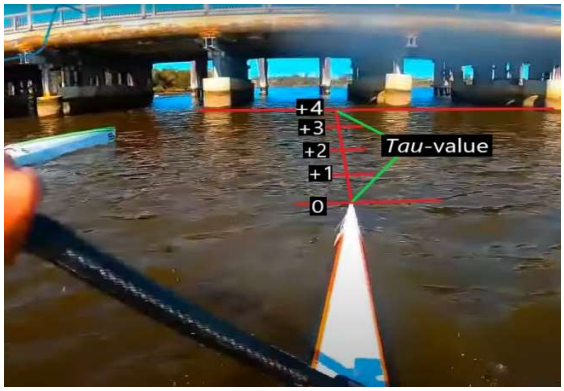
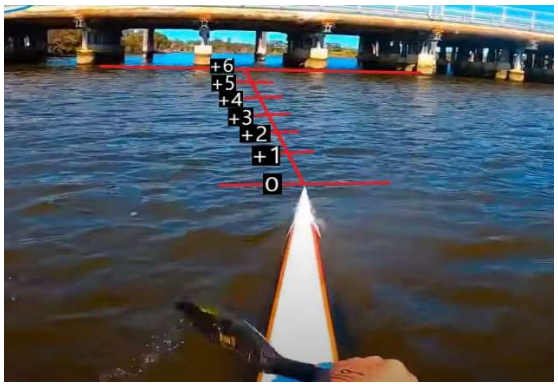
Within rowing the essence of the task is executed solely by the external movements of the boat within an action trajectory shape; The perception-action coupling within the primary focus generates the *tau*-value





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

N.J. Mol

Introduction

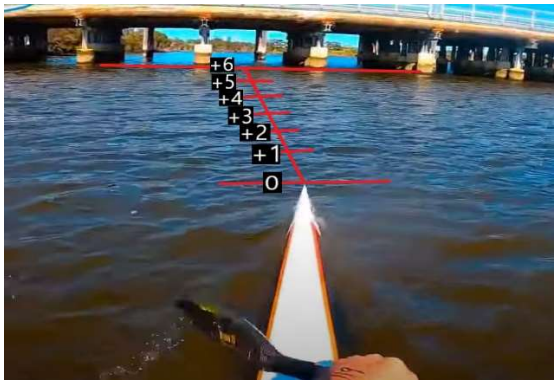
Traditionally, science has assumed that one motor action corresponds to one focus. This assumption was likely so intuitive that it was never challenged. However, this has led to the situation where, even after more than 100 years of movement sciences, a plausible explanation for the underlying functional perception processes guiding the execution of all motor actions had never been found.
In contrast, in 2016, an explanatory model emerged that has the capability to identify all functional perception processes within any imaginable motor action showing a universal approach. It demonstrates, beyond any reasonable doubt, that each motor action can only be executed through a mandatory coupling of two foci: an internal (secondary) focus that must always be directed towards an external (primary) focus. In which it should be explicitly noted that these two foci represent entities that fundamentally differ from current scientific terminology.
With regard to the external (primary) focus, it can be noted that science has, until now, truly missed everything. Therefore, it is being explained within a wide spectrum of motor actions, and this publication now reveals all facets of the primary focus within the motoric movement action *rowing*. Rowing is a unique type of motor action and, like bicycling, walking, car driving, skiing, skating, swimming, etc., falls under those actions where the entire body will become part of the movement from a random position A to a random position B. So within rowing, the boat and the rower together will form the action object as a whole, and this results in a significant and fundamental change in perception. When reaching for a coffee cup, moving a pointer to an icon on a desktop, or writing, you see the action object (respectively the fingertips, the pointer and the tip of the pen) moving outside of yourself. In which it must become crystal clear that you perceive the action trajectory shape from the outside in these cases. In contrast, when rowing a boat, you yourself, along with the boat, become the action object as a whole, and as a result, you perceive the action trajectory shape from the inside of the action. Just as you can observe a bobsled within a bobsled track as a spectator, you now become the bobsledder yourself. Which is exactly the same when you observe a marble within a marble run.

Solely the movements of the boat encompass the essence of the task c.q. the external (primary) focus

The category of motor actions discussed by the explanatory model pertains the conscious actions where it is assumed that there is always an initial formulation of an egocentric intent (an egocentric formulated will). Before picking up a coffee cup, for instance, there is always the desire to do so. The explanatory model of all motoric movement actions recognizes this as an undisputed factual aspect but adds a caveat. The egocentrically formulated intent does not, for example, concern picking up the coffee cup itself. The explanatory model reveals that this is factually incorrect and that we can only move our fingertips toward the coffee cup. Therefore, the movement of the fingertips toward the coffee cup constitutes the essence of that action.

