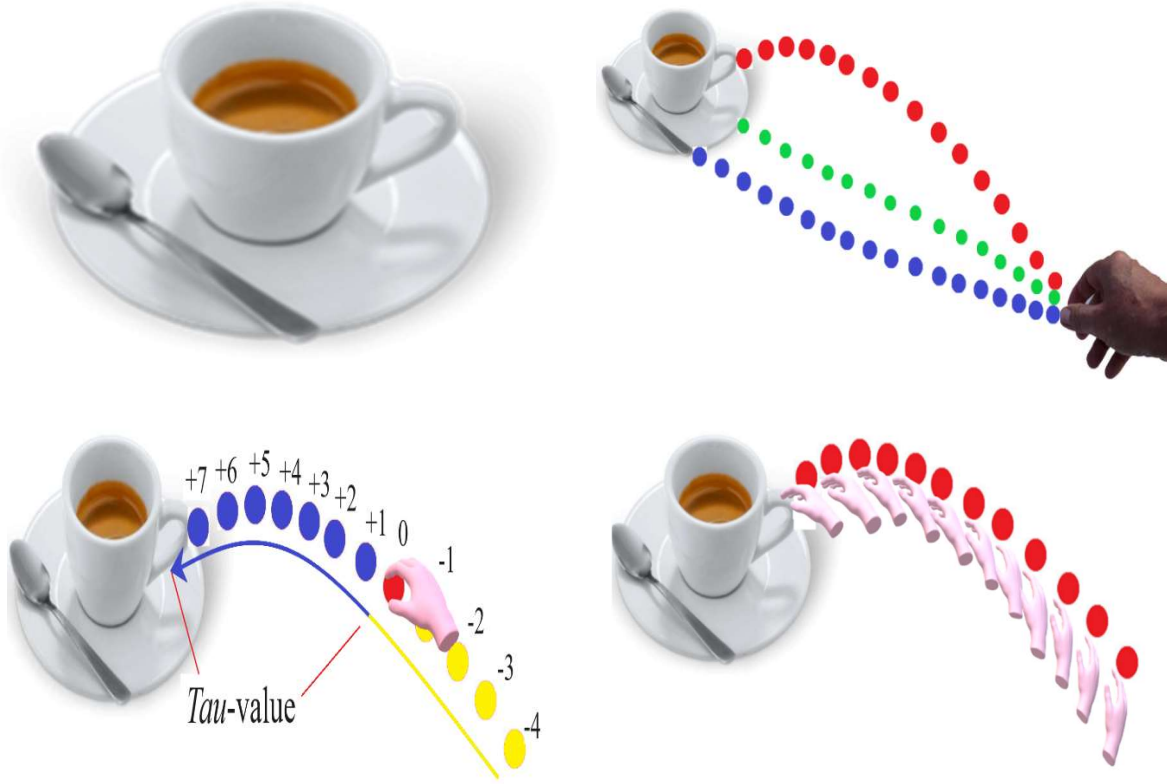
Within grasping the essence of the task is solely executed by the movements of the fingertips toward a coffee cup; Within the primary focus the fingertips are constrained within an action trajectory shape providing the *tau*-value



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

N.J. Mol

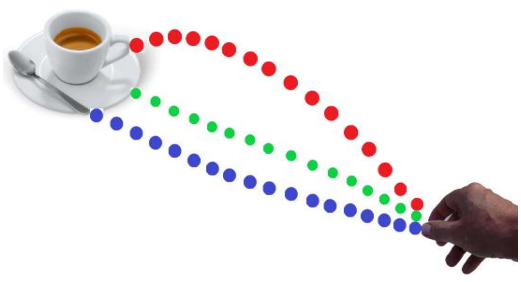
Introduction

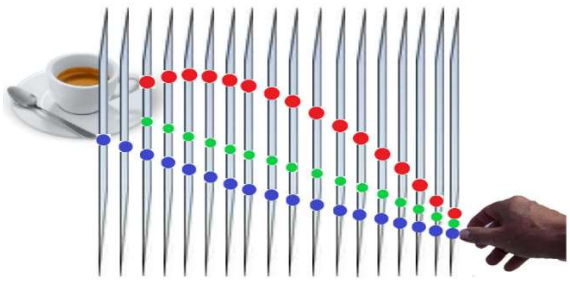
Traditionally, science has assumed that one motor action corresponds to one focus. This assumption was likely so intuitive that it was never challenged. However, this has led to the situation where, even after more than 100 years of movement sciences, a plausible explanation for the underlying functional 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. 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 observed that science has so far truly missed everything. Therefore, it will now be discussed comprehensively within a broad spectrum of motor actions, and this publication now reveals all facets of the primary focus within the motoric movement action *grasping*.

