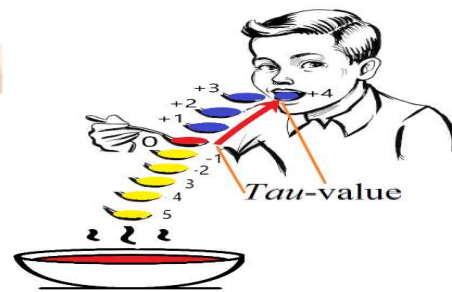
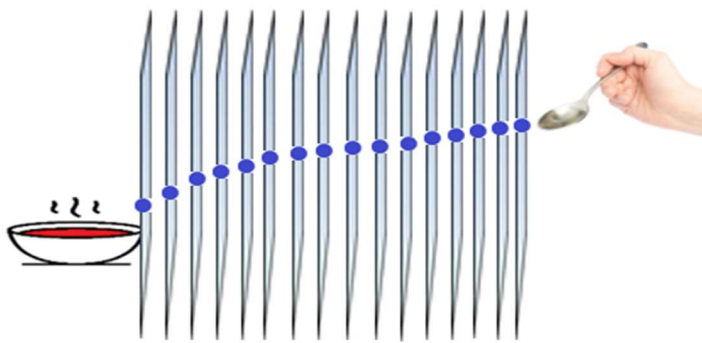


# The complete clarification of all functional perception processes within eating



*Caught In A Line*

The explanatory model of all motoric movement actions

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July 2024 ©

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## Introduction

In 2016, a comprehensive explanatory model was developed that offers the possibility to appoint all functional perception processes involved in any conceivable goal-directed motor action. It provides a universal explanation, demonstrating that the execution of any action always requires the simultaneous perception of three autonomous foci. Whether it involves catching a ball, the grasping of a coffee cup or eating soup, one autonomous focus continuously tracks the movement of the ball, the coffee cup and the soup bowl as the environmental object, universally representing a catching action. The other two autonomous foci are concerned with perceiving the movement within the egocentrically executed action: i.e., the movement of the hand (fingertips) or the spoon along an action trajectory shape (towards the ball, the coffee cup or the bowl of soup), which universally represents a throwing action.

In relationship to which it compels a fact that, within our worldly dimensions, the sequential positions P of any conceivable object are always interconnected c.q. must always sprout from each other. This factually means that, for example, with an incoming tennis ball within a catching action, the perceptions of all positions P of the tennis ball will always form a line c.q. will always represent solely one line segment shape. This limits the perception to such an extent that we can already precisely know within which global fluctuation boundaries the actual catching will have to take place. According to which it is important to realize that all manifest positions of the tennis ball create the actual line shape, but more essentially, the latent part of the tennis ball's action trajectory shape must (!) emerge from the manifest part.

This applies not only to catching actions but also to all throwing actions. So also when eating soup, all positions of the spoon will always be interconnected and construct just one sole action trajectory shape, will the current position of the spoon always represent the precise division between the manifest and latent parts of the action trajectory shape, and must the latent part of the action trajectory also (!) emerge from the manifest part. Which facts are clearly not to be refuted.

The explanatory model is based on the paradigm that, in its evolutionary development, the perceptual organ first functioned as a comparison mechanism that could record the autonomous movement of the animal and the autonomous movement of the environment c.q. the environmental objects in line segment shapes. In relationship to which it is important to emphasize that the ability to perceive movement arose long before the more advanced cognitive skills were developed that gave us insight into the nature of what exactly moves<sup>1</sup>. Thus, perceiving movement essentially has nothing to do with perceiving what exactly moves, and it can also be established that perceiving mere movement must be placed close to the origin of the evolutionary development of the perception processes.

This premise aligns entirely with the findings of J.J. Gibson, who, in addition to indicating the autonomy of the animal, also indicates the autonomy of the environment, while also showing that in the execution of every action, a touching process between the animal and the environment always takes place. If we then take the aforementioned paradigm as a starting point for the execution of a goal-directed action, it can be shown that the animal and the environmental object must at least come into contact with each other first in most motor actions. Which within our perception processes means

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1 Two important remarks: 1. Of course it is very important within evolutionary development of the perception processes that you can distinguish a lion from a zebra., and 2. Even till this day our visual perception processes observe the (external) movement of our body parts in the exact same way as they observe the movement of any other (external moving) environmental object. Solely due to internal perception processes in relationship to a causal connection with this external movement provides us the difference between the two.

that 1. a perceptual image of the movement of the environmental object within an action trajectory shape of the catching action, and 2. a perceptual image of the egocentric movement of the animal within an action trajectory shape of the throwing action, will at least have to lead to a perceptual image of a latent intersection point of those two line segment shapes.

As within any conceivable action then solely two universal possibilities arise:

1. The environmental object (e.g., the bowl of soup or the tennis ball) is standing still<sup>2</sup>. The perception records this as a zero-movement within a zero-line segment shape within the catching action, and a perceptual image of a latent egocentric action trajectory shape of the spoon within the throwing action must be formed to construct a perceptual image of an intersection point of the two involved action trajectory shapes.
2. The environmental object (e.g., the bowl of soup or the tennis ball) is moving (towards us). The perception records this as a movement within an incoming action trajectory shape within the catching action. This also necessitates forming a perceptual image of a latent egocentric action trajectory shape of the of the spoon. Which finally should lead to the creation of an autonomous perceptual image of a future (latent) intersection point sprouting from the two latent parts of the involved action trajectory shapes that are constructed separately.

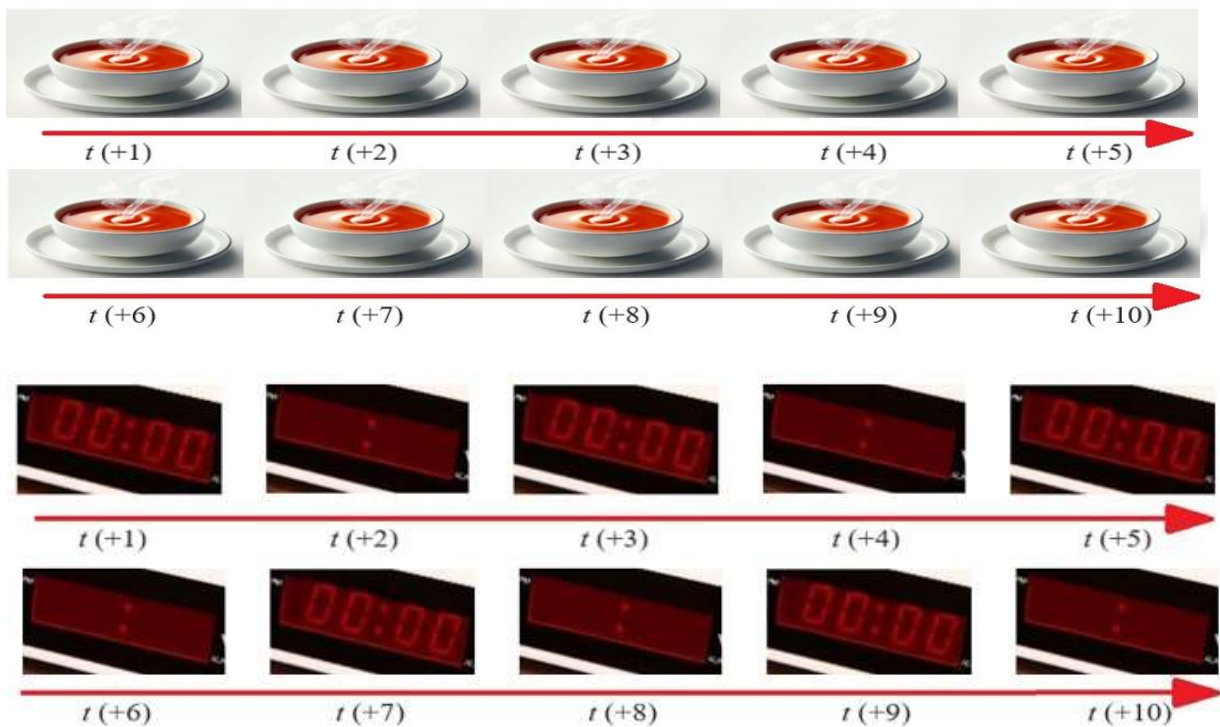
This explanation demonstrates that, contrary to the current state of science, the explanatory model shows that the perception processes within any conceivable motor action originate much more from a single universal source and illustrates that in all actions, an intersection point c.q. contact point between the animal and the environmental object must first be realized, and that after this contact, a pressing or pushing process usually follows. The model shows that the perceptual processes involved in the contact process when grasping objects are identical to the perception processes when pressing a button (e.g., piano key, touchscreen, elevator buttons, electric stove, light switch, etc.), pushing away a billiard ball, or kicking a football towards a goal. The contact process is perceptually identical in all cases. When grasping a coffee cup, however, a pressing or pushing process must follow the contact process within the relevant fingertips, resulting in a total zero vector. Conversely, pressing a piano key requires the creation of an actual movement vector to press the key down. The same applies to the other mentioned buttons and so the contact process in eating involves the same perception processes as in ordinary grasping. Followed by a pushing process of the spoon bowl into the soup upon the contact process is completed.

This overview document specifically addresses those aspects of the throwing and catching action in eating that are barely recognized within science. A small part focuses on the perception of the plate within the catching action, but the vast majority of new insights are revealed concerning the egocentric throwing action that specifically focuses on the movement of the spoon. It shows the scientific evidence that 1. a perceptual image of a latent action trajectory shape from the spoon to the plate is always first created, and 2. how this action trajectory shape can only be filled with the help of two autonomous foci. This overview document now summarizes all phenomena ever found within the movement sciences and forges them into one universal explanatory model. Based on logic, it can be concluded that this forms the complete and definitive explanation of the functional perceptual processes within all eating actions.

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<sup>2</sup> In part 1 (page 3), the explanatory model of the motoric movement action demonstrates that perception always observes stationary objects moving in time, but through an active comparison process can conclude that the object in question is stationary. Therefore, even though it is concluded that the coffee cup is stationary, zero-movement is indeed observed on a timeline, which can create an intersection point with an egocentric action trajectory shape in relationship to the grasping hand.

# Part 1 - Einstein, the Stationary Soup Bowl, and the Digital Clock: The Visual Perception Observes Stationary Soup Bowls Moving in Time



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## Introduction

In the dynamic world of visual perception and theoretical physics, seemingly simple objects like a stationary bowl of soup and a digital clock reveal surprising insights. This article explores how our visual system always perceives all environmental objects moving in time but can interpret them as static objects. By examining examples such as the blinking zeros of a digital clock and the static edges of a bowl of soup, we discover that our brains perform complex computations to understand stability and motion. The major ecological breakthrough encompasses the fact that stationary environmental objects are perceived in an identical manner to moving objects within the vista. These discoveries have profound implications, not only for visual cognition but also for our understanding of space and time, as outlined in Einstein's theory of relativity. This introduction invites you to explore the fascinating cross-pollination of psychology and physics, where the boundaries between perception and reality blur.

## The Example of the Digital Clock

Consider the example of a digital clock where the zeros flash after a power outage. When the clock starts working again, the zeros blink on and off in exactly the same place. This example illustrates an important principle. The visual perception of the first set of zeros has no relationship with the later perception of the zeros, except for their identical position. This phenomenon illustrates how we perceive zero-movement in timeline segment shapes. Stillness can only be perceived through the active comparison of all observations over time, which allows us to deduce that stationary environmental objects within a vista are perceived as actively as moving environmental objects.



## Perception of a Stationary Soup Bowl

We perceive a stationary soup bowl in an identical manner to the flashing zeros on a digital clock. The soup bowl's edges and contours do not change position over time. This lack of movement signals to our brain that the bowl is stationary. Just as with the zeros on the clock, the perception of the soup bowl at any given moment  $t(x)$  in time has no direct relationship with the perception of the soup bowl at subsequent moments  $t(x+n)$  in time. Each moment is perceived independently, yet the consistency of the bowl's position reinforces the perception of stillness.

### 1. Static Line Segments:

- The static nature of the edges and contours of the soup bowl creates a visual perception of stillness. These features remain in the same position, indicating zero movement.



2. Positional Data Consistency:

- Each point on the soup bowl's surface is linked to its previous and subsequent positions in time. This consistent positional data ensures that the bowl appears stationary, as there is no disruption in its positional continuity.

3. Perceptual Continuity:

- Our visual system continuously processes these stable elements, reinforcing the perception of the bowl as stationary. This perpetual perception is key to understanding how we interpret zero-movement within zero-movement line segment shapes.

### Ecological and Visual Perception

According to Gibson's theory of affordances, the physical properties of our environment provide opportunities for action and perception. Our visual system has evolved to take advantage of these affordances. Light and moving space are intrinsic parts of our surroundings, and organisms have ecologically and organically developed mechanisms to interact according to these elements. The key idea is that every environmental object's actual position  $P(0)$  at time  $t(0)$  within a vista is connected to its manifest positions  $P(-x)$  at time  $t(-x)$  and future (latent) positions  $P(+x)$  at time  $t(+x)$ , and thus is always confined within a line segment shape c.q. always is confined within a timeline. This continuity helps us perceive objects as stable and unchanging when they are at rest.

### The Visual System as a Comparing Organ

Our perception system functions as a comparing organ, utilizing logic to interpret and understand our environment. Here's how this works:

1. Comparison Over Time:

- Our visual system compares the positions of objects at different moments in time. For example, when looking at a stationary soup bowl or the zeros on a digital clock, our brain continuously compares their positions at  $t(0)$ ,  $t(+1)$ ,  $t(+2)$  etc., in time. Despite perceiving each moment independently, the consistent positional data across these moments leads to the interpretation of stability and zero movement.

2. Logical Consistency:

- The brain uses logic to make sense of the visual information. If an object appears in the same place repeatedly without any perceived movement between these instances,
- lows us to understand and navigate a complex environment.

3. Pattern Recognition:

- Our visual system is adept at recognizing patterns and regularities. By comparing the spatial and temporal patterns of objects, it can determine whether something is moving or still. This pattern recognition relies on logical assessment of the consistency and changes in the visual input.



### Zero-Movement within Action Trajectory Shapes

The concept of zero-movement within action trajectory shapes can be further illustrated through the perception of a stationary soup bowl. Similar to the flashing zeros on a digital clock, the soup bowl is perceived as being at rest because each point on its surface is linked to its previous and subsequent positions in time. This creates a continuous action trajectory shape that indicates no movement. However, it's essential to note that while the soup bowl appears motionless in space, the entire explanation hinges on its movement in time.

### Relationship with Relativity Theory

In the context of relativity theory, particularly as articulated by Einstein, the distinction between space and time becomes crucial. Objects can remain spatially stationary (zero-movement) while still undergoing temporal changes. This concept aligns with our perception of the soup bowl: although it occupies a fixed spatial position, its temporal trajectory is dynamic. The soup bowl's state evolves through time, even though it remains static in its spatial coordinates.

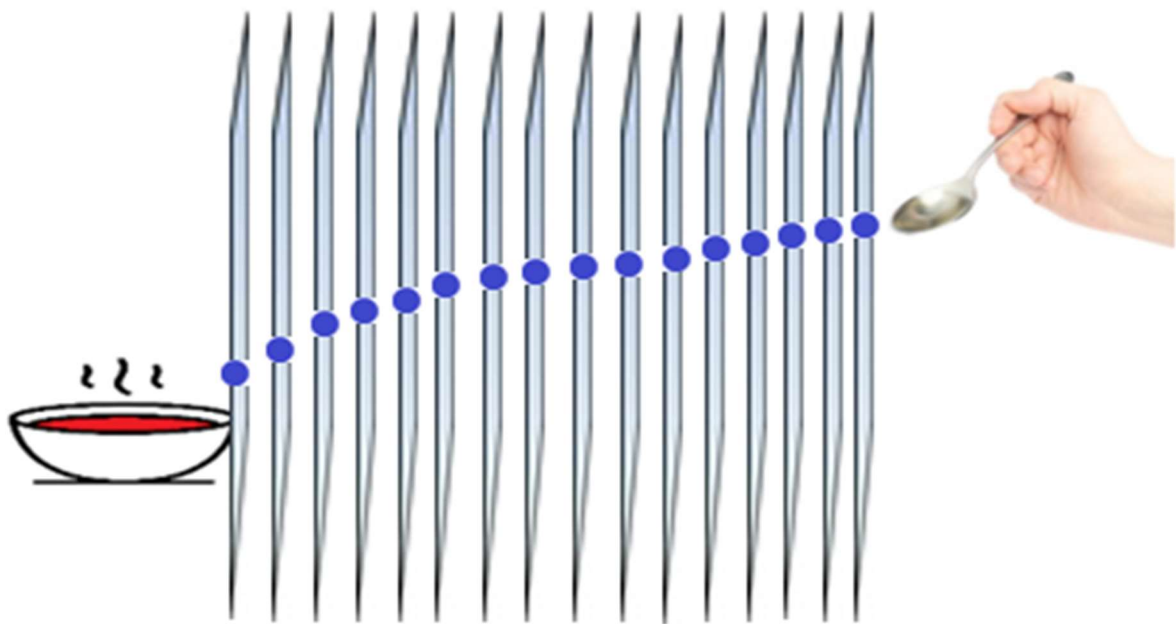
This interpretation resonates with Einstein's insight that space and time are interwoven into a single continuum, where objects move through both dimensions simultaneously. The perception of the soup bowl's zero-movement line segment shapes reflects our visual system's ability to discern spatial stability amidst temporal progression. This dual perspective underscores the intricacies of perception and the deeper philosophical implications of how we understand movement and stillness in the universe.

