The complete clarification of all functional perception processes within pouring and filling






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

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TABLE OF CONTENTS:

	Introduction	1
Part 1	Einstein, the Stationary Mailbox, and the Digital Clock: The Visual Perception Observes Stationary Mailboxes Moving in Time	3
Part 2	Prior to pouring we always first construct a perceptual image of a latent action trajectory shape of wine out of the perspective of the bottle opening – The scientific evidence	8
Part 3	Pouring is a rare motor action because the action trajectory shape becomes visible - Pouring requires a compelling coupling of a secondary (internal) focus to a primary (external) focus	12
Part 4	Within pouring the essence of the task is solely carried out by the (rising) movement of the liquid level in the glass; This external primary focus provides the *tau*-value	17
Part 5	The *tau*-coupling process within pouring demonstrates that we absolutely do not need a motor plan; Executing an external action trajectory shape along which the liquid level rises dictates all internal sensorimotor perception processes	23

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 to fill a glass (kettle, pan, plate, storage container, measuring cup, etc. etc.) with a liquid (substance), one autonomous focus continuously tracks the movement of the ball, the coffee cup and the glass (kettle, pan, plate, storage container, measuring cup, etc. etc.) as the environmental object, universally representing a catching action. The two other autonomous foci are engaged in perceiving the movement within the egocentrically executed action: the movement of the hand (fingertips) or the bottle, liquid, substance, etc., along an action trajectory shape (towards respectively the ball, coffee cup, or glass (kettle, pan, plate, storage container, measuring cup, etc. etc.), 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 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 precisely to all throwing actions. Thus, also within pouring or filling, all liquid or substance positions will always be interconnected and will construct just one sole action trajectory shape, will the actual position of the liquid or substance 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 object 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

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nature of what exactly moves[1]. 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 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 glass (kettle, pan, plate, storage container, measuring cup, etc. etc.) or the tennis ball) is standing still[2]. 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 liquid or substance 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 glass (kettle, pan, plate, storage container, measuring cup, etc. etc.) 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 liquid or substance. 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. Thus, the contact process within pouring or filling involves the identical perception processes as in ordinary grasping.

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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.

2 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.

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This overview document specifically addresses those aspects of the throwing and catching action in pouring or filling that are barely recognized within science. A small part focuses on the perception of the environmental object 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 bottle, liquid, substance, etc.. It shows the scientific evidence that 1. a perceptual image of a latent action trajectory shape from the bottle to the glass, within pouring wine, 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 perception processes within all pouring and filling actions.

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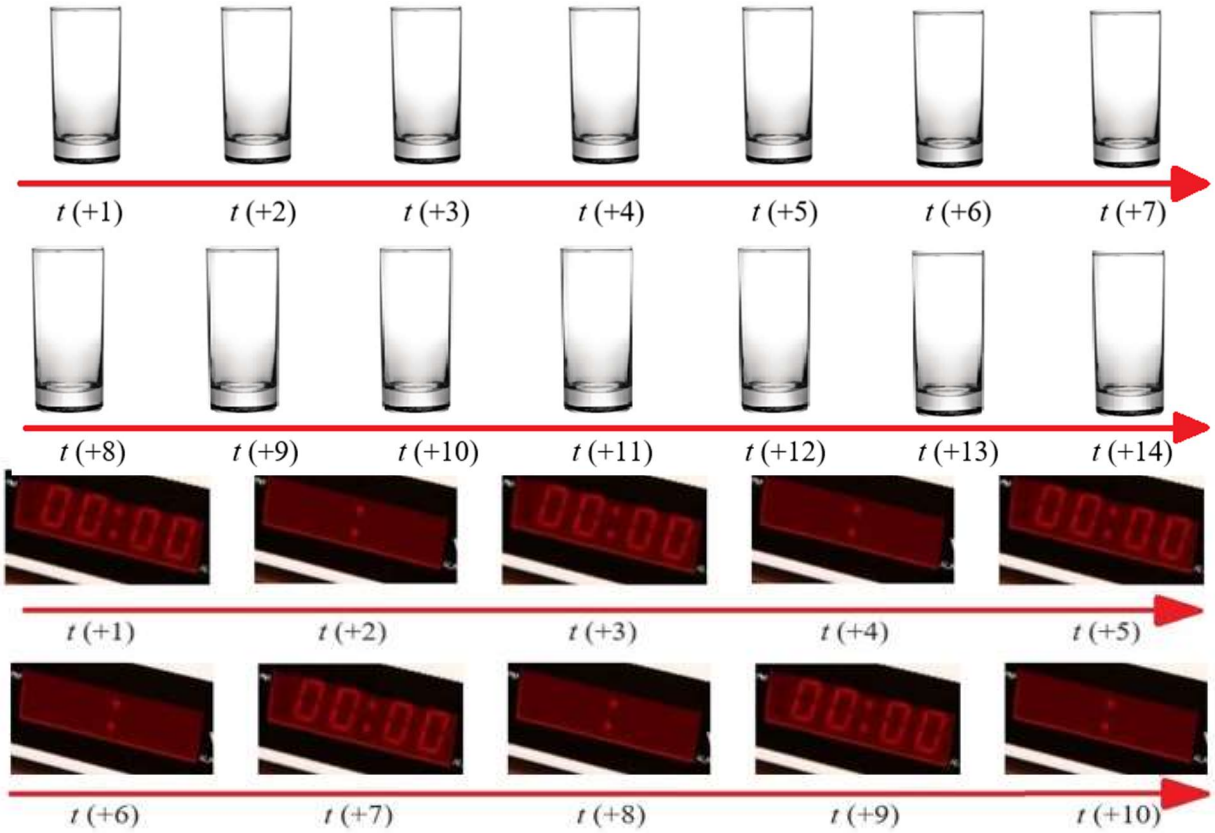
Part 1 - Einstein, the Stationary Glass, and the Digital Clock: The Visual Perception Observes Stationary Glasses Moving in Time



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Introduction

In the dynamic world of visual perception and theoretical physics, seemingly simple objects like a stationary glass 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 glass, 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 Glass

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

1. Static Line Segments:
    - The static nature of the edges and contours of the glass creates a visual perception of stillness. These features remain in the same position, indicating zero movement.
2. Positional Data Consistency:
    - Each point on the glass surface is linked to its previous and subsequent positions in time. This consistent positional data ensures that the glass appears stationary, as there is no disruption in its positional continuity.
3. Perceptual Continuity:

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

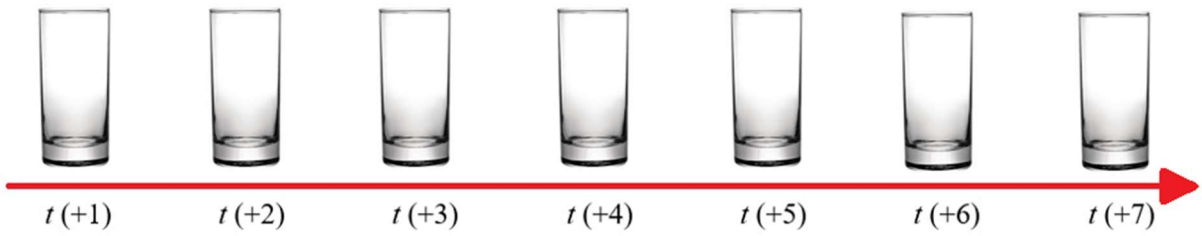
Ecological and Visual Perception

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 glass 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, the brain logically concludes that the object is stationary. This logical processing allows 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 glass. Similar to the flashing zeros on a digital clock, the glass 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 glass 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 glass: although it occupies a fixed spatial position, its temporal trajectory is dynamic. The glass 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 glass 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 glass and the zero-movement within a timeline illustrates a fundamental aspect of both visual perception and theoretical physics. While the glass 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.

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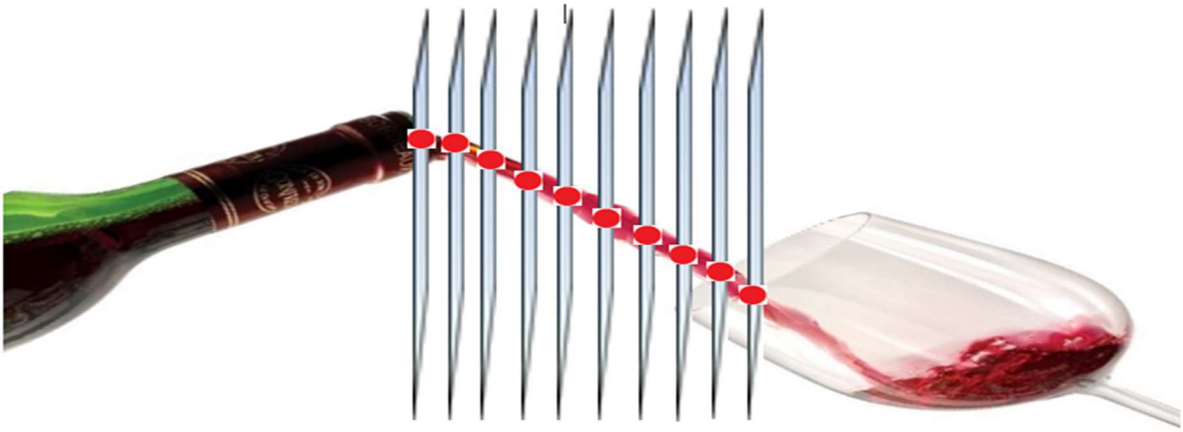
Part 2 - Prior to pouring we always first construct a perceptual image of a latent action trajectory shape of wine out of the perspective of the bottle opening – The scientific evidence



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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[3], in accordance with J.J. Gibson's theory, which includes both the movement of the animal/organism and the movement of the environment. When pouring wine into a glass, one autonomous focus remains engaged with (the movement of) the glass 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 wine along an action trajectory shape (toward the glass), which universally represents a throwing action.
This article specifically focuses on the two foci belonging to the egocentric throwing action of the wine in relation to pouring it into a glass. 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[4].
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 wine over a pre-planned action trajectory shape between the position of the bottle opening and the glass[5]. This perceptual image is therefore determined in advance within a tactical consideration and involves identifying the future sequential positions the wine must occupy to achieve a successful action. Sequential positions of any object effectively always create line segment shapes, which becomes clearly visible during pouring, and when the action is actually performed, the droplets, which essentially form the stream of liquid, 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

[3] 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
[4] 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.
[5] https://www.researchgate.net/publication/373826043_Within_pouring_the_essence_of_the_task_is_solely_carried_out_by_the_rising_movement_of_the_liquid_level_in_the_glass_This_external_primary_focus_provides_the_tau-value

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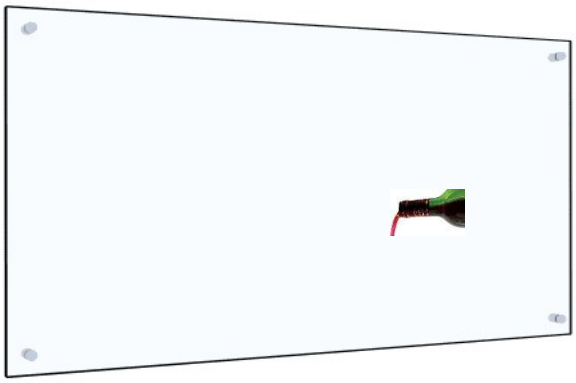
and, in full accordance with the findings of D.N. Lee, produces the *tau*-value, which plays a crucial role in the completion of the motor action in cooperation with the secondary focus[6].
The explanatory model of the motoric movement action partly relies on logical reasoning but also presents scientific evidence. This chapter provides scientific proof that within pouring, we always first create a perceptual image of a latent successful action trajectory shape of liquid out of the perspective of the bottle opening before we actually perform any action.

The scientific evidence

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 pour wine into a glass. The only instruction given is to only execute the action if the test subject believes there is a realistic possibility of actually getting the wine into the glass.

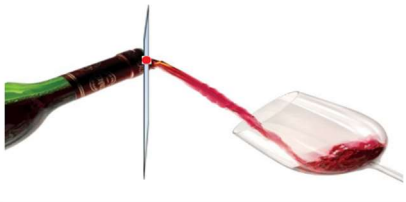


Images: The scientific proof is based upon the competence to visualize a giant huge glass shopping window. The left image shows a normal dimension of such a window. In relationship to the scientific proof you need to magnify that image 10 to 20 times. Like in the right image.