Solely the movements of the fingertips encompass the essence of the task c.q. the external (primary) focus within the motoric movement action *grasping*

The category of motor actions assessed within the explanatory model includes conscious actions, where it is assumed that there is always an egocentric intent (egocentric formulated will) formulated first. For instance, when it comes to eating, there is a need to express the desire to satisfy hunger, and in writing, there must be a desire to, for example, write a brilliant book prior to any action. Therefore, before picking up a coffee cup, there is always the initial desire to do so. The explanatory model acknowledges this as an undisputed factual given but adds a caveat. The egocentrically formulated will in eating, for example, is not essentially about satisfying hunger, and in writing, it's not primarily about writing a great book. The explanatory model shows that this is factually incorrect and that we can only move food and a pen tip along an action trajectory shape, respectively, towards the mouth and across the paper. Analogously, we can only move our fingertips toward a coffee cup, which determines the essence of that action, and therefore, only that aspect should be considered as the external (primary) focus.

The tactical movement action (TMA) within the grasping of a coffee cup





Images: First and foremost, an egocentric will must be formulated regarding our intention to perform any motor action in relation to a coffee cup. From the current position of the fingertips, we then create a perceptual image of a latent action trajectory shape, showing how (a part of) the coffee cup will be reached (left). This occurs as part of a tactical action in which two important goals are considered. Firstly, it should lead to a successful action, and secondly, ecologically evolved organisms aim to perform actions as parsimonious as possible. Within there the explanatory model of the motoric movement action provides scientific evidence[1] that, while we are indeed looking for obstacles (which could hinder a successful action) within the environment (right), our visual perception is primarily focused on creating an action trajectory shape that enables a continuous trajectory of future positions P of the fingertips. In other words, we mainly perceive the positions P where there is nothing (!) to see, and this is also the essence of the tactical action in the left photo, where there appear to be no physical obstacles on the (action) path.

The explanatory model of the motoric movement action demonstrates that after formulating an egocentric goal, we always engage in a tactical consideration[2], prior to any execution, to determine how we can bring the action object to the goal location within successive positions P. In the context of the discussed action, we always create a perceptual image of a latent action trajectory shape, allowing the fingertips to be moved successfully toward the coffee cup.