### Summary

The perception of a stationary soup bowl and the zero-movement within a timeline illustrates a fundamental aspect of both visual perception and theoretical physics. While the soup bowl appears static, acknowledging its temporal evolution highlights the complexity of our continuous active perception processes. This duality not only enhances our understanding of visual cognition but also deepens our appreciation for the interconnected nature of space and time, as explained by the theory of relativity.



## Part 2 - Prior to eating soup we always first construct a perceptual image of a latent action trajectory shape out of the perspective of the spoon bowl – The scientific evidence



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## Introduction

The explanatory model of the motoric movement action provides a universal explanation of all functional perception processes within all goal-directed actions. It demonstrates that performing any conceivable action always requires the simultaneous perception of three autonomous foci<sup>3</sup>, in accordance with J.J. Gibson's theory, which includes both the movement of the animal/organism and the movement of the environment. When eating soup with a spoon from a plate, one autonomous focus remains engaged with (the movement of) the plate as the environmental object, universally representing a catching action. The other two autonomous foci are concerned with the perception of movement within the egocentrically executed action, i.e., the movement of the spoon(-bowl) along an action trajectory shape (toward the plate), which universally represents a throwing action.

This article specifically focuses on the two foci belonging to the egocentric throwing action of the spoon(-bowl) in relation to eating soup. The explanatory model shows that every conceivable throwing action requires a compelling cooperation between an autonomous internal focus and an autonomous external focus. This insight, that two autonomous foci are present instead of a single undivided motor action, not only allows a final and ending specification of all individual perception processes but also reveals as a novelty that a coupling within the egocentric throwing action itself is capable to occur<sup>4</sup>.

The explanatory model of the motoric movement action thus provides a complete description of the *tau*-coupling process, wherein the essence of the task, the primary focus, is executed through (the perception of) the movement of the spoon(-bowl) over a pre-planned action trajectory shape between the current position of the spoon and the plate<sup>5</sup>. This perceptual image is therefore determined in advance within a tactical consideration and involves identifying the future sequential positions the spoon(-bowl) must occupy to achieve a successful action. Sequential positions of any object effectively always create line segment shapes, and when the action is actually executed, the current position of the spoon(-bowl) is going to fill in that perceptual image step by step. Thus, it can be observed within a line segment shape that the *gap* of the latent positions *P* gradually disappears and, in full accordance with the findings of D.N. Lee, produces the *tau*-value, which plays a crucial role in the completion of the motor action in cooperation with the secondary focus<sup>6</sup>.

The explanatory model of the motoric movement action partly relies on logical reasoning but also presents scientific evidence. This chapter provides scientific proof that within the eating of soup, we always first create a perceptual image of a latent successful action trajectory shape out of the perspective of the spoon(-bowl) before we actually perform any action.

## The scientific evidence

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<sup>3</sup> [The cortical streams mediate the grasping of a cup equal as they mediate within the nerve spiral \(youtube.com\) https://www.youtube.com/watch?v=QP4vPVAw-Yg](https://www.youtube.com/watch?v=QP4vPVAw-Yg)

<sup>4</sup> D.N. Lee did indeed identify the *tau*-value associated with the primary focus, but he considered the egocentric action as one indivisible whole. His lifelong quest to find the phenomenon it should be connected to remained unsatisfied because he never realized that the coupling occurs within the egocentric action itself.

<sup>5</sup> [https://www.researchgate.net/publication/376450400\\_Scientific\\_evidence\\_of\\_the\\_origin\\_of\\_two\\_autonomous\\_foci\\_and\\_how\\_their\\_roles\\_have\\_evolutionarily\\_reversed\\_Within\\_eating\\_the\\_transitioning\\_from\\_random\\_motor\\_activity\\_to\\_the\\_execution\\_of\\_deliberate\\_acti](https://www.researchgate.net/publication/376450400_Scientific_evidence_of_the_origin_of_two_autonomous_foci_and_how_their_roles_have_evolutionarily_reversed_Within_eating_the_transitioning_from_random_motor_activity_to_the_execution_of_deliberate_acti)

<sup>6</sup> [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](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)

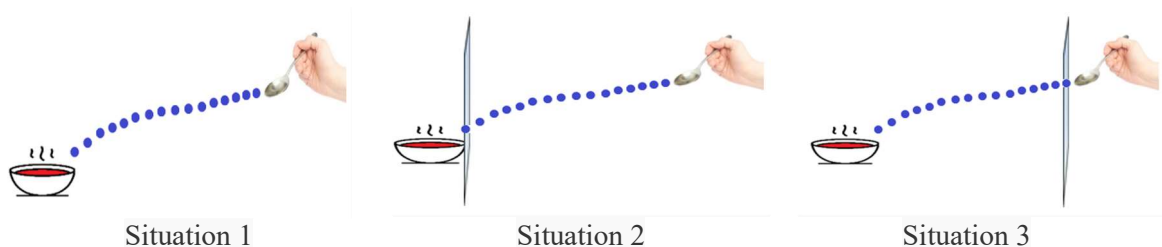
The evidence is very straightforward. You can verify it yourself through an empirical study where you are the test subject or you ask a test subject to try to eat soup. The only instruction given is to only execute the action if the test subject believes there is a realistic possibility of actually getting the spoon reaching the soup.



Images: The scientific proof is based upon the competence to visualize a giant huge glass shopping window. The left image shows a normal dimension of such a window. In relationship to the scientific proof you need to magnify that image 10 to 20 times. Like in the right image.

Choose a random table with a random placed plate of soup and create the following circumstances:

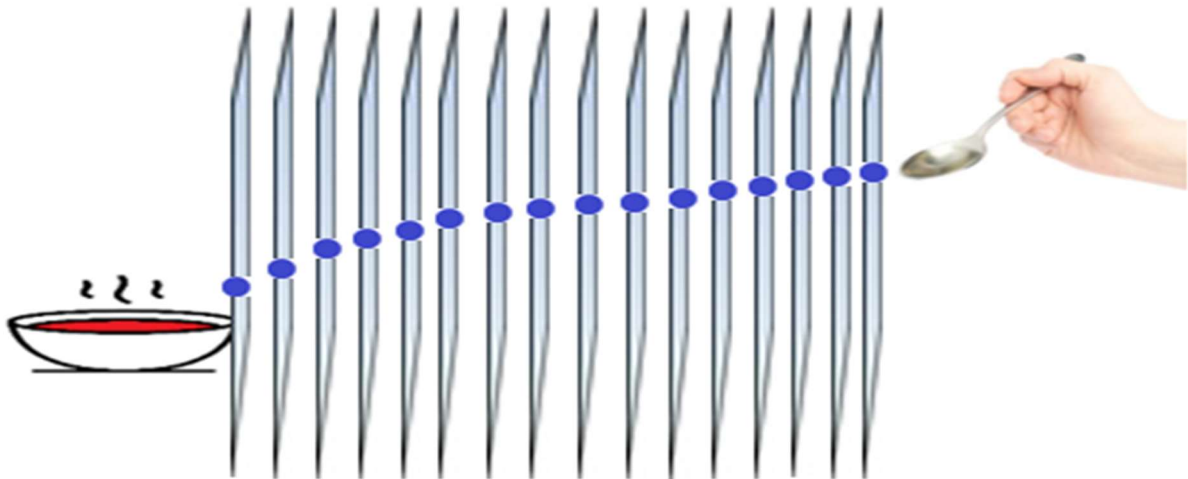
- Situation 1: Do not alter the environment (zero measurement). Let the test subject just eat soup.
- Situation 2: Place a giant huge glass shopping window (height 20 meter x width 30 meter) between the spoon and the plate, close to the plate.
- Situation 3: Place a giant huge glass shopping window (height 20 meter x width 30 meter) between the spoon and the plate, close to the spoon.
- Situation 4: Place a giant huge glass shopping window (height 20 meter x width 30 meter) between the spoon and the plate, at any random position P.



Images: In situation 1 a test subject will normally execute the eating action. In situations 2 and 3, where a giant glass store window is placed between the spoon and the plate, the test subject will not start an eating action with the intent to actually get soup into the bowl of the spoon. This is because there is *one* (!) position P that is perceived as blocking the spoon.

Conclusion:

In situation 1, you and/or the test subject will just execute the eating of the soup. In situations 2, 3, and 4, you and/or the test subject do not initiate an eating action with the intent to reach the soup. Situations 2 and 3 do not provide significant insight on their own, but situation 4 clarifies everything. Whether the giant glass shop window is placed near the plate or near the spoon makes no difference to the test subject. If there is a large shop window anywhere clearly present, the test subject will not initiate a motoric action with the intention to a successful action. This applies to every conceivable position P of the shop window, from the very first position P(0) near the bowl of the spoon to a shop window occupying the last position P(n) just before the plate.

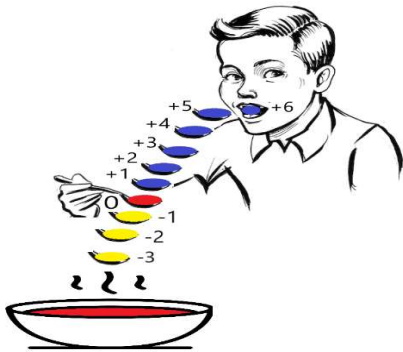


Situation 4

Image: In situation 4, it becomes clear that prior to the actual execution, we consider all consecutive future (!) positions of the spoon(-bowl). It doesn't matter where the shop window is positioned between the spoon and the plate; the action is not performed. Mathematically, one can argue that an uninterrupted series of consecutive positions  $P$  creates a line segment or line segment shape (action trajectory shape). The image provides a perfect visual representation that within a throwing action, we first form a perceptual image of the entire latent action trajectory shape before we actually execute anything.

This means that we assess every position  $P(0-n)$  between the spoon and the plate beforehand, clearly determining whether each position  $P$  allows the spoon(-bowl) to pass through so that it can ultimately reach the soup within the plate. In relationship to which it can be observed that if one position  $P$  is not empty (!), the mission is aborted. Upon which you can draw the factual conclusion that we will have to look at (!) c.q. we will have to perceive every position  $P(x)$  between the spoon(-bowl) and the plate beforehand if that specific position  $P(x)$  is also allowing the physical dimensions of the spoon to pass. Mathematically, an uninterrupted series of consecutive positions  $P$  can be designated as a line or line segment shape (action trajectory shape). This completes the scientific proof that within eating soup, we first form a perceptual image of the entire latent action trajectory shape out of the perspective of the spoon(-bowl) before we actually execute anything.

### Part 3 - Eating requires a compelling collaboration between an internal and an external focus - Solely the positions of the spoon(-bowl) towards the food and towards the mouth determine the external focus



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## Introduction:

Traditionally, science has assumed that one motor action encompasses one focus. This assumption has seemingly been so logical that it has never been questioned. However, this has led to the absence of a plausible explanation for the functional perception processes underlying the execution of all motor actions, even after 150 years of movement sciences. In 2016, an explanatory model was found that is capable of identifying all functional perception processes within any imaginable motor action. Beyond any reasonable doubt it conversely demonstrates that every motor action can only be executed through a compulsory coupling of two foci: an internal (secondary) focus must always be directed at an external (primary) focus. In which it should be explicitly noted that these two foci represent entities that fundamentally differ from current scientific terminology.

The explanatory model emphasizes that the essence of a motor task always involves the movement of an action object outside our body along an action trajectory shape, but that the action object will never be capable to move on its own along that line. The action object is often an inanimate object (pen, needle, key, tennis racket, ball, letter, pointer (pc) etc.) that we hold during an action, and even though the fingertips, during a grasp action with the hand on the outside, consist of living cells, we absolutely aren't capable of moving them there. The explanatory model unequivocally shows that initiating the movement of an action object outside our body is only possible by using secondary perception of autonomous movements within our body.

Compared to the current state of science, the explanatory model represents a revolutionary breakthrough, revealing that two foci must enter into an obligatory connection simultaneously, and this universal stacking of two perceptions of two autonomous movements occurs in every motor movement action. They are clearly autonomous because they belong to two incompatible worlds. Observations of movement inside and outside the body are actually never able to overlap.

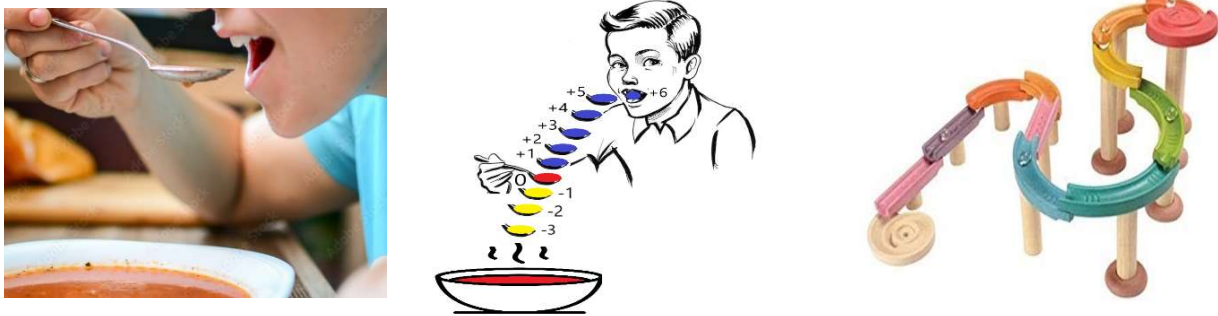
This article focuses entirely on the motor action of eating. The article convincingly demonstrates that only the spoon-(bowl) c.q. the movements of the spoon-(bowl), similar to a marble in a marble run, executes this action trajectory shape. Solely this movement encompasses the essence of the task. For this reason, primary attention should be directed towards the external movement of the spoon-(bowl). The bowl of the spoon can only be moved with completely different movements within the body that only reach the outside of the spoon. The attention required for this should serve the main goal and is therefore referred to as secondary (internal) focus. Furthermore, the explanation shows that all conceivable motor actions are based on these same two foci. Due to this universal nature, the explanatory model creates the most ultimate conceivable ecological argument. The article does not delve deeply into the differences with the current state of science because there is still no clear consensus on this subject within the scientific community.

## The primary focus in relationship to the movement of the spoon-(bowl) encompasses the perception of movement outside the body

The explanatory model of all motoric movement actions, as demonstrated in eating, shows that only the spoon-(bowl), or the movements of the spoon-(bowl), will execute the essence of the task and therefore represents the primary focus within this action. The explanatory model provides scientific evidence that a motor movement action always involves two successive autonomous phases. The tactical consideration first aims to create a perceptual image of a latent action trajectory shape over which,



in this case, the spoon-(bowl) or the movements of the spoon-(bowl) promises to become successful, and only then proceeds to actual action.



Images: Eating involves solely two main objectives: 1. reaching food and 2. subsequently getting the food into our mouth. The essence of this task is, therefore, executed solely by the autonomous movements of the spoon-(bowl), making it the primary process we need to observe. The spoon-(bowl) follows an action trajectory shape similar to how a marble completes a marble run. Within every conceivable motor action, the actual position of the marble or the action object will always mark the precise division between the manifest and latent parts of the action trajectory. In the middle illustration, the current position of the spoon with tomato soup is at position P(0) and precisely represents this dichotomy. The previously passed positions P(-3), P(-2), and P(-1) are marked in yellow. The latent positions P(+1) to P(+6) yet to be traversed are indicated in blue.

When we factually start the action, we are going to fill in the perceptual image of the action trajectory using the spoon-(bowl). So within the primary focus, this is the essential process that our perceptual systems must guide, and surprisingly, science has overlooked this process entirely until now. In subsequent articles, it will become evident that filling in the action trajectory by the spoon-(bowl) yields the crucial *tau*-value to which the secondary focus is compellingly linked, and the mediating role of the cortical streams in this process will be explained.

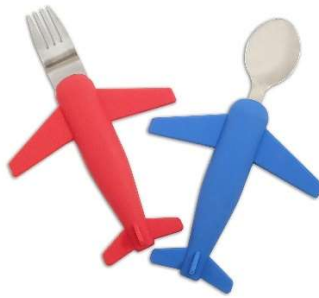


Images: The explanatory model demonstrates that within every imaginable motor action, an autonomous internal focus must be directed towards an autonomous external focus. This insight reveals the scientific evidence that we can never execute any action trajectory shape identically, as it involves the stacking of observations from autonomous movements that belong to two incompatible worlds. For example, you have never picked up a coffee cup in an identical way or executed a free throw in basketball in an identical manner. Similarly, you will never be able to produce an identical action trajectory when eating. Within which the explanatory model unequivocally emphasizes that it has never been the objective to achieve such perfect uniformity. Creating a similar form is far more efficient and effective, to the extent that a resource-conscious (parsimonious) organism would have never evolved otherwise.

Maybe we do construct perfect straight action trajectories when we create perceptual images of the future positions of the spoon-(bowl) while eating. However, due to the fact that you can only execute the movement of the spoon-(bowl) with the perception of an entirely different autonomous movement, the spoon-(bowl) will inevitably deviate from that "perfect" original pre-perceptual image at every position P within the action trajectory. This process is, therefore, guided by the double and mutual process of the cortical streams, representing the brilliant ecological response of the body to execute every motor action in the most efficient and effective way possible. The ventral and dorsal streams continuously interact with each other to correct the inevitable deviations, but this interaction does require a (very short) reaction time<sup>7</sup>. As a result we can never perform one motor action identically (conform Bernstein) and the spoon-(bowl) will always follow a different zigzag pattern while eating. Either to the food or to the mouth.

