The occurring deviations of an action trajectory involve two autonomous phenomena[10], which relate to the words *line* and *shape* in the compound term *line segment shape*. The explanatory model demonstrates that they are observed and processed completely separately, yet simultaneously. Driving and cycling (without hand brakes) show, beyond any reasonable doubt, that the deviations in relationship to the line and shape are autonomously observed and processed.

Images: The deviations within each action trajectory shape involve two autonomous phenomena, as indicated by the explanatory model, referred to as the zigzag process and the accordion process. In car driving and cycling (without hand brakes), it becomes immediately apparent that steering exclusively influences the *movement within the shape* (!) of the action trajectory. This defines the explanatory model as mediating deviations along the x-axis and causing the zigzag process. Additionally, it becomes equally evident that using the pedals exclusively influences the movement *within the line* (!) of the action trajectory shape. This defines the explanatory model as mediating deviations along the y-axis and causing the accordion process. Therefore, in driving, it becomes crystal clear that (processing the) perceptions in relationship to the shape have absolutely nothing to do with (processing the) perceptions in relationship to the line. In which it is essential to note that processing observations regarding filling the latent line with the manifest positions P within the external (primary) focus solely involves the perception of the *tau*-value and is thus actually generated solely by the pedals of the car or bicycle. Only the speed within which the line is filled determines the duration of the action, thus finalizing the action.

Deviations along the length axis or y-axis of the action trajectory shape involve deviations of the movement of the action object over time. They are related to determining the *tau*-value within a motor action, and deviations of the action object along the line can be characterized as an accordion process. Deviations along the width axis or x-axis of the shape of the action trajectory involve deviations of the movement of the action object within the shape and can be characterized as a zigzag process.

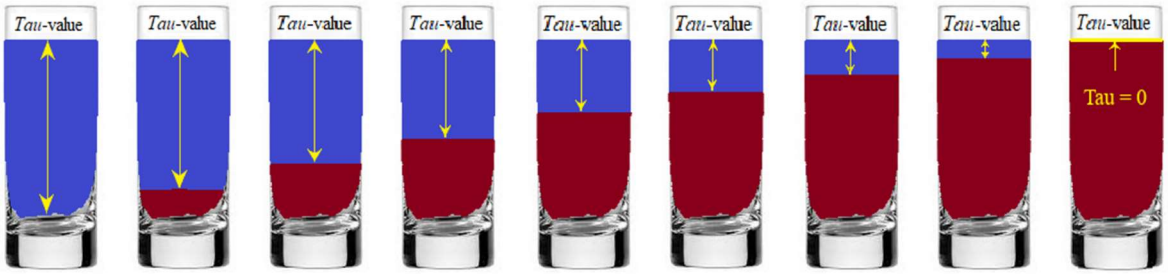
[10] In essence, they form two complex subsystems within the larger phenomenon of the whole cortical stream operation, revealing that perceiving deviations c.q. the processing of deviations leads to an unprecedented variety of hybrid perception processes. This article does not delve further into this complexity.

5. The zigzag process and the accordion process when rowing

The explanatory model of motoric movement action reveals that the zigzag process and the accordion process are inherent in every conceivable action[11]. However, in other actions, demonstrating this is much more challenging than in cycling and car driving. Nevertheless, in all actions, one must consider separate pedals and a steering wheel that autonomously influence the construction and mediation of the latent action trajectory shape, which will then be processed through hybrid forms of these phenomena. While the zigzag process (the steering process) can be adequately depicted in animations for most actions, the accordion process cannot.

Images: The zigzag process in any conceivable action can easily be represented in an animation. Due to the fact that the primary focus can only be executed by the autonomous secondary focus, the action object (respectively, the letter, the pointer, and the boat) will definitely deviate from the perceptual image of the latent action trajectory shape in width.

Although the accordion process (the pedal process) in rowing is undoubtedly demonstrated, it is challenging to depict in an animation because it involves compressions and elongations of time[12]. Nonetheless, you must recognize that you can never move the boat identically in time along an action trajectory shape. Through empirical observation, you can quickly ascertain that within certain fluctuation boundaries, it will infinitely vary.



Images: In the motoric movement action *pouring*, the accordion process is still difficult to capture in an animation. However, it can be factually stated that when filling a glass, as a very rare exception, there are absolutely no deviations within a zigzag process. The cortical streams are fully dedicated to the accordion process during pouring.

[11] While this imposes greater demands on organismal development, conversely, it allows for a compelling demonstration of its seamless integration within an ecological framework. The dichotomy that distinguishes a separate x- and y-axis component actually constitutes the breakthrough that allows us to reduce highly complex perception processes to such seemingly simple phenomena.

[12] Wherein it should be noted for the record that the bike does not move back within the action trajectory shape.