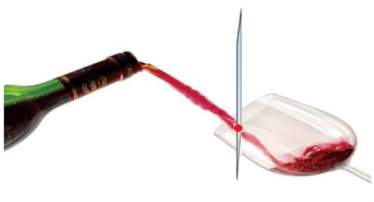
Choose a random glass and a random bottle of wine and create the following circumstances:

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

Situation 1



Situation 2



Situation 3

Images: In situation 1 a test subject will normally execute the pouring action. In situations 2 and 3, where a giant glass store window is placed between the bottle opening and the glass, the test subject

[6] https://www.researchgate.net/publication/375641377_The_tau-coupling_process_within_pouring_demonstrates_that_we_absolutely_do_not_need_a_motor_plan_Executing_an_external_action_trajectory_shape_along_which_the_liquid_level_rises_dictates_all_internal_

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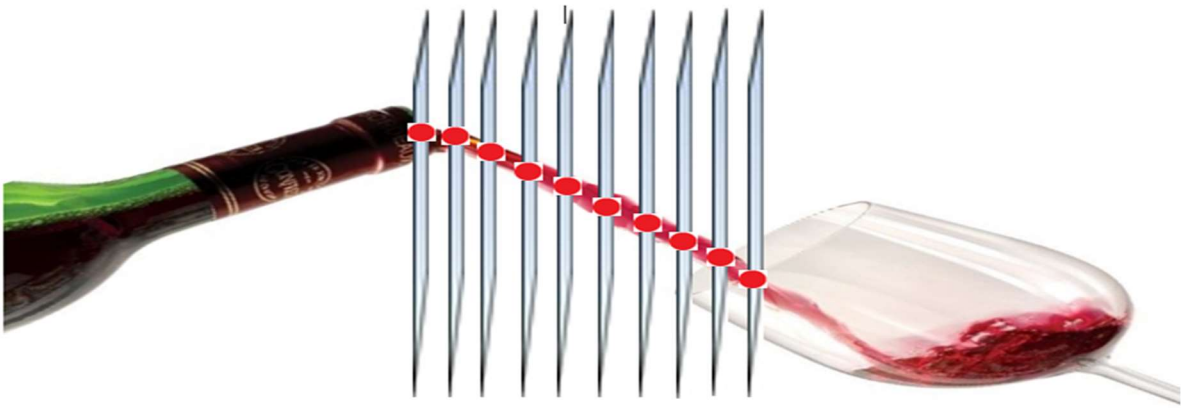
will not start a pouring action with the intent to actually get wine into the glass. This is because there is *one* (!) position P that is perceived as blocking the wine.

Conclusion:

In situation 1, you and/or the test subject will just execute the pouring of the wine. In situations 2, 3, and 4, you and/or the test subject do not initiate a pouring action with the intent to get wine into the glass. 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 bottle opening or near the glass 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 execute a successful action. This applies to every conceivable position P of the shop window, from the very first position P(0) near the bottle opening to a shop window occupying the last position P(n) just before the glass.



Situation 4

Image: In situation 4, it becomes clear that prior to the actual execution, we consider all consecutive *future* (!) positions of the wine. It doesn't matter where the shop window is positioned between the bottle opening and the glass; 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). Which becomes clearly visible within pouring. 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 bottle opening and the glass beforehand, clearly determining whether each position P allows the wine to pass through so that it can ultimately reach the glass. 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 bottle opening and the glass beforehand if that specific position P(x) is also allowing the physical dimensions of the wine to pass. Mathematically, an uninterrupted series of consecutive positions P can be designated as a line or line segment shape (action trajectory shape). Which completes the scientific proof that within pouring, we first form a perceptual image of the entire latent action trajectory shape of wine out of the perspective of the bottle opening before we actually execute anything.

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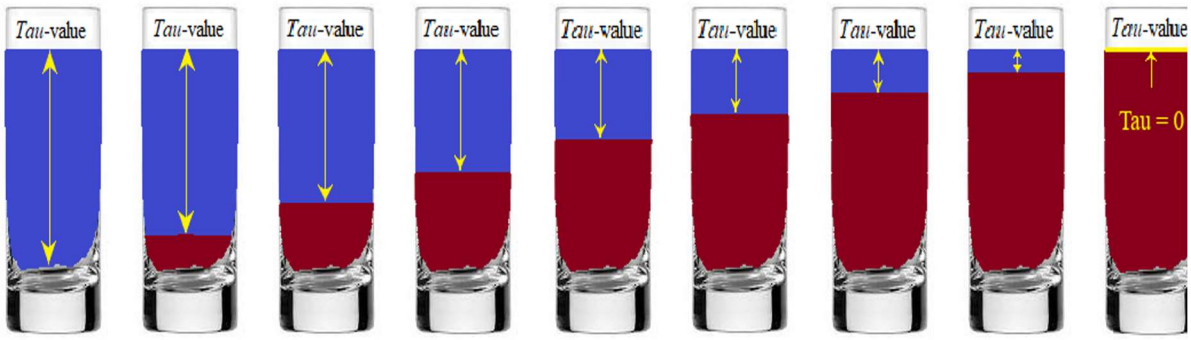
Part 3 - Pouring is a rare motor action because the action trajectory shape becomes visible - Pouring requires a compelling coupling of a secondary (internal) focus to a primary (external) focus



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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 100+ 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 (spoon, 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 motoric 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 motoric movement action of pouring. The article convincingly demonstrates that only the liquid level, i.e., the rising (moving) liquid level in the glass, similar to a marble in a marble run, executes this action trajectory shape and thereby accomplishes the essence of the task within pouring. For this reason, primary attention must be directed toward the external rise c.q. movement of the liquid level. The liquid level can only move with entirely different movements within the body that only reach the outside of the bottle (or kettle, etc.). The attention required for this must serve the main goal and is therefore referred to as the secondary (internal) focus.
Furthermore, the explanation also 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 ecological argument imaginable. The article does not delve deeply into the differences with the current state of science, as there is still no clear consensus on this topic within the scientific community.

The primary focus when filling a glass involves the perception of a movement outside the body

The explanatory model of all motoric movement actions, in the context of pouring, demonstrates that only the liquid level c.q. the rising liquid level, carries out the essence of the task and thus constitutes

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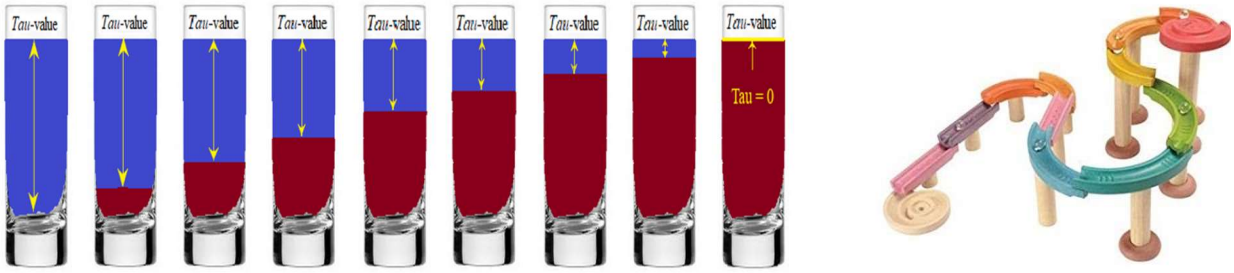
the primary focus within this action. The explanatory model provides scientific evidence that any motoric action always consists of two consecutive autonomous phases. In the first phase, a tactical consideration aims to create a perceptual image of a latent action trajectory, in this case, the shape of the liquid or the movements of the liquid, which will lead to success. Only after achieving this perceptual image does one proceed to the actual action.