The secondary focus in relationship to the movement of the spoon-(bowl) encompasses the perception of movement inside the body

When one starts to realize that the primary focus solely concerns the movements of the spoon-(bowl), it implicitly becomes evident that the spoon itself isn't capable to move at all. This analogy is strikingly similar to a ball during a free throw in basketball or various other inanimate objects like tennis rackets, cricket bats, spoons, knives, bottles, pointers (pc) and more, which clearly never move on their own. But even when we grasp a coffee cup with our hand, the explanatory model demonstrates that the hand, and consequently the relevant fingertips, must also be considered as lifeless action objects.



Images: A spoon is merely a tool used for a particular type of eating. We can also eat with our fingers, sticks, and so on. And even if we eat directly with our fingers it doesn't matter. The stacking of two autonomous foci will always exhibit the same universal cooperation. Although you could remark that when using a spoon, sticks there might be a longer distance between the secondary and primary focus, which could potentially result in a greater degree of deviations.

The outer layer of the fingertips does comprise living cells, but it is absolutely incapable of moving the fingertips in an action trajectory shape outside the body with those living cells. We can only induce movement in the outer layer of the fingertips through internal body movements. While they may approach the outer surface of the fingertips, they will always remain within the confines of the body.

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<sup>7</sup> The specific reaction time concerning cortical streams in relation to the explanatory model has never been examined. General information and empirical experiences provide an indication that the reaction time is estimated to be around 0.1 seconds; "It takes about one-tenth of a second for information about the visual scene to reach the back of the brain or the occipital lobes. During the next tenth of a second, the visual information is analysed in two separate ways. Figure 2 shows the two pathways of the dorsal stream and the ventral stream. The dorsal stream runs from the occipital lobes to three locations, the back of the brain at the top (called the posterior parietal lobes), a vertical strip of brain in the centre (called the motor cortex) and the front of the brain (called the frontal cortex). The ventral stream runs from the occipital lobes to the back of the brain at the bottom (called the temporal lobes)": Cerebral Visual Impairment - Working Within and Around the Limitations of Vision; Gordon N Dutton; [http://www.liv.ac.uk/~pcknox/Publications/trimble/CVI%20chapter%20for\\_hers-Dutton.pdf](http://www.liv.ac.uk/~pcknox/Publications/trimble/CVI%20chapter%20for_hers-Dutton.pdf)

In the case of eating with a spoon, we can only haptically perceive the (outer surface of the) spoon with the (outer surface of our) fingertips, and we can only proprioceptively<sup>8</sup> sense how movements within our body influence the haptic contact with the spoon.

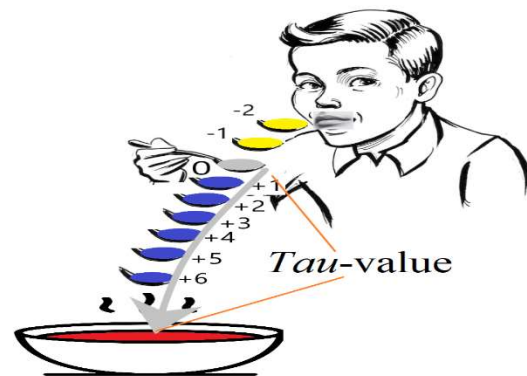
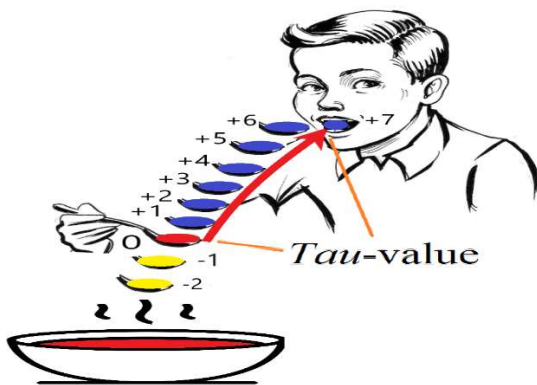
The purpose of the task within a motoric action is implicitly connected to the observation of the primary focus, leading us often to be unaware of the secondary focus during many motor actions, especially when they involve simple observations like within writing. However, in highly complex motor actions, such as a tennis serve, attention is conversely only directed towards the secondary focus c.q. the serving technique. Completely ignoring the fact that the primary focus compels the realisation of an outgoing ball trajectory shape (OBT). Which is the sole essence of a tennis service.

With some practice, you can consciously perceive the two foci simultaneously within many motor actions. For instance, in a grasping action, you can perceive the movement trajectory on the outside of your body while also focusing on movements on the inside of your body. Which exactly includes eating tasks as well.

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<sup>8</sup> Proprioceptive perception comprises two autonomous aspects: Limb Position and Movement. The explanatory model makes a clear connection between these two proprioceptive phenomena and their relation to using the pen effectively. The overall pen displacement technique is influenced by our awareness of limb position, allowing us to control the general movement of the pen on a piece of paper. On the other hand, where perception is specifically transferred to the exact movement of the tip of the pen is essential for precise writing actions.

Part 4 - Within eating the essence of the task is solely executed by the movements of the spoon toward the plate and the mouth; Within the primary focus the spoon is constrained in a script of two autonomous action trajectory shapes producing two autonomous *tau*-values



*Caught In A Line*

The explanatory model of all motoric movement actions

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## 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.

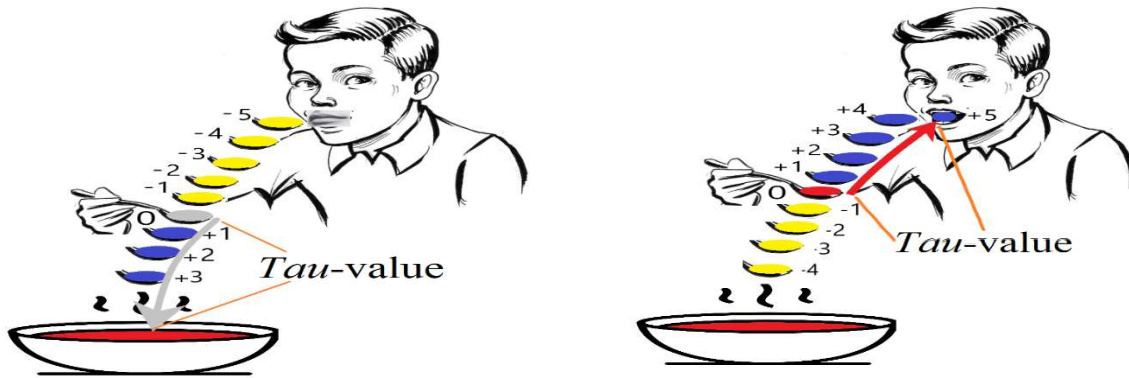
With regard to the external (primary) focus, it can be observed that science has so far truly missed everything. Therefore, it will now be comprehensively discussed within a broad spectrum of motor actions, and this publication now reveals all facets of the primary focus within the motoric movement action of eating.

### Solely the movements of the spoon 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 present action, we might indeed be very eager to satisfy our hunger, but the egocentrically formulated goal pertains solely to moving the spoon to the plate and/or to the mouth. Only that aspect thus determines the essence of the task, and therefore, only that aspect should be regarded as the external (primary) focus.

### The tactical movement action (TMA) in relationship to moving a spoon during eating





Images: Firstly, an egocentric intention must be formulated that we want to eat soup and that we will do so using a spoon. Subsequently, this will be carried out within a script involving two autonomous motor actions. From the current position of the spoon, we then create a perceptual image of a latent action trajectory shape outlining how we will reach the food (left). This occurs as part of a tactical action where two important objectives are considered. Firstly, it must lead to a successful action, and additionally, ecologically evolved organisms aim to execute actions as parsimonious as possible. After reaching the food, a perceptual image of a latent action trajectory shape towards the mouth is determined (right). The components are completely identical to those named during the food-reaching phase, yet they constitute an entirely autonomous action.

The explanatory model of the motoric movement action demonstrates that after formulating an egocentric goal, we always engage in a tactical consideration<sup>9</sup>, 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 spoon to be moved successfully toward the food and/or to the mouth.



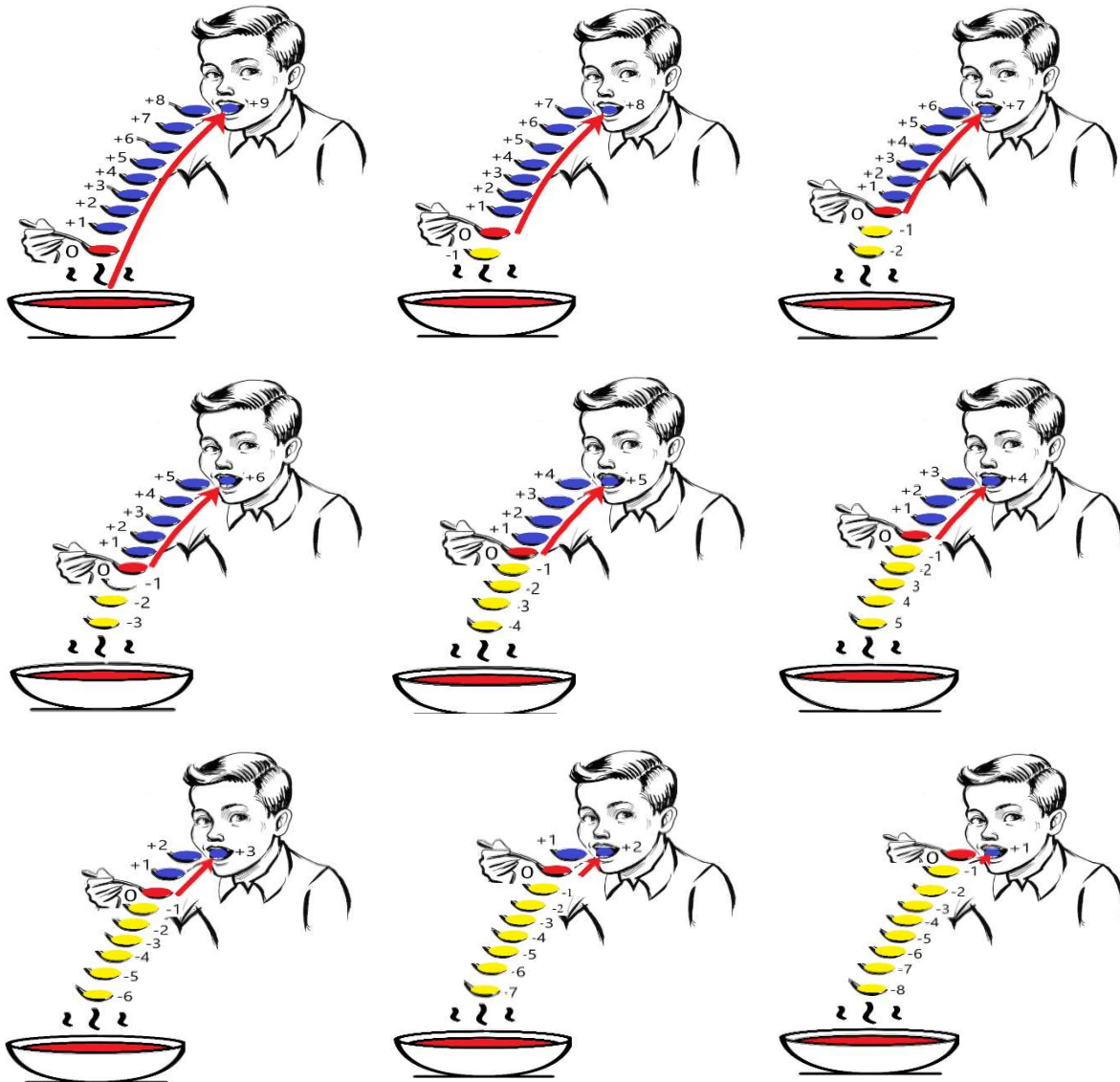
Images: It is not straightforward to present an animation that accurately represents the latent action trajectory shape being constructed. The image on the left very clearly displays the shape of the trajectory, in which all contiguous points P are distinctly weighed. However, it does not illustrate that within the construction of the trajectory shape, all dimensions of the spoon(-bowl) 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.

<sup>9</sup> 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 factual movement action (FMA) in relationship to the movement of a spoon towards the mouth

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 spoon position  $P(0)$  to the next position  $P(+1)$  within the action trajectory. Although our ultimate intention of course is to reach the mouth, the explanatory model clearly demonstrates that our perception processes in this phase are solely focused on traversing the empty space between the spoon(-bowl) and the mouth. 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.



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  $P(-x)$ .

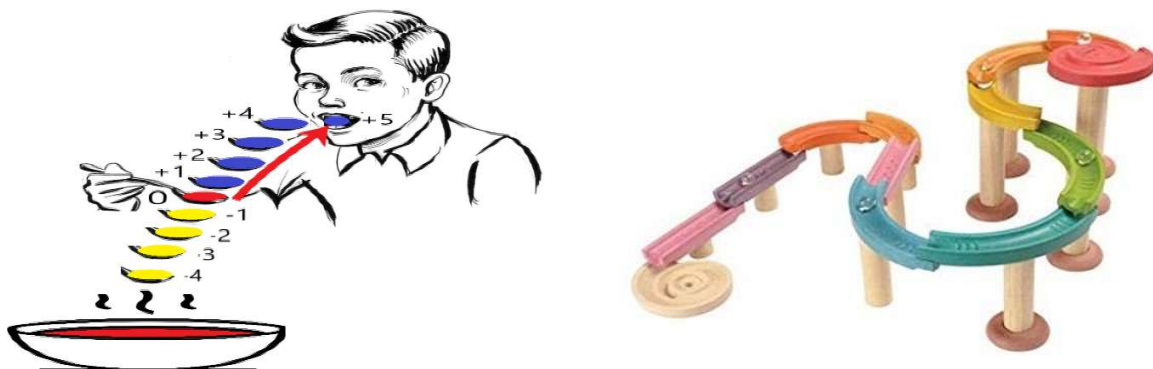
### The perception-action coupling in relationship to the movement of a spoon towards the mouth

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 load the food and to deliver it, 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 spoon and food and/or the spoon and mouth are equally significant.

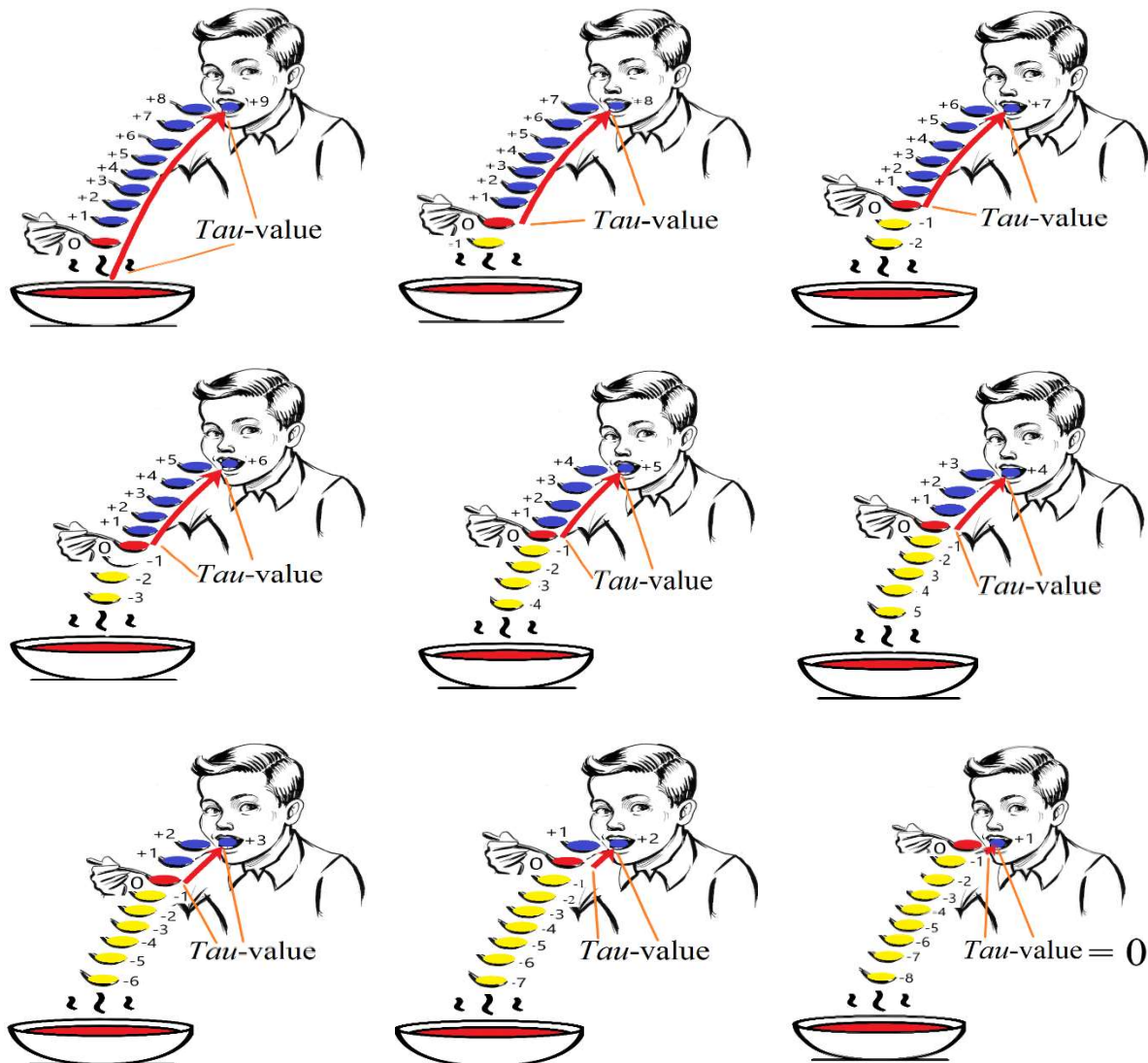
Additionally, it must be remarked that the action of the spoon at  $P(0)$  can be perceived distinctly, yet no fixed unit of time can be attributed to it. Each unit of time can be divided into a thousand smaller units, and these units can be further subdivided, leading the explanatory model to argue 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 spoon(-bowl) position solely gains meaning through the adjacent future "current" positions  $P(+x)$  and the adjacent manifest "current" positions  $P(-x)$  of the spoon. 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.

