Proprioceptive Activation System, Reality Perception, and Aesthetics

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Abstract
The perception of reality, involved in human experience and decision making, is rooted in a rational paradigm which has developed over centuries. However, to the extent that this paradigm has a tendency to reduce and generalize phenomena which are in fact individual and special features of the nature of reality, the rational paradigm is responsible for inexpedient procedures in many fields of human activity. This paper investigates such consequences in very different areas: within the arts and in the treatment of musculoskeletal dysfunctions in order to account for the structural character of the human mind and the role of “narration” in human understanding, and to suggest a holistic treatment – the Proprioceptive Activation System – for disorders in the musculoskeletal system.

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The Proprioceptive Activation System (PAS®) treatment aims at guiding the patient, suffering from pain or dysfunction of the musculoskeletal system – into activating the proprioceptive sense. The treatment re-establishes the right connection between the brain stem, pons, the cerebellum, and the cerebral cortex (from here on cortex). This enables the cortex to take over control of the musculoskeletal system. The PAS® treatment is developed and refined over a period of 35 years by the manager and owner of the treatment center PAS® by Aktiv Form, Denmark, Per Gjeding.

Proprioception is the process that enables the body to vary muscle contractions as immediate response to incoming information about outside influences. The muscle initiation is mediated through stretch receptors which supply information on the joint positions of the body.

The sensing of joint movement (proprioception) and acceleration (kinesthetic) are the sensory feedback mechanisms for movement control and posture. These mechanisms are used in conjunction with the vestibular system (the liquid filled network in the inner ear, registering the effect of gravity and keeping the body informed and in balance) by the brain to infer constant sensory input from the surroundings.

When the proprioceptive sense is well functioning, we continuously adjust our body position. This sense helps us to take optimal position in a chair, to hold on to tools like a fork or a pencil in the right way, and to estimate how to move through a room without bumping into things. If the system does not function properly, one has to keep focus on things which should work automatically. For instance, one may have to use sight to adjust one's position.

PAS® is a physical treatment. Traditionally, illness is by definition something which should be treated pharmacologically, and physical treatment is classified at the extreme edge of the medical sphere of reality. The standard perception of reality in medical science is a significant part of the basis for common medical conduct. It has a built-in set of formulated and implicit rules which govern work with patients, including which decisions and choices are made.

Examining this perception of reality involves focusing on clinical practice where doctors personally diagnose and treat patients. In this context, since the late nineteenth century, internal medicine as a specialty (now split into many branches) has held a central and leading position as “the generic and central specialty to which other specialties refer for the last word on our underlying ills, our ‘diseases.’”

In order to examine how and where PAS® treatment differs fundamentally from the general organized practice
of medicine, including the colliding paradigms of reality perception involved, it is important to take a closer look at the intellectual and cultural history behind present day practice of medicine. The following account of positions in the perception of reality in relation to medical practice is largely taken from the book Blind Spots: The Failure of Contemporary Medicine to Recognise an Epidemic of Energy Loss and underlying Environmental Disruption by the Danish physician Henrik Isager. In his work, Isager was inspired by what he experienced in the clinic Aktiv Form where the PAS® treatment was developed by Per Gjeding.

Cartesianism

The philosophical foundation of medical epistemology changed fundamentally between around 1690 and the middle of the nineteenth century. It is paradigmatically expressed by the French philosopher René Descartes (1596-1650). His fundamental characterization of being, the so called cogito argument "Cogito, ergo sum" ("I think, therefore I am") has had an overwhelming effect on later Western self-consciousness and thinking. Its influence has been conspicuous in medical self-perception and the medical perception of reality.

One significant effect of Cartesianism on medical epistemological practice was and is the perception of the human body as a machine and of the world of reality as a closed system of causes and effects. In contrast to the spatial and extensive physical body, Descartes perceived the soul and consciousness respectively as something non-spatial and something which consciously communicates with the brain via the pineal gland. This introduced a body-soul dualism.

Positivism and Modern Physics

The Cartesian reduction of the human body to a machine survived into the reign of positivism where reality was deemed equal to the "positive" - that which can be acknowledged and quantified by science, that which can be counted, measured, weighed, or photographed, a "pure science" which had no need to explore the ideological foundations of its epistemology. The immortal soul dropped out, and the body-soul dualism became a body-psyche or a body-consciousness dualism.

The background to positivism in scientific theory was Isaac Newton's description of a substantial and mechanistic world governed by regularity, in which the future can be explained on the basis of the past. This view of the world, as is evident from Newton's religious writings, was bound up with a belief in an almighty God who had determined the absolute laws of nature.

In the second half of the nineteenth century physics bade farewell to this view of reality. Thermodynamics opened up a radically different perception, and after Einstein demonstrated the relationship between energy and mass, substance/mass was no longer the fundamental quality. In philosophical terms, the new view of physics is non-substantial. The world is not perceived primarily as being made up of objects in the classic sense; rather, there is a common field of energy which links everything. This change dramatically decreased the legitimacy of an atomic vision, positivism, and materialistic reductionism.

However, the Cartesian-positivistic approach in many fields of science, including that of medicine, is still predominant, and the author of this paper came across the clash of reality paradigms in his own field of humanities: aesthetics. Just as is the case of the materialistic reductionism of medicine's reality paradigm, the traditional paradigm of aesthetics "translates" the qualitative nature of reality to a quantitative representation which is fundamentally different from the quality it seeks to grasp.

Traditionally, and compatible with the "body machine" and the deterministic and causality based idea of reality within medicine, the work of art (literature, pictorial art, or music) has been conceived as a "machine of symbols", the expression of which is the above mentioned quantitative representation of reality. In order to come up with a qualitative approach to the representation of art, I have found it very rewarding to include the change of the paradigm of reality, introduced with thermodynamics and quantum mechanics.