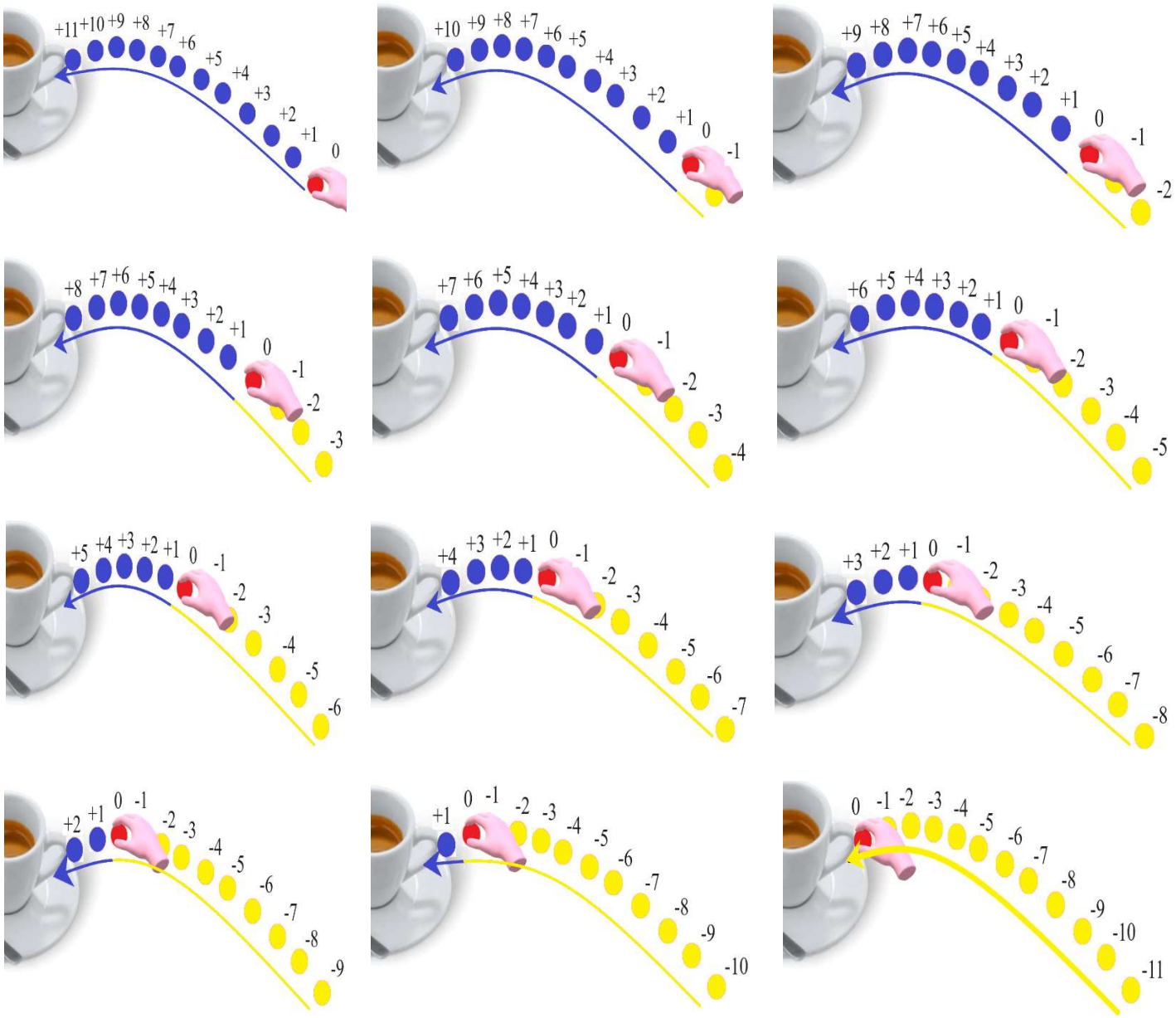
Images: It is not straightforward to present an animation that accurately represents the latent action trajectory shape being constructed. The image on the left very clearly displays the shape of the trajectory, in which all contiguous points P are distinctly weighed. However, it does not illustrate that within the construction of the trajectory shape, all dimensions of the fingertips/hand are also precisely incorporated, as shown in the image on the right. The perceptual image we pre-construct of the trajectory might possibly contain a hybrid blend of these two animations.

<u>The factual movement action (FMA) within the grasping of a coffee cup</u>

After determining a perceptual image of a latent action trajectory shape, we proceed to actually carry out the action. This process effectively starts with bridging the gap from the current position of the fingertips P(0) to the next position P(+1) within the action trajectory. Although our ultimate intention of course is to reach the coffee cup, the explanatory model clearly demonstrates that our perception processes in this phase are solely focused on traversing the empty space between the fingertips and the coffee cup. Which at a micro-level shows, that essentially only the positions P(-1), P(0), and P(1) matter to us during this bridging process.