The  $\tau$ -value in relationship to the movement of a spoon towards the mouth

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

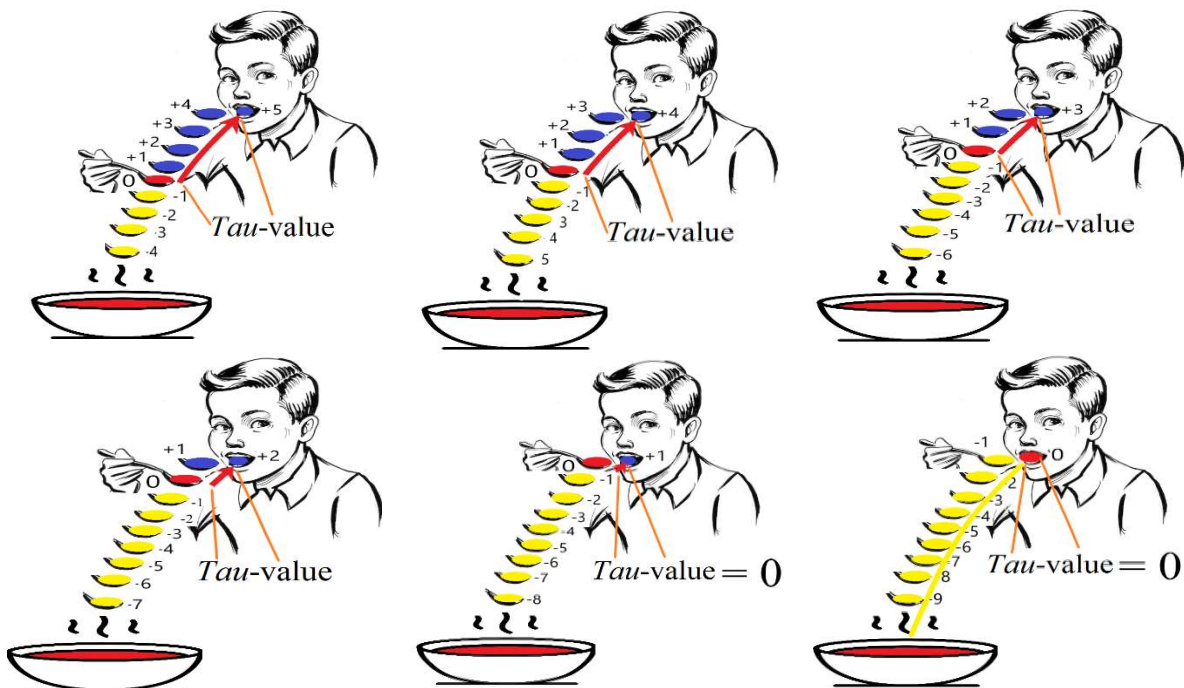


Images: Within the perception-action coupling, the bowl of the spoon will traverse all latent positions P that are tactically predetermined within a perceptual image of an action trajectory shape. With each successive position P of the spoon, the *tau*-value will decrease, until it eventually approaches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

#### The perception of the *tau*-value in relationship to the movement of a spoon towards the mouth

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 spoon is approaching the mouth, the perception within the internal focus, or rather, the perception of the movements of the

spoon, must take charge of slowing down and adjusting the spoon's movement in such a way that it precisely ends up in the mouth.

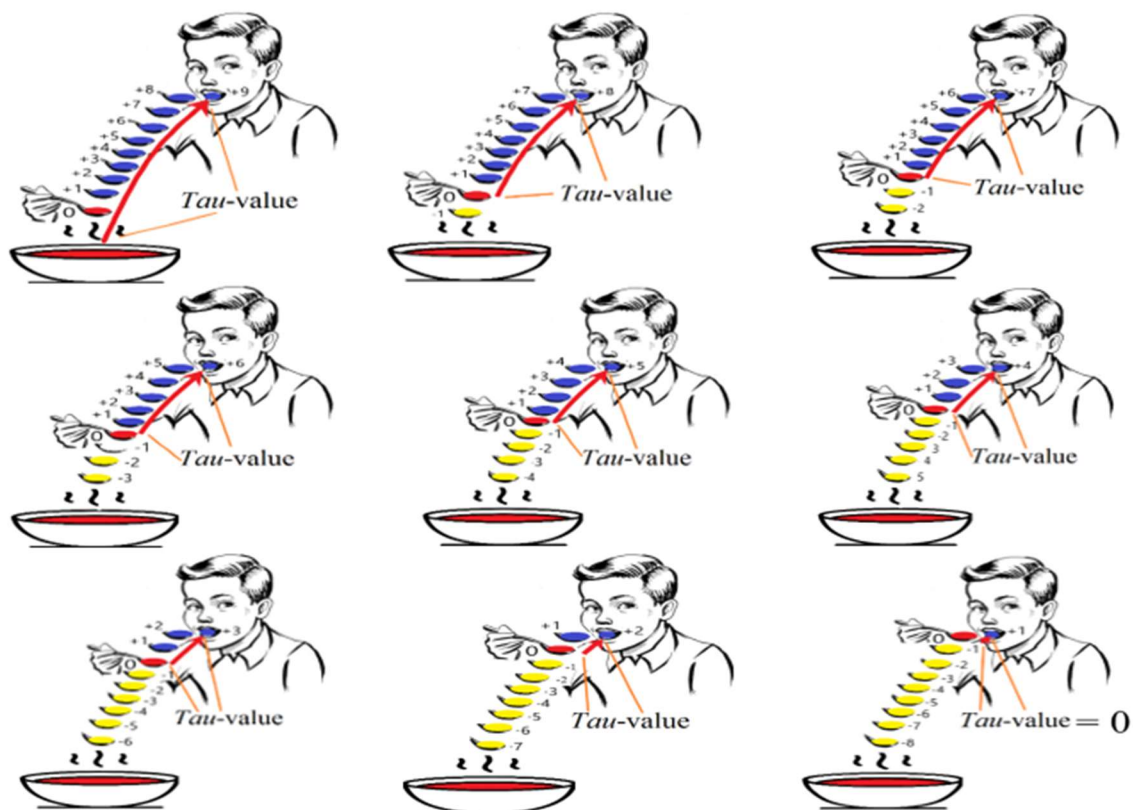


Images: The *tau*-value can be perceived in two autonomous ways. You can either observe how the yellow manifest action trajectory shape takes over the blue line or at the most basal level you could solely observe with what speed the blue line, representing the still latent action trajectory shape, is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



Part 5 - 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 internal sensorimotor perception processes



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## Introduction

When we want to eat soup, the explanatory model of the motoric movement action has demonstrated that solely the movement of the bowl of the spoon embodies the core of the task and of our egocentric intention. Within there scientific evidence has been provided that, prior to the actual execution of any conceivable action, we first create a perceptual image of an entire latent action trajectory shape over which we can successfully move (all the dimensions of) the action object<sup>10</sup>, in this case, the spoon, to respectively the plate and the mouth<sup>11</sup>.

However, science has so far completely missed all the essentials in regard to the action trajectory shape and only indirectly noticed that (action) paths are formed between the end effectors c.q. the action object, and the goal of the action. While it can be quickly established that all positions P of an action object are invariably constrained within one single line segment shape within any conceivable motor action. This should have led to several revolutionary insights:

1. Factually, the action object invariably fills an action trajectory shape in the same way as a marble moves within a marble run, in which the perception of the marble's current location always marks the exact boundary between the manifest and latent parts of the perceptual image of the action trajectory shape.
2. All latent positions P of the action object effectively always have to sprout from the manifest positions P, or effectively always have to originate from the manifest part of the action trajectory shape.
3. Within the action trajectory shape, it factually always becomes apparent when the action is coming to its end due to the perception of the disappearing of the complete latent action trajectory shape c.q. the *tau*-value approaching to zero<sup>12</sup>.

So, although the explanatory model demonstrates that the perception of the movement of the action object within the perceptual image of a latent action trajectory shape encompasses an autonomous phenomenon and thus exclusively is going to perform the essence of the task, the explanatory model also clearly shows that the action object itself absolutely isn't capable to move. Even when grasping with the fingertips, the explanatory model shows that the movement of the fingertips along an external action trajectory shape on the outside of the body can't be moved by the outside of the fingertips themselves. So even within grasping, the movement within the external (primary) focus can only be executed with movements that must always be perceived within the body, within the internal (secondary) focus. In the present action, where a bowl of the spoon moves at an obvious distance from the body,

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<sup>10</sup> Science and the explanatory model of the motoric movement action use the terms 1. end effector and 2. action object for the same phenomenon. For example, in eating with a spoon, science refers to the spoon bowl as the end effector, whereas the explanatory model designates the spoon bowl as the action object.

<sup>11</sup> [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](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)

<sup>12</sup> [https://www.researchgate.net/publication/372862585\\_Eating\\_requires\\_the\\_compelling\\_collaboration\\_between\\_an\\_internal\\_and\\_an\\_external\\_focus\\_-\\_Getting\\_the\\_bowl\\_of\\_the\\_spoon\\_to\\_the\\_food-mouth\\_along\\_an\\_action\\_trajectory\\_shape\\_is\\_the\\_essence\\_within\\_eat](https://www.researchgate.net/publication/372862585_Eating_requires_the_compelling_collaboration_between_an_internal_and_an_external_focus_-_Getting_the_bowl_of_the_spoon_to_the_food-mouth_along_an_action_trajectory_shape_is_the_essence_within_eat)



this insight will be easily recognized, and it will also be easy to determine that the bowl of the spoon can solely be moved along an external action trajectory shape with movements within the body that solely reach up to the spoon's handle<sup>13,14</sup>.



Images: The explanatory model of the motoric movement action shows, beyond any reasonable doubt, that there is no need for a motor plan to initiate an action. It demonstrates that all sensorimotor perception processes within the internal (secondary) focus simply need to follow the lead of the external (primary) focus. This clarification, which does not require any hierarchy, underscores our freedom from being tied to specific sensorimotor movements and this perspective is in perfect alignment with an ecological approach to motor actions. The difference between eating by oneself and being fed provides scientific evidence that perceiving the *tau*-value of the approaching spoon bowl is an autonomous phenomenon<sup>15</sup>. Regardless of the origin, we open our mouths when food arrives.

In summary, this leads to the conclusion that the phenomenon of the perception-action coupling is solely related to the perception of movement within the external (primary) focus. Only within this focus, a perceptual image, consisting of the future positions *P* of the action object, is filled by the future actual positions of that exact same action object. Also, only within this focus, the *tau*-value can be perceived. This publication now explains how the perception of the *tau*-value should be linked to the internal (secondary) focus and extensively discusses the consequences this has for the perception processes within the internal (secondary) focus c.q. for all sensorimotor actions.

#### A universal *tau*-coupling is present within every conceivable motoric action

The explanatory model, in conjunction with previous publications, demonstrates that the *tau*-value can be universally observed within any conceivable action. This aligns with the findings of D.N. Lee, who showed that in many actions, a gap c.q. a line segment shape between the action object and the end goal<sup>16</sup> gradually approached zero and eventually completely disappeared. While Lee's discovery generated significant interest in the scientific community, a major breakthrough remained elusive. Lee

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<sup>13</sup> [https://www.researchgate.net/publication/373624625\\_Within\\_any\\_imaginable\\_motor\\_action\\_the\\_external\\_primary\\_focus\\_cq\\_the\\_essence\\_of\\_the\\_task\\_is\\_solely\\_executed\\_by\\_the\\_action\\_object\\_-\\_Solely\\_the\\_external\\_movements\\_of\\_the\\_spoon\\_compel\\_the\\_primary\\_focus](https://www.researchgate.net/publication/373624625_Within_any_imaginable_motor_action_the_external_primary_focus_cq_the_essence_of_the_task_is_solely_executed_by_the_action_object_-_Solely_the_external_movements_of_the_spoon_compel_the_primary_focus)

<sup>14</sup> This intriguing dualism demands our utmost attention as it presents the essence of our perception processes. The internal (secondary) focus not only meticulously tracks the movement of the action object within the action trajectory shape but is also the instigator of this movement. It might sound paradoxical that the very action you initiate creates your own reliance. However, this is precisely what occurs because it is an implicit fact that when you move something inside your body, an external part of your body will inevitably move within an action trajectory shape on the outside of your body.

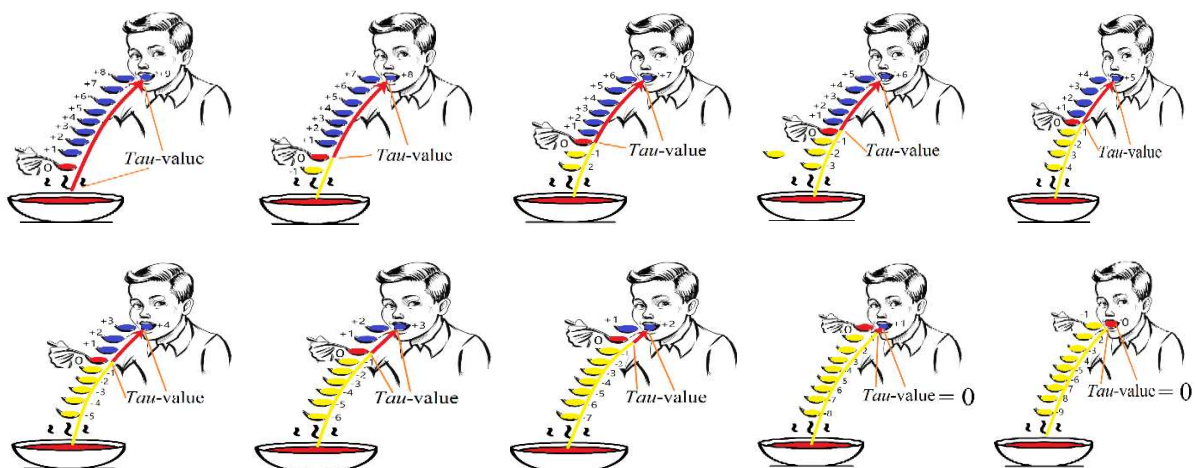
<sup>15</sup> The "flight approach" will often be quite spectacular, especially when enthusiastic fathers feed their children. However, even during feeding, the final part of the action trajectory shape will proceed just like when eating on your own.

<sup>16</sup> In the original work, examples include a long jumper leaping towards the take-off bar, a Northern Gannet diving toward the water surface, and a bee heading towards a flower.

connected this crucial *tau*-value to various irrelevant other possible *tau*-values without realizing that multiple foci could be distinguished and linked within a single motoric action. However, this insight proved to be highly relevant for the explanatory model of the motoric movement action. By understanding that the movement of an action object along an action trajectory shape outside the body is a completely autonomously observable phenomenon, and can only be executed by a completely different autonomously observable phenomenon within the body, it is now possible to explain precisely which phenomena should be connected and how the *tau*-coupling is established. The perception of the *tau*-value approaching zero within the external (primary) focus should ultimately guide the observations within the internal (secondary) focus.

### The *tau*-coupling when moving the spoon (with boiling hot soup) to the mouth

The script<sup>17</sup> for eating soup begins with picking up the spoon. Then the spoon's bowl is first brought to the soup. If the plate remains on the table, the full or empty spoon's bowl then covers a relatively long distance, respectively to the mouth and the plate, where seemingly nothing is happening. Although the explanatory model of the motoric movement action conversely shows that bridging this apparent "nothing" by the spoon's bowl indeed requires many of our perception processes, with the cortical streams playing a crucial role, the egocentrically formulated intent will only be finalized at the end of the action trajectory shape.



Images: Before we actually move a spoon to our mouth, a perceptual image is always created of a latent action trajectory shape along which all dimensions of the spoon (or spoon-bowl) will be able to reach the mouth successfully. Within these images, you can personally confirm the fact that only the spoon-bowl fills in this action trajectory shape, and therefore only the spoon-bowl fulfills the essence of the task. It can also be observed that the spoon-bowl moves like a marble in a marble run, and in doing so, the current position P (0) of the spoon (red) always marks the exact separation between the manifest (yellow) and the latent (blue) parts. When, within the perceptual image of the action trajectory shape, almost no latent positions P are left c.q. when the *tau*-value approaches zero, the action will be finalized, and the movement of the spoon-bowl must be adjusted in such a way that it ends neatly at the mouth without shooting too far (into the throat). However, when eating scalding hot soup, the spoon-bowl must be gently decelerated just before it reaches the mouth, where the soup can be cooled by blowing. The disappearance of the latent part of the action trajectory shape can be perceived in two ways. One can observe how the yellow (manifest) part takes over the blue (latent) part of the action trajectory, or even more fundamentally, one can solely perceive at what speed the blue line

<sup>17</sup> The script within eating is more complex than many other motoric actions and can be compared to juggling or performing a tennis serve. When eating, you are also creating your own catching action.