Images: Pouring is solely about filling a glass. The essence of this task is exclusively carried out by the autonomous movement of the rising liquid in the glass, and therefore, that is the primary process we need to observe. Although it may be somewhat harder to discern here, the liquid level follows an action trajectory shape just like in any conceivable action. Exactly akin to how a marble travels along a marble run. In any conceivable motor action, the current position of the marble c.q. the action object will precisely mark the division between the manifest and latent parts of the action trajectory. In the illustrations of the glasses, the current liquid level at position P(0) precisely marks that division. The positions already traversed are marked in red, while the latent positions yet to be traversed are in blue.

When we factually start to execute the action, we are essentially filling in that perceptual image of the action trajectory shape with the liquid (from the bottle, kettle, etc.). So, within the primary focus, this is the essential process that our perception processes 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 with the liquid yields the essential *tau*-value to which the secondary focus is compellingly linked and will be explained how the cortical streams have to mediate this process.

Images: The motoric movement action *pouring* is unique because it is one of the few actions where the action trajectory shape becomes visible. Similar to writing, droplets are poured at a microscopic level. The first arriving droplets create the manifest part of the action trajectory.

We might indeed form perfectly straight action trajectories when we create perceptual images beforehand during pouring. However, due to the fact that you can only execute the movement of the liquid level in the glass through the perception of an entirely different autonomous movement, the liquid level in the glass will inevitably deviate from the 'perfect' original perceptual image at every position P within the action trajectory. This process, therefore, needs to be guided by the double and mutual

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interaction of the cortical streams, which represents the brilliant ecological solution of the body to execute every motor action in the most efficient and effective manner. The ventral stream and dorsal stream continuously interact to correct the inevitable deviations, but this interaction requires a small reaction time[7]. As a result, we (conform Bernstein) can never execute one motor action identically and the rising of the liquid will always follow a constantly varying zigzag pattern during pouring.

The secondary focus when filling a glass involves the perception of a movement inside the body

When observing the pouring process and realizing that the primary focus concerns only the movements of the liquid level in the glass, it becomes evident that we cannot actually move the liquid itself. This principle applies not only to a ball in a free throw in basketball or various other inanimate objects like tennis rackets, bicycles, cricket bats, spoons, knives, pens, 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. While the outer surface of our fingertips consists of living cells, we cannot move them along an external action trajectory shape outside the body with those living cells. We can only move the outer surface of the fingertips through internal movements within our body. These movements bring them close to the outer edge of the fingertips, but they still remain within the confines of the body. Similarly, in the case of pouring a liquid, we can only haptically perceive the bottle with the (outer surface of) our fingertips, and we can only proprioceptively[8] sense how movements within our body affect the haptic contact with the bottle.

Image: Filling a glass is just one specific way of pouring. A significant percentage of mankind will have to visit a rest room multiple times a day and have lots of troubles “pouring” effectively and at a water pump, we use a pumping mechanism to pour water into a bucket. However, the method doesn't matter. The stacking of two autonomous foci will always reveal the same universal collaboration.

[7] 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

[8] Scientific research has demonstrated that proprioceptive perception encompasses two autonomous phenomena, namely: 1. *Limb Position* (LP) and 2. *Movement* (M). The explanatory model clearly illustrates this within the context of cycling as well. LP is linked to the overall cycling technique, while M pertains to the specific point where this overall perception needs to be transferred to the pedal.

Also within pouring, the goal of the task is implicitly linked to the perception of the primary focus, which often leads us to be unaware of the secondary focus during many motor actions, particularly because these often involve straightforward perceptions. However, in highly complex motor actions like a tennis serve, attention is solely directed at the secondary focus (the service technique), completely disregarding the fact that the primary focus involves creating an outgoing ball trajectory (OBT).
With some practice, you can consciously perceive both foci simultaneously within many motor actions. For instance, in a grasping action, you can perceive the action trajectory on the outside of your body while simultaneously focusing your attention on movements within your body. Which is exactly what can be experienced during a pouring action.

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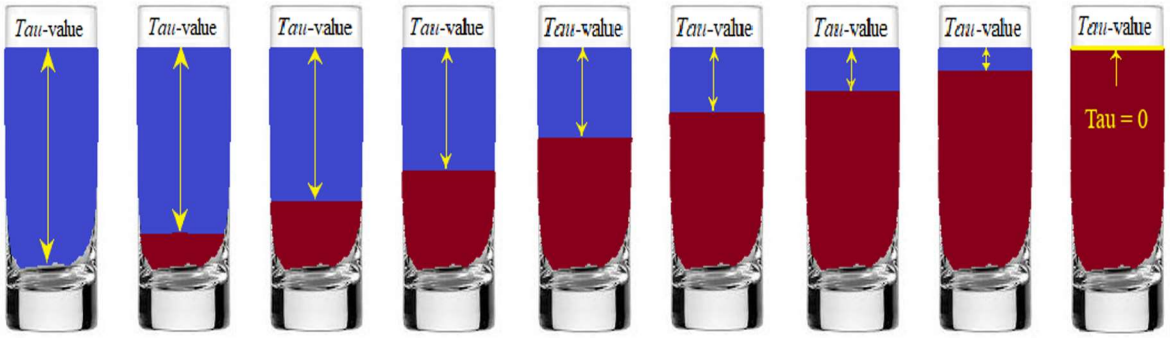
Part 4 - Within pouring the essence of the task is solely carried out by the (rising) movement of the liquid level in the glass; This external primary focus provides the *tau*-value



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

N.J. Mol

Introduction

Traditionally, science has assumed that one motor action corresponds to one focus. This assumption was likely so intuitive that it was never challenged. However, this has led to the situation where, even after more than 100 years of movement sciences, a plausible explanation for the underlying functional perception processes guiding the execution of all motor actions had never been found.
In contrast, in 2016, an explanatory model emerged that has the capability to identify all functional perception processes within any imaginable motor action. It demonstrates, beyond any reasonable doubt, that each motor action can only be executed through a mandatory coupling of two foci: an internal (secondary) focus that must always be directed towards an external (primary) focus. In which it should be explicitly noted that these two foci represent entities that fundamentally differ from current scientific terminology.
Regarding the external (primary) focus, it can be noted that science has thus far truly missed everything. Therefore, it will now be discussed comprehensively within a wide spectrum of motor actions, and this publication now unveils all aspects of the primary focus within the motoric movement action *pouring*. Pouring is a unique motor action because, like writing, the action trajectory shape becomes partially visible.