1

2 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.*

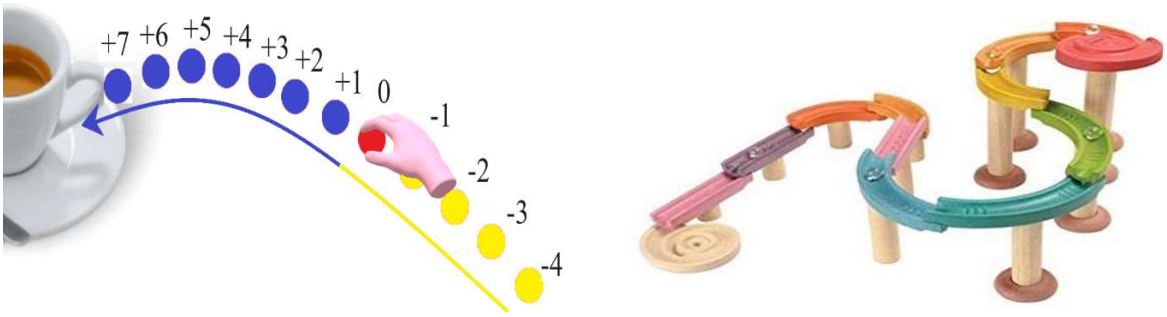


Images: In an animation, the progression within an action trajectory shape can be depicted as follows. Within any conceivable action, the action object can successfully execute the action only by first occupying the next position P(+1) within the action trajectory. The current position P(0) then shifts 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 the grasping of a coffee cup

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 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 comprehend when envisioning a marble in a marble run. In this analogy, you will become much more aware

that the perception-action coupling is a unified 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 perceptual processes within this motor action.
It's imperative to recognize that while the ultimate goal is to reach the coffee cup, 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 between the fingertips and the coffee cup are equally significant.
Additionally, it must be remarked that the action of the fingertips 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 current position of the fingertips solely gains meaning through the adjacent future "actual" positions P(+x) and the adjacent manifest "actual" positions P(-x) of the fingertips. 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.