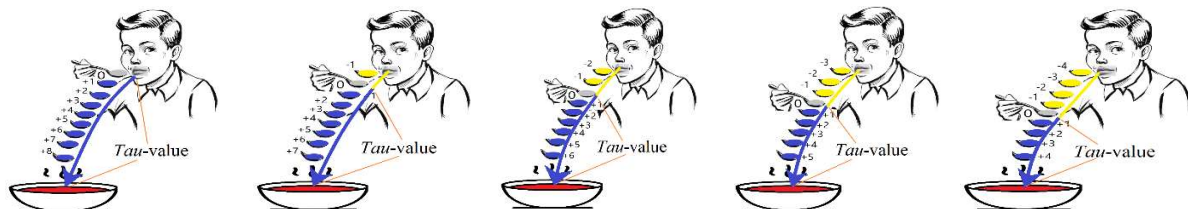
segment disappears. While peripheral vision is typically present during eating, there will hardly be a serious need for visual perception<sup>18</sup>. However, you can eat just as successfully in pitch black darkness, even with scalding hot soup, because you primarily execute the action using proprioceptive perception, just as you do in daylight.

So, while it may appear that only the end of the action trajectory is crucial, the explanatory model is clear: the perception of every position between the spoon and the mouth is equally vital for success. The finalization of the action and the bridging process are, in fact, two distinct phenomena that must be successfully executed sequentially. One can never reach a successful conclusion if the bridging phase has not been successful as well.

However, the successful completion of the end phase is also crucial for a task to succeed. This success hinges on perceiving that the *tau*-value, within the external (primary) focus, is approaching zero. Then, within the internal (secondary) focus, adjustments to the movement towards the handle of the spoon must be made so that the spoon or spoon's bowl consistently ends up neatly at the front of the mouth and doesn't overshoot into the throat. Or, when eating boiling hot soup, it must be brought and stopped very close to the mouth. Ergo, in many motor actions, it can be concluded that, after a phase of relative acceleration during the bridging phase, a relative deceleration of the action object occurs as the end of the action approaches<sup>19</sup>.

#### The *tau*-coupling when moving the spoon to the plate

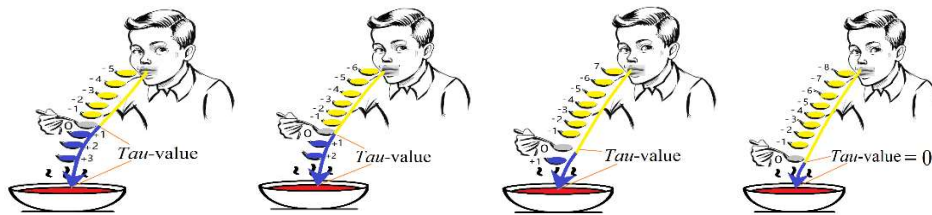
The script<sup>20</sup> for eating soup begins with picking up the spoon. Then the spoon's bowl is first brought to the soup. If the plate remains on the table, the full or empty spoon's bowl then covers a relatively long distance, respectively to the mouth and the plate, where seemingly nothing is happening. Although the explanatory model of the motoric movement action conversely shows that bridging this apparent "nothing" by the spoon's bowl indeed requires many of our perception processes, with the cortical streams playing a crucial role, the egocentrically formulated intent will only be finalized at the end of the action trajectory shape.



<sup>18</sup> Visual perception is actually only needed for the motoric movement action *blowing* to determine the shape of the action trajectory of the air to be blown and to provide feedback on whether that air reaches the soup. Additionally, visual perception becomes more important as the bowl of soup empties. Then, you'll need to check if there's enough soup left to spoon and where it's located in the bowl.

<sup>19</sup> As explained in this section, the explanatory model underpins the notion that within many motoric actions a bell-shaped profile is capable of occurring when plotting the execution speed of an action against time in a graph. In many actions, it is indeed typical that after a short initiation phase, a smooth and faster bridging phase occurs, followed by a more precise phase towards the end. Although the model generally supports these principles, it doubts the emergence of a highly proportional bell shape in all cases. Additionally, the explanatory model illustrates that this is certainly not the case for all actions. In situations where you need to create a crescendo at the end of the action, such as clapping your hands or defending against an attacker with a punch or a kick, you must accelerate the relevant body parts in the final phase. Similarly, in many ball sports, achieving a necessary "crescendo" can only be accomplished if, after an initial relatively slower catching phase, you maximize acceleration of the ball towards the end of the action trajectory shape.

<sup>20</sup> The script within eating is more complex than many other motoric actions and can be compared to juggling or performing a tennis serve. When eating, you are also creating your own catching action.



Images: Before we actually move a spoon to the plate filled with soup, a perceptual image is always created of a latent action trajectory shape along which all dimensions of the spoon (or spoon-bowl) will be able to reach the surface of the soup successfully. Within the shown animations, you can personally confirm the fact that only the spoon-bowl fills in this action trajectory shape, and therefore only the spoon-bowl fulfills the essence of the task. It can also be observed that the spoon-bowl moves like a marble in a marble run, and in doing so, the current position P (0) of the spoon (grey) always marks the exact separation between the manifest (yellow) and the latent (blue) parts. When, within the perceptual image of the action trajectory shape, almost no latent positions P are left c.q. when the *tau*-value approaches zero, the action will be finalized, and the movement of the spoon-bowl must be adjusted in such a way that it ends neatly at the surface of the soup without making a big splash. The disappearance of the latent part of the action trajectory shape can be perceived in two ways. One can observe how the yellow (manifest) part takes over the blue (latent) part of the action trajectory, or even more fundamentally, one can solely perceive at what speed the blue line segment disappears. While peripheral vision is typically present during eating, there will hardly be a serious need for visual perception<sup>21</sup>. However, you can eat just as successfully in pitch black darkness, even with scalding hot soup, because you primarily execute the action using proprioceptive perception, just as you do in daylight.

#### The perception processes within the internal (secondary) focus in regard to the sensorimotoric movements towards the handle of the spoon

The explanatory model of the motoric movement action presents a completely new paradigm. It's built on the factual observation that an autonomous internal movement of any organism will implicitly lead to an autonomous external movement of the outside of that organism. In which it is also a fundamental fact that the movement of any given position P on the outside of that organism will need to sprout out of each other c.q. that all those positions P will always be interconnected. Which factually means that they will always create a line segment shape. So the most important conclusion reveals that these two movements are implicitly connected, but that the perception processes mediating these movements are completely autonomous and independent of each other<sup>22</sup>.

This aforementioned clarification doesn't pertain to the paradigm itself but to its foundation. In regard to which the explanatory model notes that these phenomena occur regardless of which focus you centralize. However, the new paradigm lies in the novelty that you can fully execute a motor action by

<sup>21</sup> Visual perception is actually only needed for the motoric movement action *blowing* to determine the shape of the action trajectory of the air to be blown and to provide feedback on whether that air reaches the soup. Additionally, visual perception becomes more important as the bowl of soup empties. Then, you'll need to check if there's enough soup left to spoon and where it's located in the bowl.

<sup>22</sup> While the explanatory model of the motoric movement action has a strong suspicion that the earliest organisms initially engaged in random motor movements, it demonstrates that after millions of years of evolution, the roles of internal and external have reversed. It's much more efficient for organisms to work from an action trajectory shape rather than relying on random motor movements. Creating an action trajectory shape, for instance, from fingertips to a coffee cup or from a spoon to a soup bowl, is by far more effective and efficient than repeatedly generating random internal movements with the hope that the fingertips will reach the coffee cup or the spoon will reach the soup.



focusing solely on creating and completing an external action trajectory shape. In contrast to the idea that early organisms primarily started by emphasizing arbitrary motor movements within the body and then observing the external result, the explanatory model states that these roles have now been completely reversed after millions of years of evolution. So within eating soup, we primarily perceive the dominant movement of the spoon bowl within the external (primary) focus and guide its progress with motoric movements within the internal (secondary) focus, which only reach the outer parts of the handle of the spoon.

Thanks to this new paradigm, the explanatory model of the motoric movement action is now capable of identifying all functional perception processes within any conceivable motoric action, thus enabling it to describe all sensorimotor perception processes within any conceivable motoric action. In this section, a list of the most crucial insights will be outlined, with a focus on challenging many prevailing assumptions within the scientific community.

#### a. Visuomotoric perception processes

Of course, science views both visual perception and motor action as essential in executing actions, assuming they share a close relationship. Which, out of a single-focus perspective, led to the rather artificial birth of the term *visuomotoric* perception processes. While one might argue that the term provided some direction in scientific thinking, its content remained vague and never led to any significant consensus.

The explanatory model now emphatically reveals that this term represents an erroneous way of thinking within the scientific community and that it must be expunged from the realm of scientific discourse. The explanatory model effectively illustrates that, in practice, when visual perception comes into play, its exclusive role is to contribute to the perception-action coupling taking place within the external (primary) focus, and has no bearing whatsoever within the internal (secondary) focus. In plain terms, visual perception, by itself, will never induce any movement.

#### b. Sensorimotoric perception processes

Just like the concept of visuomotoric perception processes, science introduced the term *sensorimotoric* perception processes. In contrast to the previous paragraph, the explanatory model provides a significantly broader description in regard to those sensorimotoric processes than previously presumed in the scientific community and shows unequivocally that we even can execute motoric actions solely through proprioceptive perception, expanding our capabilities beyond what science has traditionally acknowledged. Many actions can be executed with ease, albeit less efficiently, in complete darkness or without any visual input<sup>23,24</sup>. Consider activities like clapping your hands behind your back, unlocking a door with a key at night, or swatting an annoying mosquito behind your ear. In all these actions, the *tau*-value within the external (primary) focus can be entirely perceived proprioceptively<sup>25</sup>.

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<sup>23</sup> Motoric displacement actions from point A to point B, such as walking, cycling, rowing or car driving, can hardly be executed without visual input. However, a person with 100% visual impairment is perfectly capable to navigate through their home freely and by foot travel significant distances outside using a cane. This cane vividly demonstrates that our perception processes are not solely focused on reaching point B but are also deeply engaged in the bridging process. With the cane, the individual is essentially "observing" (feeling) whether the next position P (+1) within the perceptual image of the latent action trajectory shape, is accessible and can be occupied by their body. This observation mirrors what was mentioned earlier regarding the spoon's journey towards the mouth or towards the plate of soup.

<sup>24</sup> Think also of inserting a car key into the ignition. In an unfamiliar car, we need visual perception several times initially to create an action trajectory shape, but after a few repetitions, we do it entirely blindly.

<sup>25</sup> [https://www.researchgate.net/publication/342715828\\_The\\_complete\\_functional\\_explanation\\_of\\_limb\\_position\\_and\\_movement\\_in\\_relationship\\_to\\_the\\_proprioceptive\\_perception\\_-\\_The\\_behavioural\\_perception\\_processes\\_within\\_clapping\\_behind\\_your\\_back](https://www.researchgate.net/publication/342715828_The_complete_functional_explanation_of_limb_position_and_movement_in_relationship_to_the_proprioceptive_perception_-_The_behavioural_perception_processes_within_clapping_behind_your_back)

Additionally, the explanatory model unmistakably reveals that within any conceivable action, an external (primary) focus, operating within a strict *tau*-coupling process, can only be executed by an internal (secondary) focus. It highlights that this secondary focus is exclusively perceived within the body, and therefore, all perceptions within this focus are inherently of a sensorimotoric nature.

c. The internal (secondary) focus has an indispensable interdependent relationship with the external (primary) focus.

So, the explanatory model revolves around an entirely new paradigm, which reveals that within the execution of a single action, implicitly two autonomous foci arise in relation to two autonomous movements. These two autonomous foci must enter into a mandatory collaboration to accomplish the action successfully. The collaboration involves the motor processes within the internal (secondary) focus, which alone can enable the action object to move, compellingly following the movement within the external (primary) focus. When one is first confronted with this concept, it may evoke an extremely paradoxical feeling. How can a phenomenon that is inherently essential to the action and only solely can ensure the action's success be so dependent on another autonomous phenomenon that it itself brings to life? However, with further contemplation, one will come to realize that it is a remarkable evolutionary discovery and that it provides an explanation for all functional perception processes within any conceivable motor action. Moreover, the explanatory model clearly elucidates how this phenomenon must have developed from the earliest stages of evolution, but further details are omitted here for the sake of brevity<sup>26</sup>. It is emphasized that these two phenomena are entirely interdependent, and without either one, no motor action can be successfully executed.

d. No motor plan and no hierarchy

If the scientific community were to acknowledge that the perception of the movement of an action object within an action trajectory shape, within the external (primary) focus, has the capability to guide the entire execution of any conceivable motoric action, several challenges within science would be resolved immediately. If it were accepted that, prior to the execution of a motor action, we create an all-encompassing and directing perceptual image of an external latent action trajectory shape, the need for a motor plan would instantly disappear. Which would lead to the understanding that all sensorimotor movements simply serve the external (primary) focus, and as a result, there would be no need to recognize hierarchy within the sensorimotor structure. Then all sensorimotor activity can hierarchically be regarded at the exact same level which just obediently have to carry out the task within the external (primary) focus.

e. The explanatory model reflects an optimal ecological approach

In the current scientific paradigm, there is a consensus that motor planning exists, but there is absolutely no agreement on how such a motor plan is developed. While it's acknowledged that creating a motor plan demands more cognitive capacity from an organism, it essentially reveals that, even after many decades, there is no clear answer to this question. An important, unanswered scientific question

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<sup>26</sup> In future publications, where the precise role of the cortical streams in regard to this phenomenon will be explained, this evolutionary development will be further elucidated. In brief, the explanation will demonstrate that organisms initially started with just random (!) movements within their bodies to move a part of the external body somewhere. After millions of years, we 1. realized that this specific external body part, like a marble in a marble run, fills an external action trajectory shape, and 2. gained a solid understanding of the involved motoric movements. This understanding allowed us to reverse the roles, shifting from initiating movements from inside the body to initiating them from the outside. This line of thinking even goes so far as to suggest that the cortical streams within an organism have evolved evolutionarily to precisely mediate this relationship of a marble-marble run in a double and reciprocal process.



is how a motor plan adapts when a sudden change occurs during an action. Which also leads to the pressing follow-up question of how more primitive organisms can cope with such situations.

The explanatory model of the motoric movement action demonstrates that perceiving the *tau*-value, despite its inherent complexity, can be distilled into a very simple universal phenomenon. Which is also explained in the context of moving a spoon when eating<sup>27</sup>. To perceive the *tau*-value, all you need to do is register the speed at which the latent part of the perceptual image of the entire action trajectory shape disappears. Essentially, this amounts to a straightforward observation of the disappearance of a two-dimensional line segment.

Subsequently the explanatory model reveals that the internal (secondary) focus can align itself with the external (primary) focus as a whole, without any rigid hierarchy. This simplifies the observation of the *tau*-coupling process to such an extent that, within an ecological framework, it's hard to surpass and which concept can also be applied to the earliest organisms.

f. Spoon movements are proprioceptively perceived

The explanatory model clearly demonstrates that the internal (secondary) focus is exclusively perceived within the body and thus shows that there can never be visual perception involved in this process. The internal (secondary) focus can only be perceived proprioceptively. You can easily confirm this when eating soup, as you can successfully eat boiling hot soup even in pitch black darkness. Visual perception of the soup bowl, crucial when fetching the food, can be bypassed by bringing your free hand to the bowl. In this way, you can entirely proprioceptively create and complete a perceptual image of a latent action trajectory shape between the soup bowl and the spoon, allowing you to perfectly stop the spoon at your mouth without sight. The only visual perception you miss in this context is within the external (primary) focus of the motoric movement action *blowing*, which is responsible for providing feedback on whether your blowing direction towards the hot soup is correct. However, when you bring the soup very close to your mouth, even this remark will not become a significant issue.

g. Hybrid (proprioceptive) perception processes

A significant shortcoming in scientific research pertains to the notion that motor actions are always executed with roughly the same sensorimotor perception processes. The explanatory model reveals a universal framework, but it clearly demonstrates as a novelty that often multiple constellations of perception processes are involved within the execution of the same motoric action and that we are capable to endlessly, *ecologically* (!), vary within this realm.

For example, when in pitch black darkness, we bring our (non-key-holding) hand to a lock, we can successfully move the key to the lock using solely proprioceptive perception within the external (primary) focus c.q. we can successfully move the key along a perceptual image of a latent action trajectory shape using solely proprioceptive perception processes. So even if it then appears that we perform this motoric action with only visual perception in broad daylight, that's factually incorrect. In broad daylight visual perception processes may dominate, but proprioceptive perception processes will never disappear and so will always be present in some hybrid form. So actions we perform during the day with relatively many visual perception processes are always executed proprioceptively as well.