In the context of rowing, we may indeed have a desire to win an Olympic medal, but the egocentrically formulated goal pertains solely to moving the boat along an action trajectory shape. Only that aspect determines the essence of the task assignment, and therefore, only that aspect should be considered as the external (primary) focus.

The tactical movement action (TMA) within rowing



Images: Firstly, an egocentric intention must be formulated, indicating that we want to move our boat from position A to position B. Then, starting from the current position of the boat, we first establish a perceptual image of a latent action trajectory shape between position A and position B (left). This occurs as part of a tactical action where two important goals are considered. Firstly, it should lead to a successful action, and secondly, ecologically evolved organisms aim to execute actions as parsimonious as possible. The race situation (right) further underscores this tactical consideration. Although it might appear, due to the mere presence of other competitors, that we wouldn't create a perceptual image of a latent action trajectory shape without them because then there are seemingly no obstacles present, this is categorically incorrect. The tactical consideration is not focused on the presence of boats of other competitors but solely on the "empty" positions P within the race situation where the boat can move without obstruction. Therefore, our visual perception always focuses on positions P where there is nothing to see, as all such positions can guarantee unobstructed passage for the boat.

The explanatory model of the motoric movement action demonstrates that after formulating an egocentric goal, we always engage in a tactical consideration[1], prior to any execution, to determine how we can bring the action object to the goal location within successive positions P. Within the current action, we always first create a perceptual image of a latent action trajectory shape over which the boat can be successfully moved from position A to position B.

The factual movement action (FMA) when rowing towards a bridge

After establishing a perceptual image of a latent action trajectory shape, we proceed to execute the action, starting with bridging the actual position P(0) of the boat to the next position P(+1) within the action trajectory shape. Although we naturally want to come out neatly between the pillars of the bridge, the explanatory model clearly shows that during this phase, our perceptual processes are primarily concerned with bridging the empty space between the boat and the bridge c.q. between the animal and

[1] The scientific evidence has been unequivocally provided for all grasping actions and all throwing actions, and can be easily universally extrapolated to any conceivable action. N.J. Mol; *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 trajectory shape.*

the environment (Gibson[2]). So essentially, on a micro-level, only the positions P(-1), P(0), and P(+1) are relevant to us during this bridging phase.

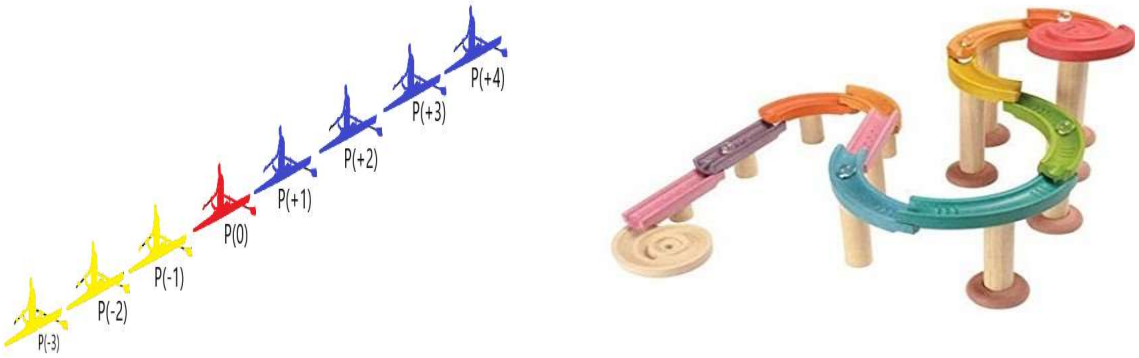
Images: In an animation, the progression within an action trajectory shape can be depicted as follows. Within any conceivable action, the action object can successfully execute the action only by first occupying the next position P(+1) within the action trajectory. The current position P(0) then shifts one step forward, and a manifest position P(-1) is added. This process repeats with every new position P(0) until the end of the action trajectory is reached. To comprehend the perception processes at the most fundamental level it is of the utmost importance that you start to understand that the latent part of the action trajectory shape will factually need to sprout out of the already manifest positions P(-x).