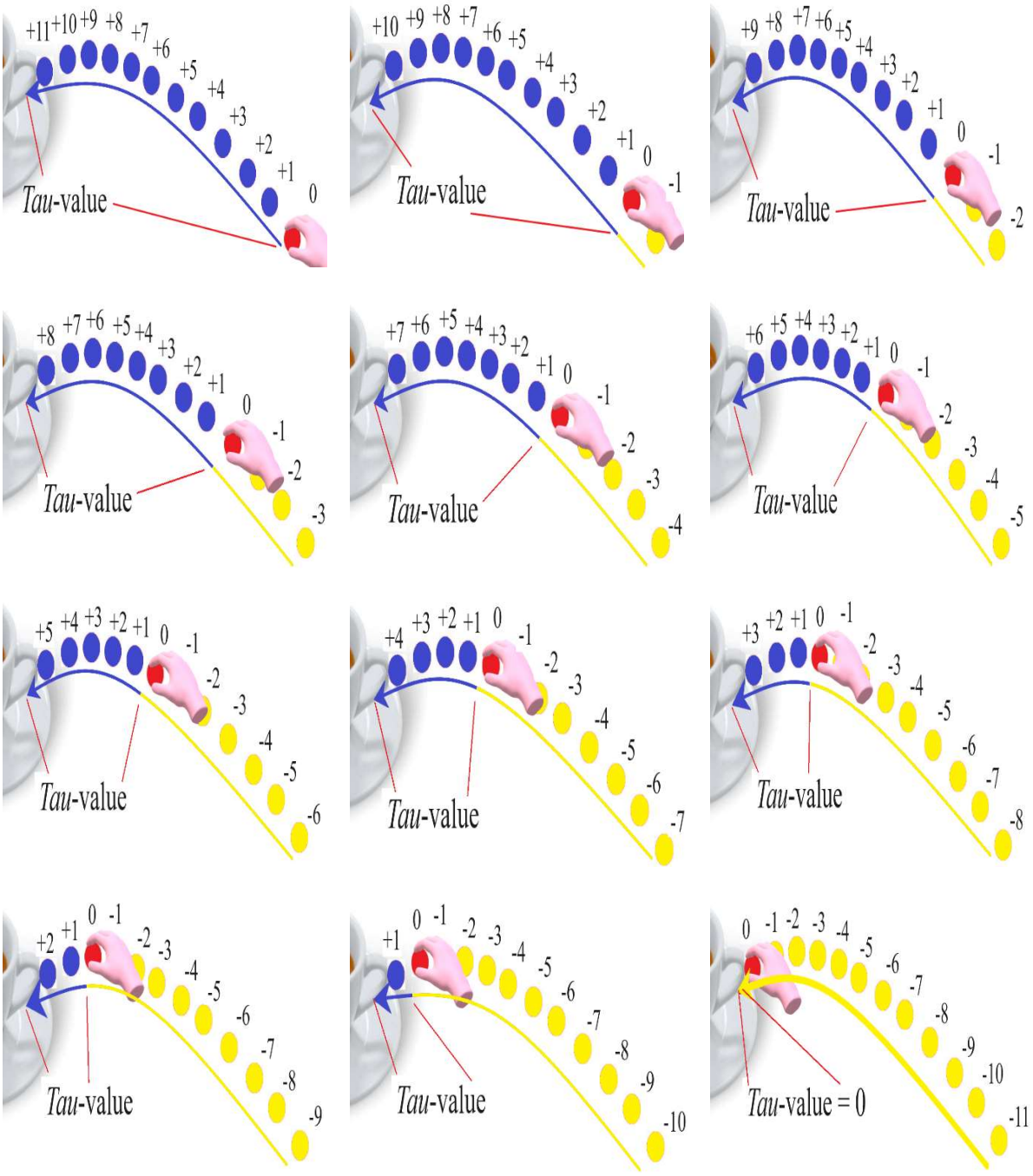


Images: Within many motoric actions the action trajectory shape will not become visible, making it challenging to depict with animations. Conversely, the marble within the marble run, is capable to vividly illustrate this concept. It clearly showcases one single phenomenon wherein the marble, at each 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 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. There is a compelling interdependent relationship, and without that coupling, we would never, under any circumstances, be able to execute any motoric movement action.

The *tau*-value within the grasping of a coffee cup

The explanatory model of the motoric movement action demonstrates with the aforementioned perception-action coupling that the perception of each position of the fingertips c.q. the action object within the action trajectory shape is equally important. However, as the fingertips approach 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.

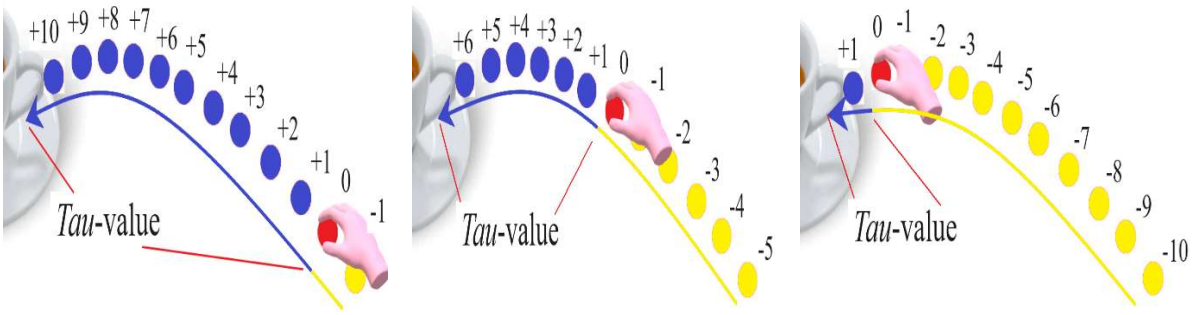


Images: Within the perception-action coupling, the fingertips will traverse all latent positions P that are tactically predetermined within a perceptual image of an action trajectory shape. With each successive position P of the fingertips, the *tau*-value will decrease, until it eventually approaches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

The perception of the *tau*-value in relationship to the grasping of a coffee cup

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 is perceived that the fingertips are approaching the coffee cup, the perception within the internal focus, or rather, the perception of the movements on the inside of the fingertips, must take charge of slowing down and adjusting the outside movement of the fingertips within the action trajectory shape in such a way that they precisely end up at the handle of the coffee cup.



Images: The *tau*-value can be perceived in two autonomous ways. You can either observe how the yellow manifest action trajectory shape takes over the blue line or at the most basal level you could solely observe with what speed the blue line, representing the still latent action trajectory shape, is disappearing. Within which you factually solely observe how the latent (blue) gap is closing.

Perceiving the *tau*-value approaching to zero can be observed in two autonomous ways. The first way involves filling in the perceptual representation of the entire latent action trajectory shape with the manifest positions P of the fingertips. In animations, this should be depicted as the yellow line taking over or filling in the blue line. The other way involves a much more fundamental way of perceiving the *tau*-value. In contrast to the first way, this is solely based on the disappearance of the latent positions P from the perceptual representation of the entire latent action trajectory shape. Which means that you solely observe with what speed the blue line disappears.