Solely the rising movement of the liquid level determines the essence of the task c.q. the external (primary) focus within the motoric movement action *pouring*

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 may indeed want to quench our thirst, but the egocentrically formulated goal is solely to raise the liquid level in the glass. Only that fact determines the essence of the task, and therefore, only that fact should be considered as the external (primary) focus.

The tactical movement action (TMA) in relationship to pouring

Images: Firstly, an egocentric intention must be formulated that we want to quench our thirst and that we want to fill a glass. Subsequently we then create a perceptual image of a latent action trajectory shape outlining how we will let the liquid level rise. This occurs as part of a tactical action where two

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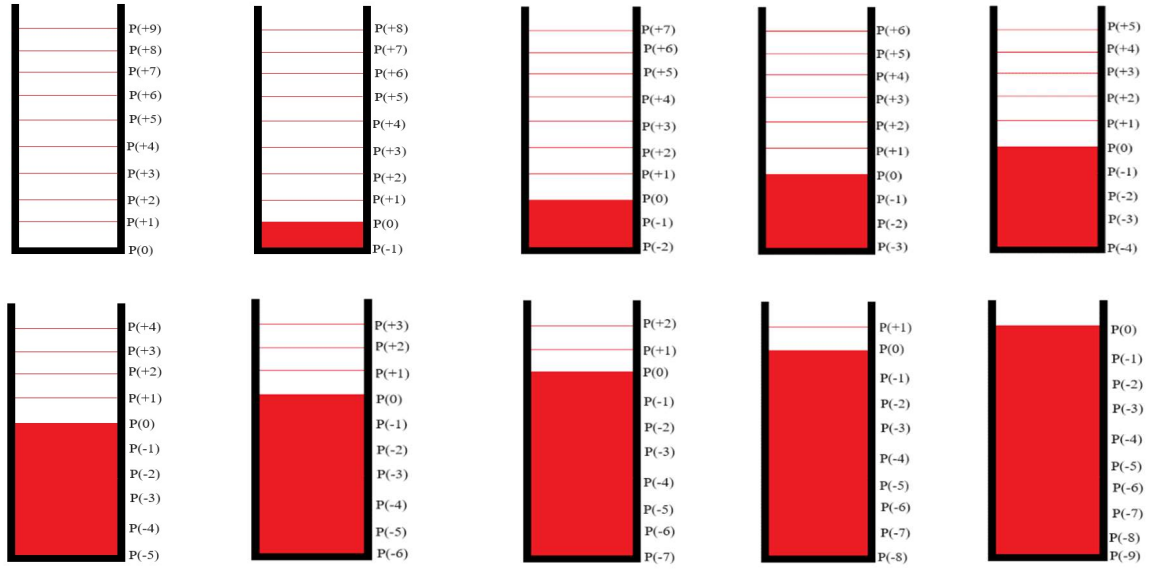
important objectives are considered. Firstly, it must lead to a successful action, and additionally, ecologically evolved organisms aim to execute actions as parsimonious as possible. Pouring actually involves the formation of two action trajectory shapes. The first action trajectory shape concerns the transition of the liquid into the glass, and the second action trajectory compels the rise of the liquid level in the glass. This publication focuses solely on the rise of the liquid level c.q. focuses solely on the essence of the task.

The explanatory model of the motoric movement action demonstrates that after formulating an egocentric goal, we always engage in a tactical consideration[9], 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 liquid level to rise successfully.

The factual movement action (FMA) within pouring

After determining a perceptual image of a latent action trajectory shape, we proceed to actually perform the action, and this begins with bridging the gap from the current position P(0) of the liquid level to the next position P(+1) within the action trajectory shape. Although, of course, we ultimately want to reach the edge of the glass, in that phase, the explanatory model clearly shows that our perception processes are solely focused on bridging the empty space between the bottom and the edge of the glass. On a micro-level, only positions P(-1), P(0), and P(+1) are important to us at that point.



Images: In an animation, the progression of an action trajectory shape can be depicted as follows. Within any conceivable action, the action object c.q. the liquid level can successfully execute an action only by first occupying the next position P(+1) within the action trajectory shape. The current position P(0) then shifts one place upward, and a manifest position P(-1) is added. This process continues with each new position P(0) until the end of the action trajectory shape 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).

[9] 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 perception-action coupling within pouring

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 is essential to recognize that while the ultimate goal involves reaching the edge of the glass, during the execution of the action, we are only occupied with bridging empty space where apparently *nothing* (!) is happening. Within any conceivable action, it can be observed that one spends relatively more time bridging the void than there seems to be any actual activity taking place. However, the explanatory model makes it abundantly clear that in pouring, not only the end goal is significant but also that all positions P between the bottom and the edge of the glass are equally important.
Additionally, it should be noted that the action can be clearly perceived within the perceptual image, but there is no fixed unit of time that can be associated with it. Each unit of time can be divided into a thousand smaller units, and these units can be further subdivided, leading the explanatory model to argue that the action at P(0) fundamentally takes such a brief time span that it only gains significance in relationship to perceptions of the adjacent time frames. In other words, perceiving the actual position of the liquid level solely gains meaning through the adjacent future "actual" positions P(+x) and the adjacent manifest "actual" positions P(-x) of the liquid level. 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: In many motor actions, the action trajectory shape will not become visible, making it often challenging to form an understanding of the perception-action coupling. Pouring and writing make it somewhat easier because the manifest part of the action trajectory remains visible. However, the perceptual image of the latent part remains invisible. On the contrary, in the case of a marble in a marble run, this phenomenon is very clearly visible. 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