Within the internal (secondary) focus, it's no different. You can quickly ascertain for yourself that you could move the bowl of the spoon with solely using upper-arm and/or forearm action, if you were to rigidly hold the spoon. But even when it comes to more typical motor movements used for spoon control, you can readily observe that you could relatively use more hand or more finger action. Which, in short, indicates that you might have developed your own preferred motor skills for eating, but they

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<sup>27</sup> [https://www.researchgate.net/publication/373445469\\_Within\\_eating\\_the\\_essence\\_of\\_the\\_task\\_is\\_solely\\_executed\\_by\\_the\\_external\\_movements\\_of\\_the\\_spoon\\_toward\\_the\\_plate\\_and\\_the\\_mouth\\_Within\\_the\\_primary\\_focus\\_the\\_spoon\\_is\\_constrained\\_in\\_a\\_script\\_of\\_two\\_auto](https://www.researchgate.net/publication/373445469_Within_eating_the_essence_of_the_task_is_solely_executed_by_the_external_movements_of_the_spoon_toward_the_plate_and_the_mouth_Within_the_primary_focus_the_spoon_is_constrained_in_a_script_of_two_auto)

will always consist of an ever-evolving combination of hybrid sensorimotor perceptions. Due to the fact that such a complex phenomenon is involved will never allow an identical configuration of perception processes to arise.

Upon which the explanatory model of all motoric movement actions again hastily wants to add that these hybrid possibilities in the utmost harmony align within an ecological approach and that a parsimonious organism would never have strived to achieve identical executions.

#### h. Optimization process

The explanatory model of the motoric movement action demonstrates that a motor action can only be executed by the stacking of two autonomous foci and shows within the previous paragraph that the perception of movement within the internal (secondary) focus is inherently of such a high complex nature that it will definitely prevent the occurrence of an identical internal configuration to occur.

Consequently this will cause that the action object is capable to and definitely shall deviate from the perceptual image of the latent action trajectory shape at each progressing point P and even though the cortical streams ingeniously mediate this process, it's empirically evident that an identical execution of any action trajectory shape is unattainable. This unequivocally portrays that performing any conceivable action can only be viewed as an optimization process. Hence, you will never be able to make a spoon c.q. a spoon bowl move identically. Instead, you solely can optimize the perceptions within both foci, which also allows you to perform actions in a very successful manner but in ever-varying ways.

#### i. Within the internal (secondary) focus the line and shape within the line segment shape of the action trajectory demand autonomous perception processes; Solely the line generates the $\tau$ -value

The explanatory model of the motoric movement action demonstrates, beyond any reasonable doubt, that we do not (need to) create motor plans and that all sensorimotor processes can be compellingly guided by the external (primary) focus. But if a motor plan would have been necessary, science would still have remained remote from a breakthrough, as sensorimotor processes must accompany two autonomous phenomena within the action trajectory shape that have never been recognized in science. The frequently used compound term "action trajectory shape" is in fact a line segment shape and encompasses two autonomous components: the line and the shape. The explanatory model illustrates that they are perceived entirely separately but simultaneously. For experts, this is clearly recognizable within any conceivable action. However to make it comprehensible for everyone, these phenomena are explained within the context of the motoric movement action *car driving* (or riding a bicycle) since this action inherently contains the scientific evidence of these two autonomous perceptions.



Images: In the case of a car and a bicycle without hand brakes, only the steering wheel can compensate for deviations in the width of the action trajectory shape, and the pedals can only compensate for deviations in the length of the action trajectory shape.

When driving a car, it becomes immediately evident that one can exclusively influence the movement within the shape (!) of the action trajectory with the steering wheel. This defines the explanatory model as mediating the deviations in the y-axis. Additionally, it should also become immediately clear that with the pedals, one can exclusively influence the movement within the line (!) of the action trajectory. This defines the explanatory model as mediating the deviations in the x-axis<sup>28</sup>.

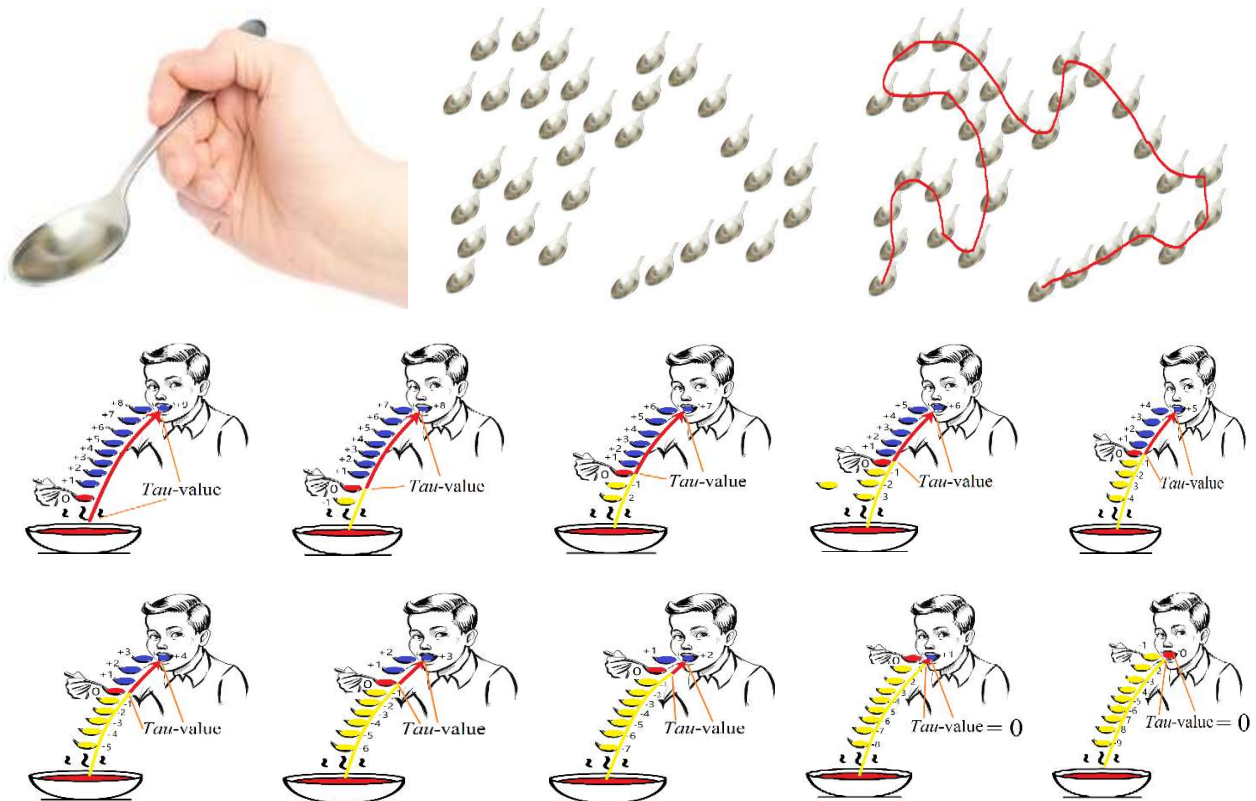
So, when driving a car, it becomes crystal clear that perceiving (and controlling) the shape has absolutely nothing to do with perceiving (and controlling) the line. In which it is essential to mention that perceiving the filling of the latent line (within the x-axis) by the manifest places P of the action object within the external (primary) focus solely involves the *tau*-value which within car driving is solely executed by the pedals. Solely the speed with which the line is filled determines the duration of the action c.q. determines the finalization of the action.

The explanatory model of the motoric movement action demonstrates that the perception of movement within the internal (secondary) focus in any conceivable action, including the current eating operation, contains the same x- and y-axis components. Although it places greater demands on the development of an organism, conversely, it can be shown to fit perfectly within an ecological approach. The dichotomy, where a separate x- and y-axis component is distinguished, can actually deliver the final breakthrough in the understanding of why we are capable to reduce very complex perception processes to the perception of such trivial and simple phenomena. The mere perception of the x-axis can be traced back to simply perceiving how the latent part of the perceptual image of the latent action trajectory disappears.

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<sup>28</sup> The same explanation naturally applies when considering a bicycle with coaster brakes.

## Part 6 - Scientific evidence of the origin of two autonomous foci and how their roles have evolutionarily reversed; Within eating the transitioning from random motor activity to the execution of deliberate actions demands shifting the internal and external focus



### *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 daily essential task of eating. 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 deliberate motor activity aimed at performing a specific task as a result of an egocentrically formulated intention. At the end of this part, eating 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 eat soup with a spoon. 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<sup>29</sup>, 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<sup>30</sup>. 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<sup>31</sup>. 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

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<sup>29</sup> 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.

<sup>30</sup> 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: *Caught In A Line*.

<sup>31</sup> [https://www.researchgate.net/publication/336880958\\_The\\_explanatory\\_model\\_of\\_all\\_motoric\\_movement\\_actions\\_-\\_The\\_Marble\\_Run](https://www.researchgate.net/publication/336880958_The_explanatory_model_of_all_motoric_movement_actions_-_The_Marble_Run)

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<sup>32</sup>.

b. Basic exercise (passive arm with a spoon)

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<sup>33</sup>. So, all separate positions of the arm and of the spoon are going to traverse a

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<sup>32</sup> 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.

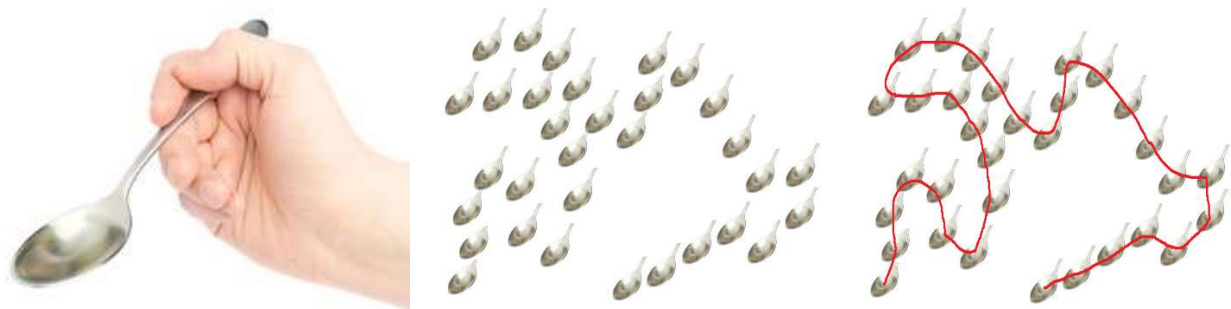
<sup>33</sup> Hence, you must also realize that when eating soup, where we typically focus on the movement of the spoon-bowl, all other mentioned body and spoon parts also move in line segment shapes. This demonstrates that the related perception processes are entirely subjective and depend on the chosen focus.

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, 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 outer surface of the handle of the spoon. 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. The basic exercise in relation to motor activity moving a bowl of a spoon

If we define an action as a conscious motor activity in which a specific goal is pursued from an ego-centrally formulated will, then the explanation in the entire first part of this article falls outside the framework of actions. In this paragraph, we still do not assume a conscious goal-directed action, but rather build upon what the basic exercise regarding the movement of a spoon demonstrates.



Images: The basic exercise can be translated into a motoric action with a spoon. You should primarily focus on manipulating the handle of the spoon c.q. your main focus should be on proprioceptive perception towards the handle of the spoon, with only a secondary awareness of whether and how the spoon bowl moves through space. Even if you only engage in upper-arm, forearm, hand, or even just internal finger movements, the consequences remain the same<sup>34</sup>.

As the previous paragraph shows, the basic exercise can easily be translated into an action with a spoon. To maximize the difference between the (perception of) the movement of the spoon bowl and the (perception of) the movement of internal motor activity, and thus make the principles clearly accessible, you were specifically asked not to perform arm activity. However, the distance between the spoon bowl and the motor activity does not matter at all because even if you focus primarily on internal motor arm activity, you will actually observe that the spoon bowl moves randomly through the air. You can develop only upper or lower arm activity, but even if you only develop hand or even just

<sup>34</sup> Two essential omissions should be noted in the animations: 1. Only a limited number of spoon positions are represented. If you engage in a few minutes of random motor activity, the entire environment should be filled with spoon positions. 2. The connection of successive positions P of the spoon bowl cannot be captured in an animation. The perception of the spoon's movement involves a continuous (smooth) line of spoons. The red line represents this continuous connection but does not show spoon bowls. Therefore, you need to create a hybrid representation, which you can only perceive by actually moving a spoon in the air.

finger action, the same principles will still apply. You will, once again, only be able to observe that the position P (0) of the spoon bowl must always result from the preceding positions c.q. that all positions P of a spoon bowl are always stuck in one line.

#### Conclusion basic exercise in relation to motor activity moving a bowl of a spoon

In actions involving lifeless objects, such as a spoon, it becomes immediately clear that you (secondarily) can make the spoon bowl move by focusing entirely on a different (primary) motor activity, which can only reach up to the outer surface of the handle of the spoon. This is the only thing necessary to draw the following factual conclusions:

- 1) Although there is nothing predictable about where the spoon bowl will move, as random internal motor activity will always result in random or chance movements of the spoon, there is, on the other hand, a very essential fact to note. All separate points/positions P of the spoon will always have to be connected c.q. will always have to emerge from each other. Due to which one can conclude that all those points always construct a linear form, and that, too, always involves exact one (!) entire line segment shape. The spoon 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 bowl of the spoon 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 spoon bowl within the line segment shape that all positions of the bowl become a part of.

The perplexing aspect of this realization may be the fact that the movement of the spoon bowl over a line segment shape is entirely dependent on a completely different internal motoric movement solely reaching the outer surface of the handle of the spoon. Without this source of action, the spoon will never move. Additionally, the confirming aspect of this realization may concern the conviction that the perception of the movement of the spoon bowl 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.

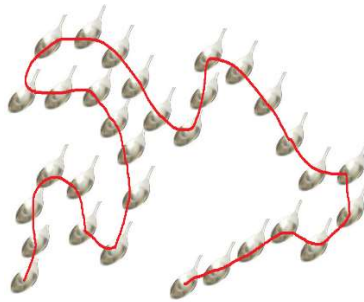
So, within the second part we do assume deliberate actions where an egocentric will is formulated to achieve a specific goal and in this chapter the movement of a spoon when eating encompasses the key issue. The basic exercise clearly shows that two possible action strategies c.q. execution perspectives can be pursued in this regard.

- a. Execution perspective 1 – Primary focus on the movements towards the outer surface of the handle of the spoon and secondary focus on the movement of the spoon bowl

The basic exercise from the first part clearly demonstrates that with the primary focus on internal motor activity, directed at the outer surface of the handle of the spoon, we can make the spoon bowl move randomly through the air. However, this random movement becomes problematic when formulating the egocentric intention to precisely reach the mouth from a soup bowl. With the primary focus on internal motor activity, we can make the spoon bowl occupy a vast number of positions in the air in just a few minutes, but it is far from parsimonious (efficient and effective). And this is even without



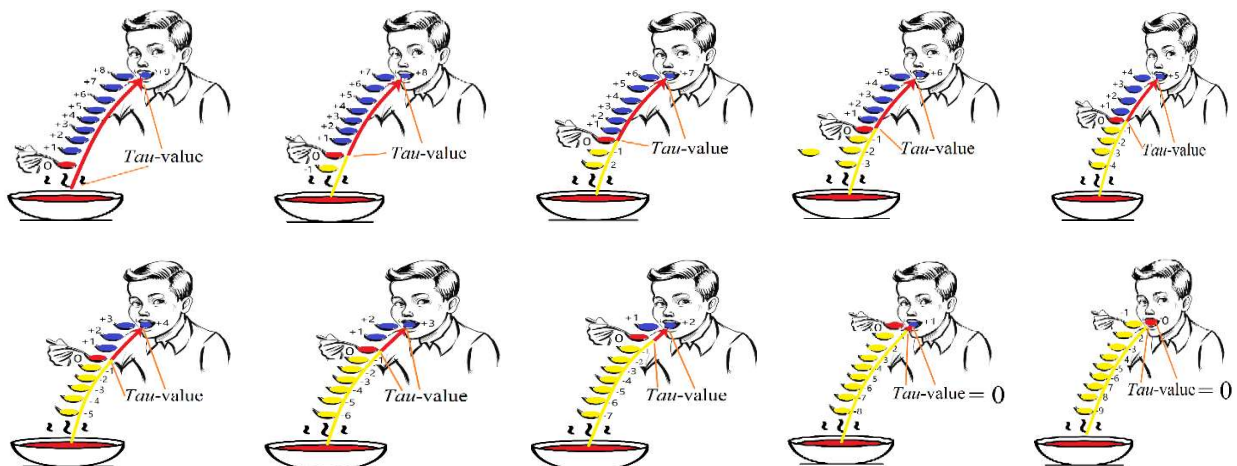
considering whether you could bring the spoon bowl, which moves relatively quickly due to the active motor activity, to a precise stop right at the mouth.



Images: Even when one intends to move a spoon within a conscious goal-directed action, it always remains a strategy to, with primary focus on the outer surface of the handle of the spoon, secondarily observe whether the spoon bowl ever reaches the mouth. Although it requires a considerable amount of luck and/or patience, it remains a possible action strategy. However, it is not particularly parsimonious within this eating task.

b. Execution perspective 2 – Primary focus on the movement of the spoon bowl and secondary focus on movements towards the outer surface of the handle of the spoon

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 deliberate action, one can adopt a completely different execution perspective. It would be by far the most parsimonious (ecological) solution to conceptualize and construct an action trajectory shape between the spoon bowl and the plate.



Images: It is most economical to first create a perceptual image of an (efficient and effective) latent action trajectory shape over which the spoon bowl can be successfully moved between the mouth and the soup bowl, and then proceed to fill it in factually.