The perception-action coupling within rowing

With the preceding argumentation, the explanatory model of the motoric movement action now provides a comprehensive and universal explanation of how perception is linked to the action within any conceivable task. The animations in the previous section illustrate that the action object maintains a fixed relationship with the perceptual image of the action trajectory shape. This becomes easier to

[2] With this observation, the explanatory model of the motoric movement action finalizes J.J. Gibson's *The Affordances Theory*. In addition to the organism, Gibson introduced the second essential entity of the environment. However, he was missing the finalizing third entity of the action space between the organism and the environment.

comprehend when envisioning a marble in a marble run. In this analogy, you will become much more aware that the perception-action coupling is one unified c.q. one complete phenomenon where only a single change occurs every ongoing time span. Within the marble run it becomes quite visible that during the actual execution, each position P(0) serves as the precise separation between all already manifested positions P(-x) and the latent positions P(+x) yet to be traversed.
Through this explanation of the perception-action coupling, the explanatory model can precisely demonstrate how organisms must have evolved within an ecological framework. However, delving into this subject exceeds the scope of this publication. Instead, several crucial points will be highlighted concerning the functional perception processes within this motor action.
It's imperative to recognize that while the ultimate goal is to finally arrive at that random position B, during the execution of the action we are solely engaged in bridging empty space where seemingly nothing is happening. It can be observed within any conceivable action that we spend relatively more time bridging this nothingness than in actual observable activity. The explanatory model, however, unequivocally shows that not only the end goal matters, but all positions P of the boat between position A and position B are equally significant.
Additionally, it must be remarked that the action of the boat at P(0) can be perceived distinctly, yet no fixed unit of time can be attributed to it. Each unit of time can be divided into a thousand smaller units, and these units can be further subdivided, leading the explanatory model to argue that the action at P(0) fundamentally takes such a brief time span that it only gains significance in relationship to perceptions of the adjacent time frames. In other words, perceiving the actual boat position solely gains meaning through the adjacent future "*actual*" positions P(+x) and the adjacent manifest "*actual*" positions P(-x) of the boat. Within which the overarching idea is to emphasize that perceptions within any conceivable action mainly pertain to one single phenomenon wherein the perception of the action also compels a perceptual image, but primarily that they are absolutely interdependent.