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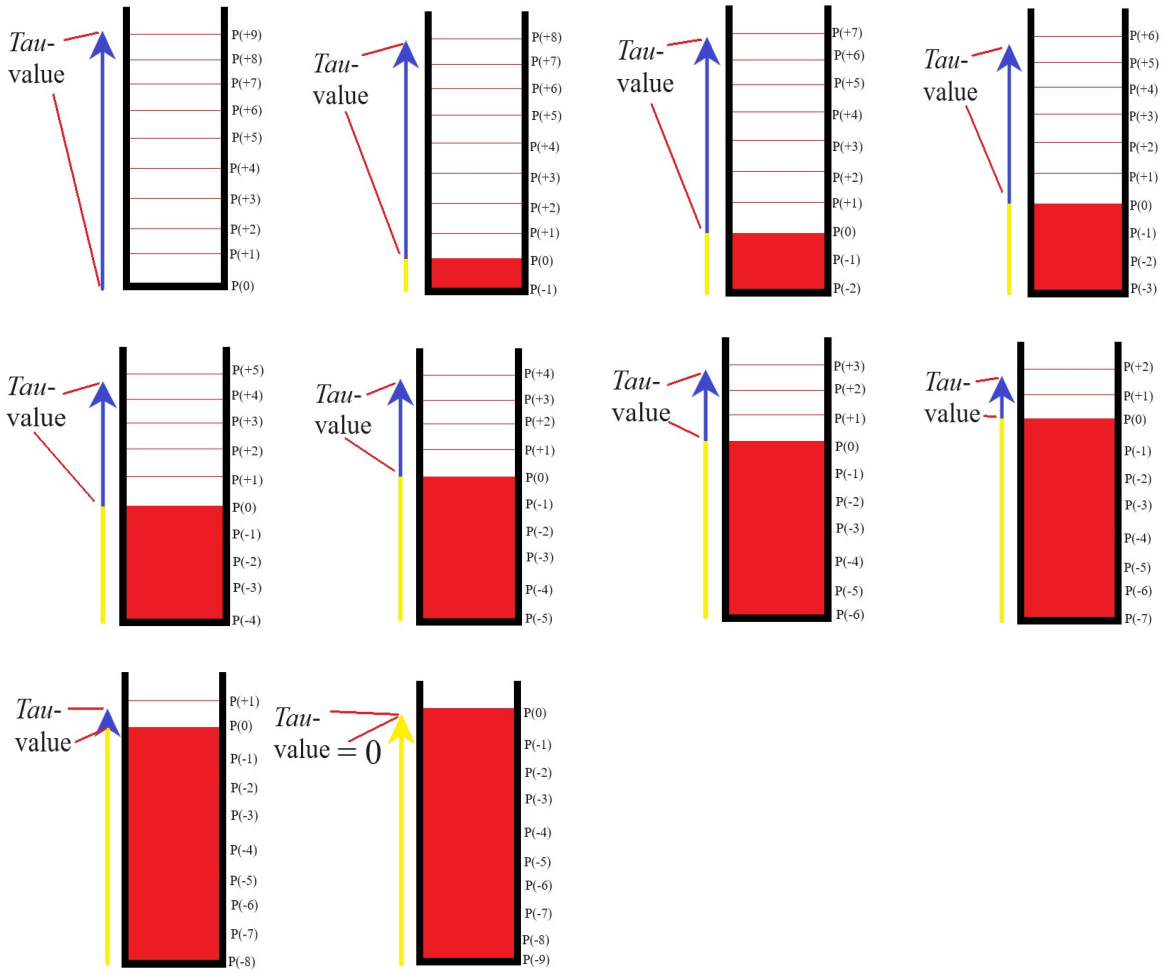
conversely, without the marble, we would be completely unable to perceive any coupling as well. There is a compelling interdependent relationship, and without that coupling, we would never, under any circumstances, be able to execute any motoric movement action.

The *tau*-value in relationship to pouring

The explanatory model of the motoric movement action, in conjunction with the perception-action coupling, demonstrates that the perception of each position of the liquid level c.q. the action object within the action trajectory shape is equally important. However, when the liquid level approaches the end of the action trajectory shape, the task or the egocentrically formulated will is about to be finalized. In every conceivable action, the action object progresses through the action trajectory shape in a universal manner until there are no latent positions P left. Within his *tau*-coupling theory, D.N. Lee referred to this as approaching the *tau*-value to zero.



Images: Within the perception-action coupling, the liquid level 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 liquid level, the *tau*-value will decrease, until it eventually approaches zero c.q. becomes zero.

The perception of the *tau*-value within pouring

The perception of the *tau*-value within the external (primary) focus is an essential process because, within a strict *tau*-coupling, it must establish a compelling relationship with the internal (secondary)

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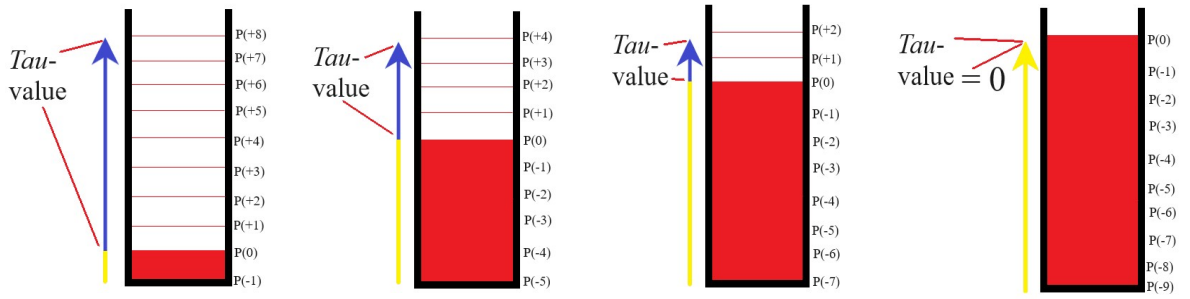
focus to make an action successful. When it is observed that the liquid level is approaching the edge of the glass, the perception within the secondary internal focus c.q. the perception of the movements of the bottle, must ensure that the bottle is slowed down and tilted back in a way that decelerates the rise of the liquid level and brings it to a precise stop.



Images: When you fill a glass, you can perceive how the *tau*-value approaches zero in two ways. On one hand, from the perspective of the liquid, you can observe how the fluid gradually occupies the latent positions P within the action trajectory shape. Then you primarily focus on how the red block, or the red action trajectory shape, develops. On the other hand, in a much more fundamental way, from the perspective of the empty glass, you are capable to perceive how the emptiness inside the glass gradually disappears. Then you mainly observe how the white block vanishes, or how the white positions P of the latent action trajectory shape disappear. Essentially, then you only perceive how the latent white *gap* (conform Lee) closes.

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 liquid level. 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.