In the second execution strategy, the roles of attention are reversed. The primary focus now has the goal to track the progress of the bowl of the spoon 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 spoon bowl can be successfully moved from the soup bowl to the mouth.
- b. There needs a significant complex system to be present which must be capable of mediating the (perception of) the movement of the spoon bowl within the action trajectory shape. While the roles of attention can be reversed, will not change the fact that the spoon can only be moved by (the perception of) a completely different autonomous (internal) phenomenon. Even if we try to enforce that the bowl of the spoon actually fills in the perceptual image of the latent action trajectory shape, the autonomy of the motor activity will cause the spoon bowl 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. Therefore 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 bowl of the spoon can be successfully transferred from the soup bowl to the mouth prior to any actual execution. Regarding this first condition, the explanatory model of the motoric movement action has provided universal scientific evidence that we create such a perceptual image within every conceivable action. This has been specifically addressed within computer<sup>35</sup>, grasping<sup>36</sup> and throwing<sup>37</sup> tasks, but it can easily be adapted to any conceivable action.
- b. Secondly, an organism must have the cognitive ability to mediate the movement of the spoon bowl 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 spoon bowl within an action trajectory shape, the spoon 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

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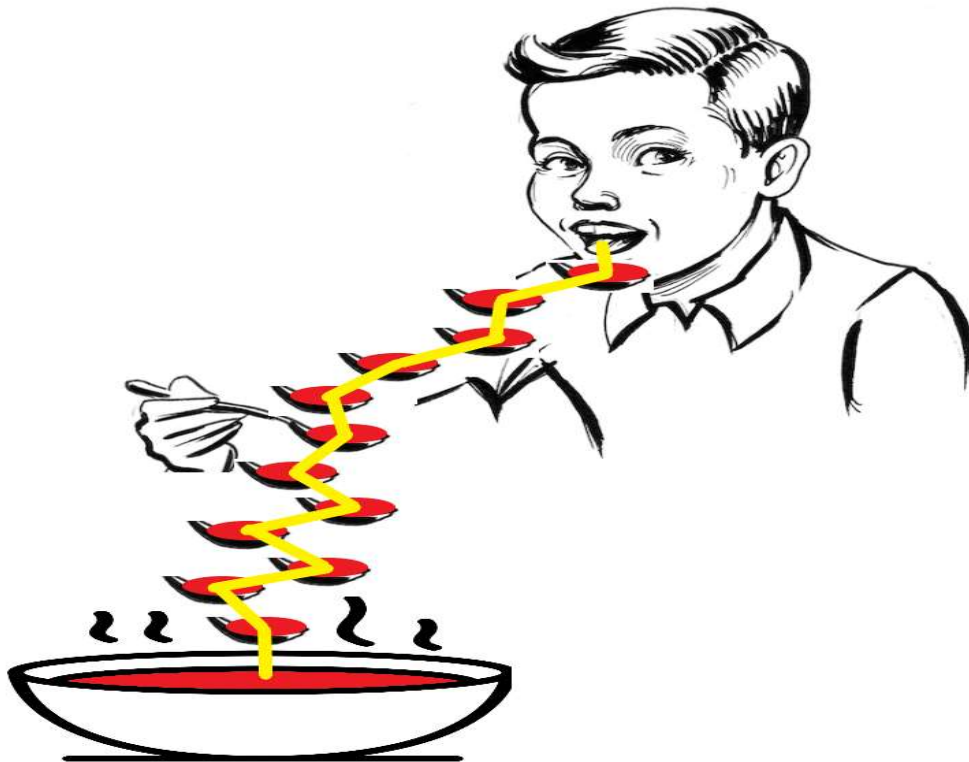
<sup>35</sup> <https://www.researchgate.net/publication/372719694> When moving a pointer on a computer screen you are mainly attentive to where 'nothing' is - The scientific evidence regarding visual perception within each motor action

<sup>36</sup> <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 trajectory? sg%5B0%5D=cjBGD1Dj5Ixr2T4se38lo9o1z\_M-KwSU49eb\_oQsTOUjibSgy5M67E9dyDJ2vYL6jmizwVBbPYrgk9NU6pmmALDQpNZJERFlrXLCWSXY.BBjj\_0oQKGMN\_JQZfSCEjGE1eN9IjRkkPyAjEjWlaxLJGM1U2MeX-LYMQPb3Fz\_XmE18jNVnKKf8WfOSPcG4l1w&\_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6Im-hvbWUiLCJwYWdlIjoicHJvZmlsZSI6InBvc2l0aW9uIjoicGFnZUNvb3RlbnQifX0

<sup>37</sup> <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

straight, ultimate parsimonious, action trajectory shape between the soup bowl and the mouth, 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 (mainly visual) perception of the movement of the spoon will certainly want to follow the perceptual image of the latent action trajectory shape, but the autonomous proprioceptive perception of the movements toward the outer surface of the handle of the spoon will actually ensure that the bowl of the spoon will deviate at every point  $P$  within the perceptual image of the latent action trajectory shape. 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 spoon bowl 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 eating task, the dorsal stream is mainly related to the processing of perceptions concerning the specific position of the bowl of the spoon, 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 spoon bowl relative to the action trajectory shape and vice versa. So, the dorsal stream mainly processes the position of the bowl of the spoon, 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 spoon bowl.

Part 7 - The explanation of the emergence of the cortical streams - We can only guide the spoon bowl towards the mouth and the plate 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

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May 2024

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<https://www.explanatorymodel.nl/>

## 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 start to bring the spoon bowl towards the mouth or plate.
2. The understanding of the necessity of a compelling collaboration between an internal and an external focus in every motor action. The movement of the spoon bowl in relationship to the external action trajectory shape can solely be perceived outside the body and is only caused by perception of movements within the body, reaching only to the outer surface of the spoon. Due to their exclusive domains these perceptions are incompatible.
3. The assumption of the crucial role of the movement of the bowl of the spoon over the action trajectory shape as the essence of this task, 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 spoon bowl within an action trajectory shape towards the plate, it is a subjective choice from the perspective of the bowl of the spoon. With the same arm action, all other parts of the arm (elbow, hand, upper arm, etc.) and all other parts of the spoon also move in a unique action trajectory shape. This demonstrates that there is a causal relationship between the perception of internal and external movements when moving an arm with a spoon, but an explicit relationship only arises when we subjectively "choose" the spoon bowl as the action object<sup>38</sup>.

As a concluding step, this chapter delves into the functioning of the cortical streams when we aim to eat soup with a spoon. 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

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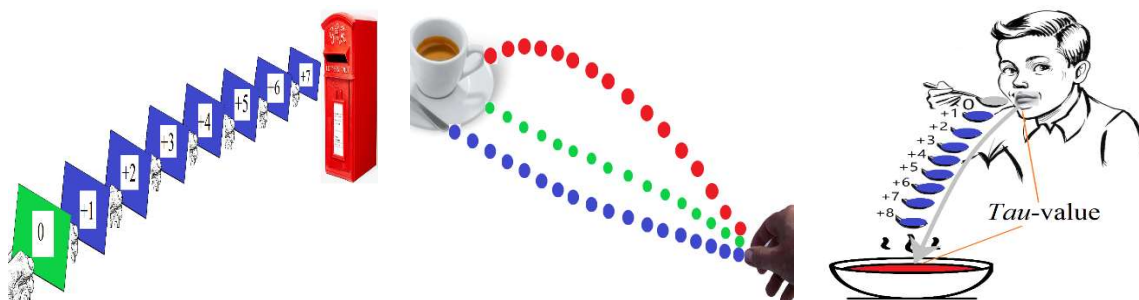
<sup>38</sup> [https://www.researchgate.net/publication/376450400\\_Scientific\\_evidence\\_of\\_the\\_origin\\_of\\_two\\_autonomous\\_foci\\_and\\_how\\_their\\_roles\\_have\\_evolutionarily\\_reversed\\_Within\\_eating\\_the\\_transitioning\\_from\\_random\\_motor\\_activity\\_to\\_the\\_execution\\_of\\_deliberate\\_acti](https://www.researchgate.net/publication/376450400_Scientific_evidence_of_the_origin_of_two_autonomous_foci_and_how_their_roles_have_evolutionarily_reversed_Within_eating_the_transitioning_from_random_motor_activity_to_the_execution_of_deliberate_acti)

explained how they mediate two autonomous processes within every motor action, namely the zigzag process and the accordion process<sup>39</sup>.

1. The tactical movement action (TMA) within eating encompasses the construction of a perceptual image of a latent action trajectory shape between the spoon bowl and the plate/mouth

Supported by scientific evidence<sup>40</sup>, 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 within eating is to create a perceptual image of a latent action trajectory shape between the current position of the spoon bowl and the plate or the mouth.

The explanatory model demonstrates that during this phase, we are indeed largely focused on all physical dimensions of the plate 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 construction of a perceptual image of a latent action trajectory shape between the current position of the bowl of the spoon and the plate also indicates that we strategically determine beforehand whether the space between the spoon bowl and the plate (in the very near future) can be filled or bridged by a continuous line segment shape of all dimensions of the spoon bowl. The explanatory model provides irrefutable scientific evidence, and you can quickly conclude from your own empirical experiences that you create a completely different action trajectory shape when all kind of objects are blocking the plate, and that you do not create any perceptual image of an action trajectory shape when the plate 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 spoon bowl, one must perceive the movement of the action object during the bridging process, as only the spoon bowl, 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 bowl of the spoon, 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 spoon bowl towards the soup within the plate. This contrasts with the traditional perspective of science, which remains constantly focused on the plate itself. During the actual movement action (AMA), our main concern is the

<sup>39</sup> In previous publications, this has been referred to as the harmonica process.

<sup>40</sup> [https://www.researchgate.net/publication/373624625\\_Within\\_any\\_imaginable\\_motor\\_action\\_the\\_external\\_primary\\_focus\\_cq\\_the\\_essence\\_of\\_the\\_task\\_is\\_solely\\_executed\\_by\\_the\\_action\\_object\\_-\\_Solely\\_the\\_external\\_movements\\_of\\_the\\_spoon\\_compel\\_the\\_primary\\_focus\\_w](https://www.researchgate.net/publication/373624625_Within_any_imaginable_motor_action_the_external_primary_focus_cq_the_essence_of_the_task_is_solely_executed_by_the_action_object_-_Solely_the_external_movements_of_the_spoon_compel_the_primary_focus_w)



egocentric bridging process of the spoon bowl, 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 the plate itself is not any longer the focal point, but rather the movement of the spoon bowl towards it c.q. the bridging of the void (!) between the current location of the spoon bowl and the plate 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 bowl of the spoon and the plate can be filled by a continuous line segment shape of all dimensions of the spoon bowl. This means that all positions P between the current location of the spoon bowl and the plate 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 spoon bowl is now, and position P(x+1), the perception of the next position where we need to move the bowl of the spoon. In this phase, we are primarily engaged in the aforementioned bridging process and only monitor whether the gap between the spoon bowl and the plate is closing. This also reveals another essential ecological novelty, showing that during the actual movement action (AMA), we are indeed not concerned with the plate of soup itself, but only with reducing the number of latent positions P within the action trajectory shape.

2. The reciprocal dependency between the internal and external focus results in absolute deviations of the spoon bowl within the perceptual image of the latent action trajectory shape

The explanatory model of the motoric movement action unequivocally illustrates within the context of eating soup with a spoon that two foci always arise<sup>41</sup>. We can only guide the spoon bowl along an external action trajectory 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 bowl of the spoon 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 towards the outer surface of the spoon can lead the spoon bowl externally along an action trajectory shape, yet the progression of the spoon bowl within that trajectory will, as the primary focus, dictate those internal motoric movements. The inevitable consequence of this observation encompasses that it is not a matter of whether the bowl of the spoon 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. Within the actual movement action (AMA) the cortical streams will have to mediate the continuous flow of absolutely emerging deviations

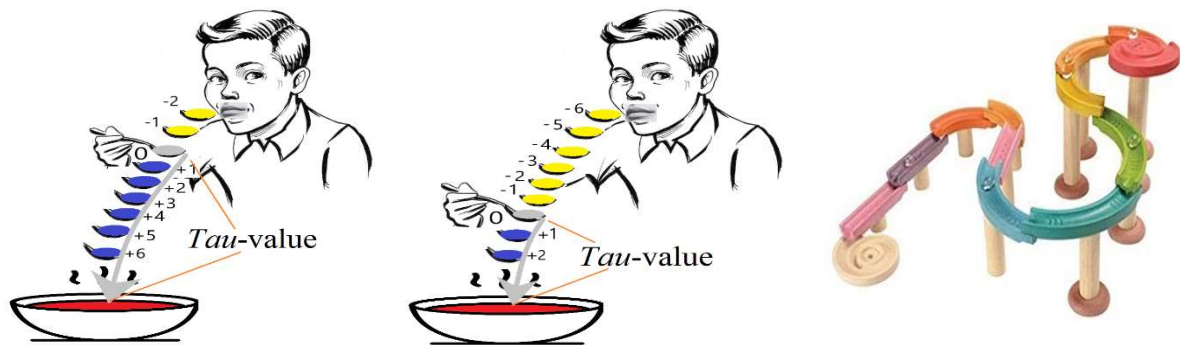
If we now combine the two preceding paragraphs and proceed to actually execute the action of eating, our main endeavour will primarily become to initiate the bridging process of the spoon bowl in which the perceptual image of the action trajectory shape serves as an open yet compelling guiding<sup>42</sup>

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<sup>41</sup> [https://www.researchgate.net/publication/372862585\\_Eating\\_requires\\_the\\_compelling\\_collaboration\\_between\\_an\\_internal\\_and\\_an\\_external\\_focus\\_-\\_Getting\\_the\\_bowl\\_of\\_the\\_spoon\\_to\\_the\\_food-mouth\\_along\\_an\\_action\\_trajectory\\_shape\\_is\\_the\\_sole\\_essence\\_within\\_eating](https://www.researchgate.net/publication/372862585_Eating_requires_the_compelling_collaboration_between_an_internal_and_an_external_focus_-_Getting_the_bowl_of_the_spoon_to_the_food-mouth_along_an_action_trajectory_shape_is_the_sole_essence_within_eating)7t3YNqTJnZU4RTi54cSyfrzX5ZRA&\_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InByb2ZpbGUiLCJwYWdlIjoicHJvZmlsZSI6InBvc2l0aW9uIjoicGFnZUNvbnRlbnQifXQ

<sup>42</sup> 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 spoon bowl deviates, as long as the spoon bowl comes closer to the endpoint. However,

phenomenon. This means that we aim to *step by step* (!) reduce the distance between the current position of the spoon bowl and the plate, starting with the first step of moving the spoon bowl 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 eating, 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 spoon bowl, must emerge from each other, meaning that the perception of the spoon bowl's movement is always captured in one single line segment shape. In which the current position  $P(0)$  of the bowl of the spoon 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 spoon bowl positions prior to the current position  $P(0)$ .

The perceptual image of the entire 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 spoon bowl 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 spoon bowl will inevitably deviate<sup>43</sup> from the perceptual image. It is an absolute factual given that cannot be avoided, and it would quickly lead to chaotic action trajectories<sup>44</sup> if there were not a system capable of mediating these deviations.

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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 borders of the) direction it should take.

<sup>43</sup> As stated in footnote 5, 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 spoon bowl in an identical manner each time, eating would become a neigh 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.

<sup>44</sup> 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 the latent action trajectory shape, constructed within the tactical movement action (TMA), depicts a smooth line segment shape. However, during the actual execution, the spoon bowl, akin to a ring in relationship to a nerve spiral<sup>45</sup>, 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 spoon bowl 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<sup>46</sup>. Similar to a marble in a marble run, the bowl of the spoon in relationship to the 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 spoon bowl towards the action trajectory shape, and vice versa the ventral stream primarily monitors the complete action trajectory shape towards the actual position of the spoon bowl. The nerve spiral clearly demonstrates that this double reciprocal coupling inevitably leads to deviations c.q. to touches of the ring with the spiral, causing the bowl of the spoon 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 shape. Therefore, it ideally presupposes a mutually reinforcing system that continuously monitors the relationship with the action trajectory shape from the current position of the spoon bowl, and conversely, constantly monitors the actual position of the spoon bowl from the perceptual image of the complete action trajectory shape.

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 spoon bowl, while the dorsal stream does so vice versa, primarily from the actual position of the spoon bowl 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 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

<sup>45</sup> <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

<sup>46</sup> You can speak of micro-adjustments or of updating c.q. renewing the perceptual image of the remaining latent action trajectory.

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<sup>47</sup>, 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.



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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<sup>48</sup> 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 action trajectory shape involve deviations of the movement of the action object within the shape and can be characterized as a zigzag process.

##### 5. The zigzag process and the accordion process during the actual movement action (AMA) when eating soup

The explanatory model of the motoric movement action reveals that the zigzag process and the accordion process are inherent in every conceivable action<sup>49</sup>. However, in other actions, demonstrating this

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<sup>47</sup> 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.

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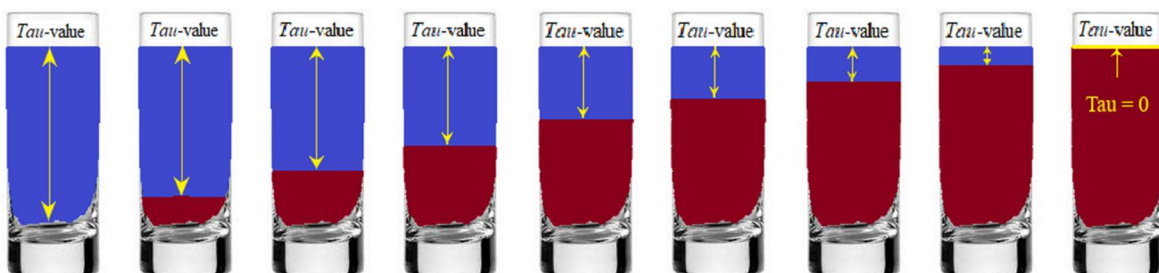


is much more challenging than in cycling or car driving. Nevertheless, in all actions, one must consider separate pedals and a steering wheel that autonomously influence the construction and mediation of the latent action trajectory shape, which will then be processed through hybrid forms of these phenomena. 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 spoon bowl) will definitely deviate from the perceptual image of the latent action trajectory shape in width.