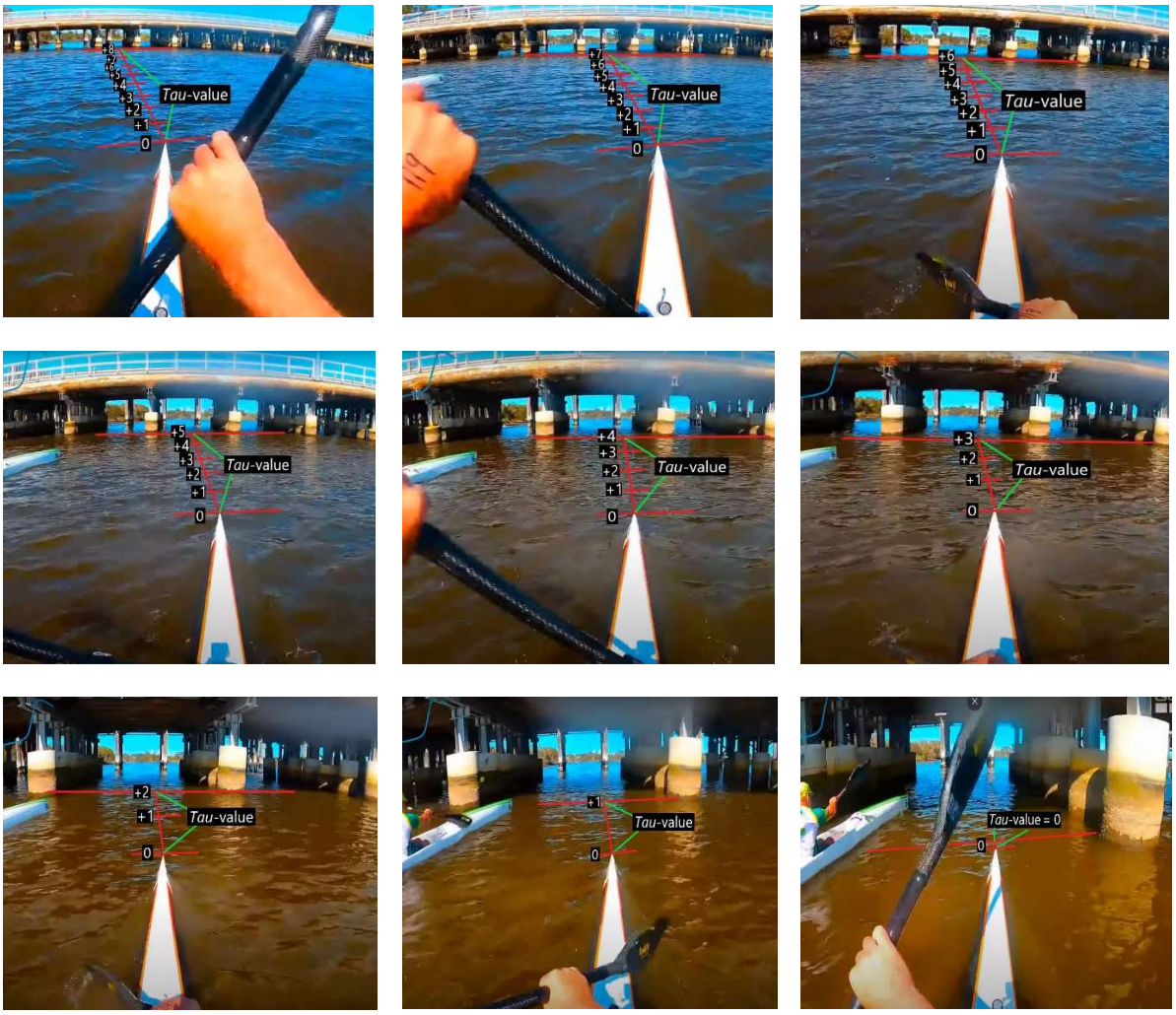


Images: Within many motoric actions the action trajectory shape will not become visible, making it challenging to depict with animations. Conversely, the marble within the marble run, is capable to vividly illustrate this concept. It clearly showcases one single phenomenon wherein the marble, at each position P, delineates the precise separation between all already manifested positions P(-x) and all latent positions P(+x). Additionally, it exemplifies one of the essences of the (perception-action) coupling. If we couldn't see the marble run, the movements of the marble would lack essential context, and conversely, without the marble, we would be completely unable to perceive any coupling as well. Without each other, they, therefore, have no meaning, and we would never, under any circumstances, be able to execute any motoric movement action.

The *tau*-value within rowing towards a bridge

The explanatory model of the motoric movement action demonstrates with the aforementioned perception-action coupling that the perception of each position of the boat c.q. the action object within the action trajectory shape is equally important. However, as the boat approaches the end of the action trajectory shape, the task c.q. the egocentrically formulated goal starts to become finalized. Within any

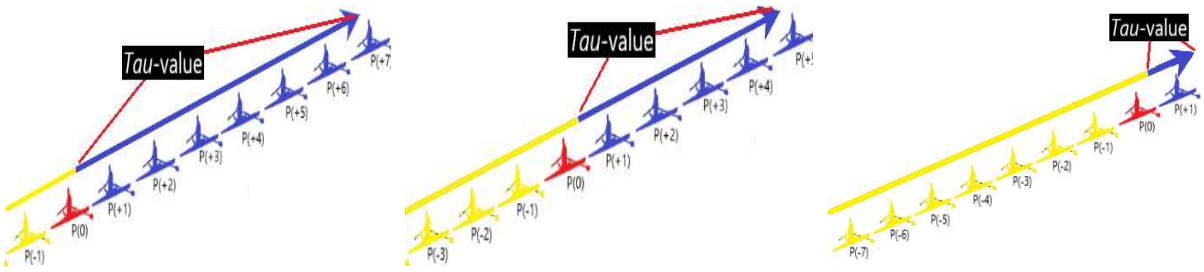
imaginable motor action, the action object will universally traverse the action trajectory shape until there are no latent positions P left. Within his *tau*-coupling theory, D.N. Lee referred to this phenomenon as the closing of the gap c.q. as the *tau*-value approaching to zero.



Images: Within the perception-action coupling, the boat will traverse all latent positions P that are tactically predetermined within a perceptual image of an action trajectory shape. With each successive position P of the boat, the *tau*-value will decrease, until it eventually approaches zero c.q. becomes zero.

<u>The perception of the *tau*-value within rowing towards a bridge</u>

The perception of the *tau*-value within the external (primary) focus is an essential process, as it must establish a compelling relationship with the internal (secondary) focus within a strict *tau*-coupling to ensure the successful execution of an action. When it's perceived that the boat's bow is approaching the bridge pillars, the perception within the internal focus, or more precisely, the perception of the movements of the paddles, must ensure that the boat is slowed down and steered in such a way that it neatly ends up between the bridge pillars.



Images: The *tau*-value can be perceived in two autonomous ways. You can observe how the manifest (yellow-colored) action trajectory shape takes over the latent (blue-colored) trajectory shape, or you can observe at an even more basic level the speed at which the latent part of the action trajectory shape disappears. In which you essentially only perceive how the latent (blue-colored) "gap" closes.

The perception of the *tau*-value approaching zero can be observed in two autonomous ways. The first method involves filling in the perceptual image of the entire latent action trajectory shape with the manifest positions P of the boat. The other method is even more basic in its perception of the *tau*-value. Unlike the first method, it is solely based on the disappearance of the latent positions P from the perceptual image of the entire latent action trajectory shape. In this case, imagine that in the animations, you are only perceiving the speed at which the gap c.q. the blue line between the boat and the pillars of the bridge is closing.