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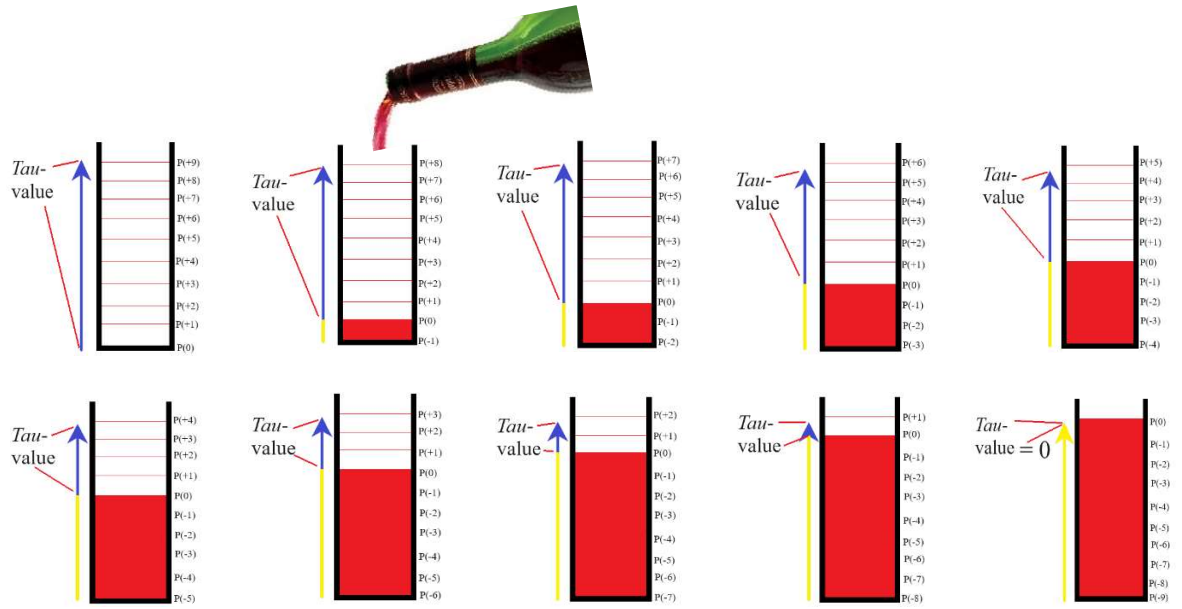
Part 5 - The *tau*-coupling process within pouring demonstrates that we absolutely do not need a motor plan; Executing an external action trajectory shape along which the liquid level rises dictates all internal sensorimotor perception processes



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

N.J. Mol
November 2023

Introduction

When we aim to fill a glass, the explanatory model of the motoric movement action has demonstrated that only the (ascending) movement of the liquid level embodies the core of the task and thus the essence of our egocentric intention. In which 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 along which we can successfully move all dimensions of the action object[10], in this case, the liquid level, to the edge of the glass[11].
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[12].
However, 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 on its own. 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, in which the liquid level moves at an obvious distance from the body, this insight will be easily recognized, and it will also be easy to determine that the

[10] 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. The action object in pouring is the liquid level, and this may feel somewhat peculiar. Nevertheless, this is the aspect we focus on during pouring, and which has been demonstrated within scientific research (Hayhoe, Land e.a.).
[11] https://www.researchgate.net/publication/372290282_Grasping_encompasses_two_consecutive_autonomous_phases_-_The_scientific_proof_that_we_tactically_construct_an_action_trajectory_shape_prior_to_the_factual_execution_of_that_exact_same_action_trajector
[12] https://www.researchgate.net/publication/373167637_Pouring_is_a_rare_motor_action_because_the_action_trajectory_shape_becomes_visible_-_Pouring_requires_a_compelling_coupling_of_a_secondary_internal_focus_to_a_primary_external_focus

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rising of the liquid level can solely be moved along an external action trajectory shape with movements within the body that solely reach up to the outer surface of the bottle[13,14].

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.

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[15] gradually approached zero and eventually completely disappeared. While Lee's discovery generated significant interest in the scientific community, a major breakthrough remained elusive. Lee 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

[13] 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_

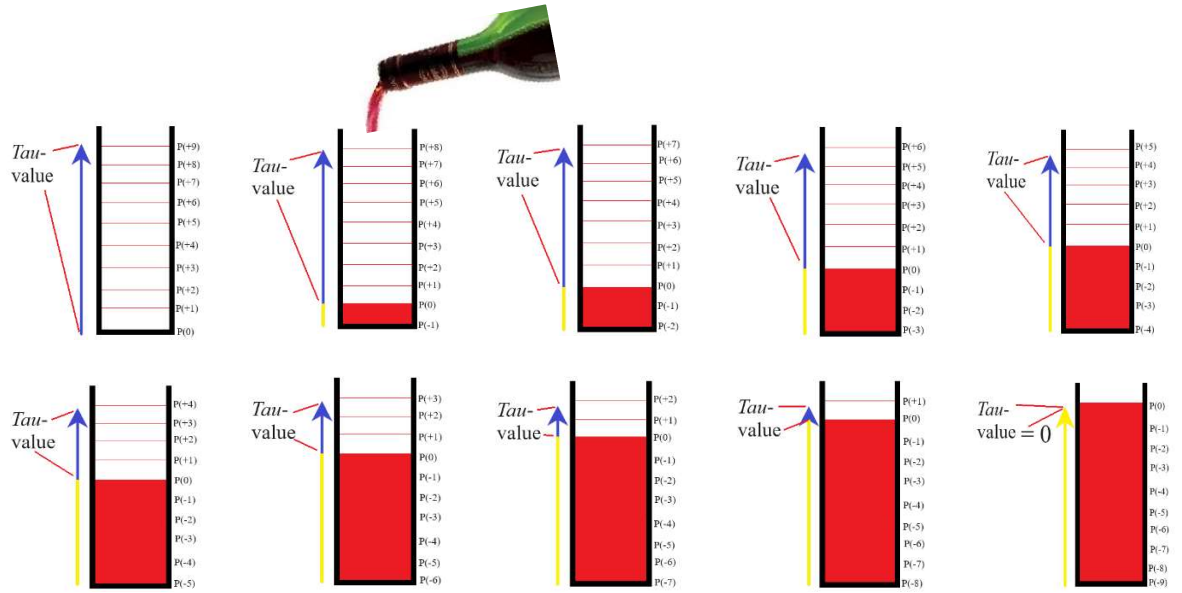
[14] This intriguing dualism demands our utmost attention as it presents the essence of our perception processes. The internal (secondary) focus not only meticulously tracks the movement of the action object within the action trajectory shape but is also the instigator of this movement. It might sound 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.