The accordion process (the pedal process) when eating soup is difficult to depict in an animation because it involves compressions and elongations of time<sup>50</sup>. Nonetheless, similar to driving a car, you must realize that you can never move the spoon identically in time along an action trajectory shape. You can quickly observe empirically that they will vary infinitely within certain fluctuation boundaries.



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.

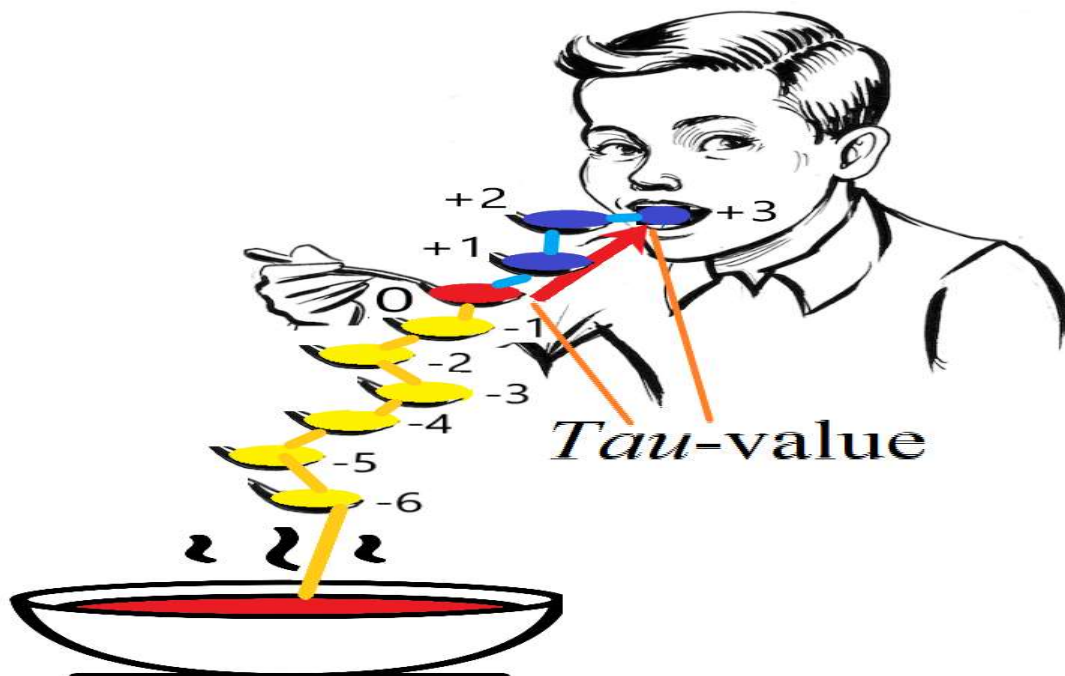
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separate x- and y-axis component actually constitutes the breakthrough that allows us to reduce highly complex perception processes to such seemingly simple phenomena.

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## Part 8 - When eating soup the cortical streams will have to mediate the ego-centric zigzag movement of the spoon toward the plate and toward the mouth



*Caught In A Line*

The explanatory model of all motoric movement actions

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## Introduction

The current scientific perspective views the execution of motor actions as a single, indivisible process because it assumes only one focus in relation to the execution of a single action. It is assumed that in catching a ball or grasping a coffee cup, the perception processes are mainly concerned with these objects, upon which a motor plan (movement plan) is then formulated to get them in hand. This explanation presupposes a significant degree of automation of the movement of the hand (the fingertips) due to the dominant or leading perception of the ball or coffee cup. After all, there is only one focus to be divided. Consequently, in scientific research, the (perception of the) movement of the hand has so far taken a subordinate place.

According to this explanation, when i.e. eating soup with a spoon, it is assumed that the perception processes continually remain focused on the plate of soup. Here too, due to this leading focus, a significant degree of automation of the spoon's movement is assumed, and little further attention is given to the perception processes in relation to the movement of the spoon.

Since 2016, however, a new explanatory model has been developed that sheds a completely different light on the execution of motor actions. It encompasses a universal explanation that shows that the execution of any conceivable action always requires the simultaneous perception of three autonomous foci, in accordance with J.J. Gibson's theory, which compels both the movement of the animal/organism as well as the movement of the environment. In catching a ball or grasping a coffee cup, one autonomous focus remains concerned with (the movement of) the ball and/or the cup as an environmental object, which universally represents a catching action. The other two autonomous foci are concerned with the perception of the movement within the egocentrically executed action, i.e., with the movement of the hand (the fingertips) along an action trajectory shape (towards the ball and/or the coffee cup), which universally represents a throwing action. Thus, the explanatory model confirms the autonomy of perceiving (the movement of) the ball and/or the coffee cup, but also reveals the novel insight that the throwing action of the hand (fingertips) is also a completely autonomously perceived part of the action. The same clarification leads to the confirmation of the autonomous perception of the plate when eating soup, but conversely, it is also formulated that two foci are engaged in autonomously perceiving the movement of the spoon.

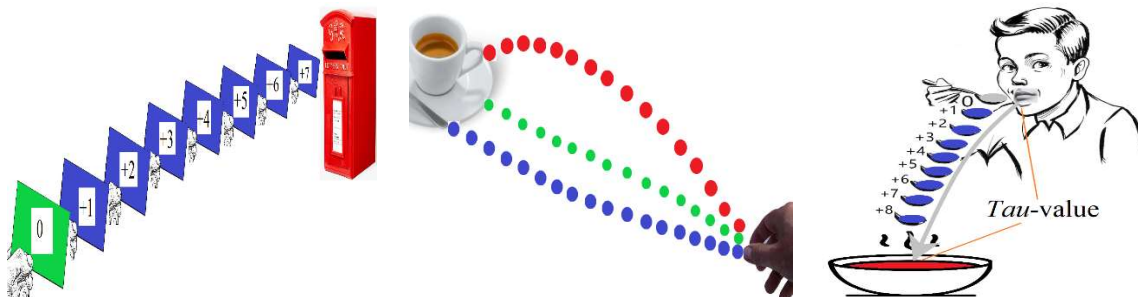
Precisely because the scientific relevance of this aspect has never been recognized, this article specifically focuses on the two foci that belong to the throwing action of the spoon within an egocentrically

executed action trajectory shape in relation to, for example, the eating of soup. It convincingly demonstrates that the spoon can solely be autonomously moved in a zigzag manner within an action trajectory shape. The cortical streams, entirely in accordance with the current scientific literature, must mandatorily mediate this process, and the explanation can only be understood if one realizes that our perception processes must be egocentrically focused on the autonomous guidance of the spoon along an action trajectory shape toward the plate.

6. The tactical movement action (TMA) within eating encompasses the construction of a perceptual image of a latent action trajectory shape between the spoon bowl and the plate/mouth

Supported by scientific evidence<sup>51</sup>, 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 within eating is to create a perceptual image of a latent action trajectory shape between the current position of the spoon bowl and the plate or the mouth.

The explanatory model demonstrates that during this phase, we are indeed largely focused on all physical dimensions of the plate 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 construction of a perceptual image of a latent action trajectory shape between the current position of the bowl of the spoon and the plate also indicates that we strategically determine beforehand whether the space between the spoon bowl and the plate (in the very near future) can be filled or bridged by a continuous line segment shape of all dimensions of the spoon bowl. The explanatory model provides irrefutable scientific evidence, and you can quickly conclude from your own empirical experiences that you create a completely different action trajectory shape when all kind of objects are blocking the plate, and that you do not create any perceptual image of an action trajectory shape when the plate 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 spoon bowl, one must perceive the movement of the action object during the bridging process, as only the spoon bowl, 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 bowl of the spoon, 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.

<sup>51</sup> [https://www.researchgate.net/publication/373624625\\_Within\\_any\\_imaginable\\_motor\\_action\\_the\\_external\\_primary\\_focus\\_cq\\_the\\_essence\\_of\\_the\\_task\\_is\\_solely\\_executed\\_by\\_the\\_action\\_object\\_-\\_Solely\\_the\\_external\\_movements\\_of\\_the\\_spoon\\_compel\\_the\\_primary\\_focus\\_w](https://www.researchgate.net/publication/373624625_Within_any_imaginable_motor_action_the_external_primary_focus_cq_the_essence_of_the_task_is_solely_executed_by_the_action_object_-_Solely_the_external_movements_of_the_spoon_compel_the_primary_focus_w)

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 spoon bowl towards the soup within the plate. This contrasts with the traditional perspective of science, which remains constantly focused on the plate itself. During the actual movement action (AMA), our main concern is the ego-centric bridging process of the spoon bowl, 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 the plate itself is not any longer the focal point, but rather the movement of the spoon bowl towards it c.q. the bridging of the void (!) between the current location of the spoon bowl and the plate 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 bowl of the spoon and the plate can be filled by a continuous line segment shape of all dimensions of the spoon bowl. This means that all positions P between the current location of the spoon bowl and the plate 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 spoon bowl is now, and position P(x+1), the perception of the next position where we need to move the bowl of the spoon. In this phase, we are primarily engaged in the aforementioned bridging process and only monitor whether the gap between the spoon bowl and the plate is closing. This also reveals another essential ecological novelty, showing that during the actual movement action (AMA), we are indeed not concerned with the plate of soup itself, but only with reducing the number of latent positions P within the action trajectory shape.

7. The reciprocal dependency between the internal and external focus results in absolute deviations of the spoon bowl within the perceptual image of the latent action trajectory shape

The explanatory model of the motoric movement action unequivocally illustrates within the context of eating soup with a spoon that two foci always arise<sup>52</sup>. We can only guide the spoon bowl along an external action trajectory 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 bowl of the spoon 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 towards the outer surface of the spoon can lead the spoon bowl externally along an action trajectory shape, yet the progression of the spoon bowl within that trajectory will, as the primary focus, dictate those internal motoric movements. The inevitable consequence of this observation encompasses that it is not a matter of whether the bowl of the spoon 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.

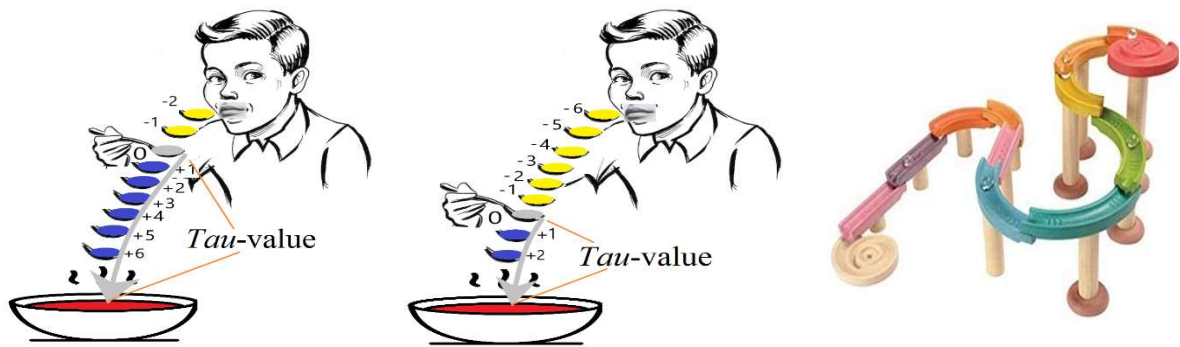
8. Within the actual movement action (AMA) the cortical streams will have to mediate the continuous flow of absolutely emerging deviations

If we now combine the two preceding paragraphs and proceed to actually execute the action of eating, our main endeavour will primarily become to initiate the bridging process of the spoon bowl in which

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<sup>52</sup> [https://www.researchgate.net/publication/372862585\\_Eating\\_requires\\_the\\_compelling\\_collaboration\\_between\\_an\\_internal\\_and\\_an\\_external\\_focus\\_-\\_Getting\\_the\\_bowl\\_of\\_the\\_spoon\\_to\\_the\\_food-mouth\\_along\\_an\\_action\\_trajectory\\_shape\\_is\\_the\\_sole\\_essence\\_within\\_eatie7t3YNqTJnZU4RTi54cSyfrzX5ZRA&tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InByb2ZpbGUlLCJwYWdlIjoicHJvZmlsZSI6bnVvc2l0aW9uIjoicGFnZUNvbnRlbnQifX0](https://www.researchgate.net/publication/372862585_Eating_requires_the_compelling_collaboration_between_an_internal_and_an_external_focus_-_Getting_the_bowl_of_the_spoon_to_the_food-mouth_along_an_action_trajectory_shape_is_the_sole_essence_within_eatie7t3YNqTJnZU4RTi54cSyfrzX5ZRA&tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InByb2ZpbGUlLCJwYWdlIjoicHJvZmlsZSI6bnVvc2l0aW9uIjoicGFnZUNvbnRlbnQifX0)

the perceptual image of the action trajectory shape serves as an open yet compelling guiding<sup>53</sup> phenomenon. This means that we aim to *step by step* (!) reduce the distance between the current position of the spoon bowl and the plate, starting with the first step of moving the spoon bowl 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 eating, 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 spoon bowl, must emerge from each other, meaning that the perception of the spoon bowl's movement is always captured in one single line segment shape. In which the current position  $P(0)$  of the bowl of the spoon 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 spoon bowl positions prior to the current position  $P(0)$ .

The perceptual image of the entire 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 spoon bowl 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 spoon bowl will inevitably deviate<sup>54</sup> from the perceptual image. It is an absolute factual given that cannot be avoided, and it would quickly lead to chaotic action trajectories<sup>55</sup> if there were not a system capable of mediating these deviations.

<sup>53</sup> 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 spoon bowl deviates, as long as the spoon bowl 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 borders of the) direction it should take.

<sup>54</sup> As stated in footnote 5, 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 spoon bowl in an identical manner each time, eating would become a neigh 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.

<sup>55</sup> 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 the latent action trajectory shape, constructed within the tactical movement action (TMA), depicts a smooth line segment shape. However, during the actual execution, the spoon bowl, akin to a ring in relationship to a nerve spiral<sup>56</sup>, 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 spoon bowl 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<sup>57</sup>. Similar to a marble in a marble run, the bowl of the spoon in relationship to the 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 spoon bowl towards the action trajectory shape, and vice versa the ventral stream primarily monitors the complete action trajectory shape towards the actual position of the spoon bowl. The nerve spiral clearly demonstrates that this double reciprocal coupling inevitably leads to deviations c.q. to touches of the ring with the spiral, causing the bowl of the spoon 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 shape. Therefore, it ideally presupposes a mutually reinforcing system that continuously monitors the relationship with the action trajectory shape from the current position of the spoon bowl, and conversely, constantly monitors the actual position of the spoon bowl from the perceptual image of the complete action trajectory shape.

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 spoon bowl, while the dorsal stream does so vice versa, primarily from the actual position of the spoon bowl 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 absolute zigzag and accordion-like deviations barely stand out, making the executed action trajectory shapes appear deceptively straight.

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

<sup>56</sup> <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

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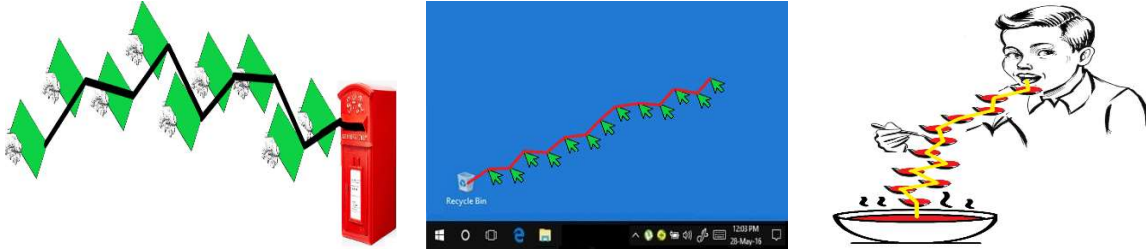
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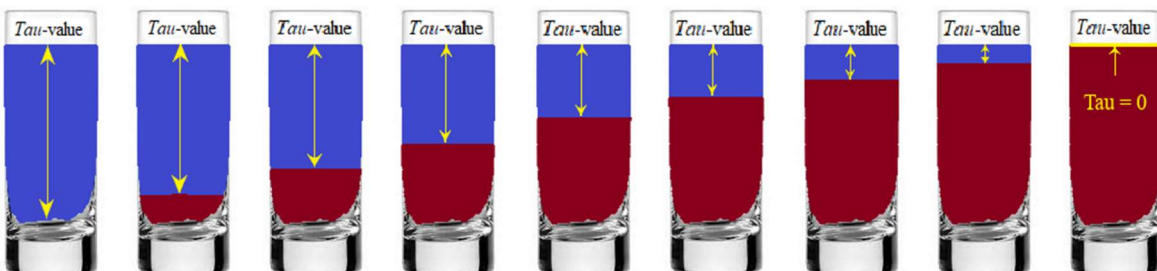
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