[15] 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.

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 filling a glass

In general, we typically fill objects (glasses, buckets, kettles, etc.) with a substantial fill capacity. This means that, after a short, probably slightly slower initial phase, the liquid level must first traverse a relatively long distance during which seemingly nothing remarkable happens. Although the explanatory model of the motoric movement action indicates that bridging[16] this apparent 'nothingness' by the liquid does indeed demand much of our perception processes, where the cortical streams are crucial, the egocentrically formulated will is only finalized at the end of the action trajectory.



Images: Before we proceed to fill a glass, a perceptual image is constructed of a latent action trajectory shape, along which the liquid level is capable to successfully reach the rim of the glass. By observing the illustrations, it can be objectively determined that only the liquid level fills this action trajectory, thus exclusively embodying the essence of the task. Furthermore, it is objectively ascertainable that the liquid level moves akin to a marble in a marble run, where the current position P(0) of the liquid level always precisely demarcates the separation between the manifest (yellow) and latent (blue) segments. The disappearance of the latent segment of the action trajectory shape can be perceived in two ways: one can observe how the yellow (manifest) part supplants the blue (latent) part of the action trajectory or, in a more fundamental sense, one need only observe the speed at which the blue segment vanishes c.q. at which the blue gap closes.

While it may appear that only the end of the action trajectory is crucial, the explanatory model is clear: the bridging process of every position P of the liquid level between the bottom and the top of the glass is equally vital for success. The finalization of the action and the bridging process are, in fact, two

[16] In contrast to current scientific beliefs, the explanatory model of the motoric movement action demonstrates that, contrary to prevailing thought within the scientific community, the essence of the task is indeed finalized at the end of the action trajectory shape. However, it also asserts that the transitional phase is equally integral to the task. Both phases hold equal significance, and they must both be executed successfully for the entire motor action to have any chance of success.

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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 execution of the ending is also crucial for a motoric action to succeed. The final success of a motoric action depends on observing that the *tau*-value within the external (primary) focus approaches zero. Then, within the internal (secondary) focus, adjustments must be made to the movements towards the outer surface of the bottle, ensuring that the liquid level ends precisely at the correct height in the glass, preventing it from being too little (which the customer would not accept) or overflowing. So within many motor actions, it can be observed that after a phase of relative acceleration during the bridging phase, there is a relative deceleration of the action object as the end of the action approaches[17].

The perception of the sensorimotoric movements inside the body within the internal (secondary) focus while manipulating the outer surface of the bottle within a pouring action

The explanatory model of the motoric movement action presents a completely new paradigm. It's based on the factual observation that an autonomous internal movement of any organism will implicitly induce an autonomous external movement on 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 from each other c.q. that all those positions P will always be interconnected[18]. Which factually means that those connected positions on the outside of the body will always create an external line segment shape. So the most important conclusion reveals that the internal and external movements are implicitly connected, but that the perception processes mediating these movements are completely autonomous and independent of each other[19].
The previous explication does not concern the paradigm itself, but rather its foundation. The explanatory model notes that the mentioned phenomena will emerge regardless of which focus you centralize. The new paradigm, however, involves the novel concept that you can complete a motor action entirely by focusing solely on creating and completing the aforementioned external action trajectory shape. In contrast to the idea that the earliest organisms began with an emphasis on arbitrary motor movements within the body and then experiencing what external results they would have, the explanatory model asserts that these roles, after millions of years of evolution, have now been entirely reversed. When filling a glass, we predominantly perceive, within the external (primary) focus, the (rising) movement

[17] As explained in this section, the explanatory model underpins the notion that within many motoric actions a bell-shaped profile is capable to occur 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.
[18] If you, for example, isolate your arm and make random internal movements, all outer parts of your arm will start to move as well. So the fingertips, the knuckles of your hand and the elbow will randomly move as well about which can solely factually be remarked that, within our worldly dimensions, they will always construct only one line segment shape. The movements of all action objects c.q. all environmental objects are always caught in a line.
[19] 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.

of the liquid level in the glass outside the body, and guide that progression with motor movements within the internal (secondary) focus, which extend only to the outer surface of the bottle.
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. 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[20,21]. 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[22].
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.

[20] 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.
[21] 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.
[22] 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

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

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[23]. 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 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 altering 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

[23] 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.

also explained within the motoric action of pouring[24]. 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. Which essentially 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. The sensorimotoric movements towards the outer surface of the bottle are perceived proprioceptively

The explanatory model clearly demonstrates that the internal (secondary) focus is exclusively perceived within the body, showing that there is never any visual perception involved. The internal (secondary) focus can only be proprioceptively perceived. You can actually verify this while pouring by covering everything except the glass. As long as the glass remains visible, it will have no impact on the pouring action.

g. Hybrid (proprioceptive) perception processes

A significant shortcoming in current 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. Visual perception will be highly dominant, but proprioceptive perception will always remain in some hybrid form. So within broad daylight, we not only see the key to the lock, but we also *feel* (!) the construction of the action trajectory shape. In pouring, there are also many hybrid forms of perception processes possible. However, this is not extensively discussed here. Briefly, it is explained that we can auditorily perceive the filling of a bucket/watering can to a large extent, and we can even do that purely based on cognitive knowledge regarding the relative filling time.
Within the internal (secondary) focus, it is no different. You can quickly ascertain that you could move the bottle only with trunk action or even with just a walking action if you were to rigidly hold the bottle. In this way, you could even make it move with just upper arm and/or forearm action. Moreover, you can quickly ascertain that you could use relatively more hand action or relatively more finger action. In short, you may have developed your own preferred motor skills to execute a pouring action, but it will always consist of a constantly changing constellation of hybrid sensorimotor perception processes. 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.

[24] https://www.researchgate.net/publication/374145315_The_external_primary_focus_within_pouring_solely_encompasses_the_rising_movements_of_the_liquid_level_in_the_glass_The_liquid_level_behaves_like_a_marble_within_a_marble_run_depicting_the_perception-a

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 is 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 fill a glass in an identical manner. 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[25]. So, when driving a car, it becomes crystal clear that perceiving (and controlling) the shape has absolutely nothing to

[25] The same explanation naturally applies when considering a bicycle with coaster brakes.

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 pouring action, 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. Pouring is in this regard a very special motor action because a glass (bucket, kettle, etc.) doesn't allow deviations in the y-axis and so they don't need to be mediated.

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