When Niels Bohr presented his atomic model in 1913, it was a farewell to general causality and determinism in the view of reality. Accordingly, by moving the focus of art from its quantitative and symbolic representation to the indeterminacy of a qualitative representation – not least through an introduction of the notion of entropy – the work of art can be perceived as an objective correlation of reality itself, where the "correlativity" of a work of art is high in the region of low entropy (a high degree of indeterminacy and possibility or "potential"), and low in the region of high entropy accordingly.

Based on an increasing dissatisfaction with existing interpretations of art, music, and literature in particular, I have developed a cross-aesthetic approach to an artistic expression which is given in the correlativity model below based on my preliminary model found in figure 1.

The model depicts the interdependencies between the human mind, reality and compatible art forms. The rectangle to the left symbolizes reality as a dynamic system, marked by a "falling stone", the entropy of which is low when it possesses potential energy above the ground. When the stone falls, the potential energy is transformed to kinetic energy and entropy increases. The double arrow symbolizes the work of art, pointing towards the top and bottom, where the degree of correlativity increases inversely proportional with the fulfillment of the spectator's/ listener's/ reader's horizon of expectance.

The red arrow, "anxiety provoking appeal", suggests that the artistic expression of low entropy is processed in the "anxiety circuit" in the "primitive" encephalon of the
brain, and not in the advanced cortex, responsible for rational thinking. Much research in musical dissonance and cerebral response in fMRI-scans suggests this [e.g. 8], showing an increased activity in connection with “unpleasant” music within a cerebral network comprising limbic and paralimbic structures; including amygdala hippocampus, the para-hippocampal gyrus, and the temporal poles. The most recent study9 which focuses on the regulation of anxiety, suggests that there is a close connection between pleasant and unpleasant stimuli since both are related to two different cell types in the amygdala. This could explain why the immediate unpleasant “noise” and “horror”, experienced in listening to heavy metal music, for instance, is often followed by a feeling of “liberation” and immense wellbeing.

The Literary Mind

In his groundbreaking work The Literary Mind (1996), the linguist Mark Turner examines what he calls “the literary mind” – a way of thinking that, for our species, takes precedence over all other ways of thinking. Turner’s thesis is that through basic principles of the mind, history, projection, and parable, we are able to manoeuvre expeditiously in the world. These principles, which have wrongly been classified as “literary” – wrongly because they are active in and constituent of the “everyday mind” as well – make everyday life possible. As Turner notes: “Story is a basic principle of mind. Most of our experience, our knowledge, and our thinking is organized as stories. The mental scope of story is magnified by projection – one story helps us make sense of another. The projection of one story onto another is parable, a basic cognitive principle that shows up everywhere from simple actions like telling time to complex literary creations like Proust’s À la recherche du temps perdu. We interpret every level of our experience by means of the parable. […] Parable is the root of the human mind – of thinking, knowing, acting, creating, and plausibly even of speaking.”

While it has been common practice to regard the everyday mind as non-literary and the literary mind as an option of choice, Turner contends that the literary character of the human mind causes a fundamental way of orientation in the world. But this does not mean that the world as such is structured as a literary work; we only conceive it as such because this is what we do best. In reality, the literary mind is a limitation, because that which is not compatible with literary principles easily avoids our attention. Turner’s thesis is in line with the philosophy of Henri Bergson, who promotes an idea of the human mind as “pragmatic,” only designed to find its bearings expeditiously in its surroundings; whereby the human mind is not made up to “understand” the world as such outside the mind’s own will to control it. This is where art can step in and shake our feeling of identity between the structure of reality and the capacity of our mind to register it. Art can do this by refusing to fulfil the expectation-horizon of the mind with respect to the linguistic, iconic, or musical character of an art-work.
The literary mind is also very active in the field of medicine, from establishing an adequate narration in connection with the patient's illness: a diagnosis – to the narration of the progress of a given illness: a prognosis. Both kinds of medical storytelling are encroachments of reality in that they are determined by the capacity of the mind for a certain structural nature, causing a dominance of “release oriented” (and reduced) structures of understanding in normal human interaction. This dominance ignores or subjugates all that is not categorizationable and generalizationable in accordance with the special capacity for understanding of the mind.

Concluding on the considerations developed in the above, it will seem beneficial to suggest a method of treatment which is non-reductive and holistic of nature. The PAS* treatment is such a method.

**PAS® and Proprioception**

The word proprioception refers to the sensory information caused by contraction and stretching of muscles and by bending, straightening, pulling, and compression of the joints between the bones. Sheaths that cover the bones also contain proprioceptors. The term comes from the Latin word “proprius” meaning “one's own”. The proprioceptive sense is also referred to as "sense of self".

Proprioception is activated by the proprioceptors in the muscles, registering length, contractions, pressure, and potential harmful impact. There are two types:

1. **Muscle spindles in the muscle fibres.** The brain needs input from many of these spindles in order to register changes in the angle and position in the muscle.
2. **The Golgi tendon organ.** Registers tension.

The sensations from one's own body occur especially during movement; but they also occur while we are standing still, for the muscles and joints constantly send information to the brain to tell us about our position. Because there are so many muscles and joints in the body, the proprioceptive system is almost as large as the tactile system. Proprioception travels up the spinal cord to the brain stem and cerebellum, and some of it reaches the cerebral hemispheres.

**The Holistic Approach**

The PAS* concept is a holistic approach to health. In order to find holistic mindset, comparable to that of PAS*, we have to look to Hippocrates in Greece around 400 BC. The Hippocratic view of illness lived on until the beginning of modern times. It was based on significant knowledge of internal human physiology, and was characterized above all by a holistic view of the human body. The body's life is not just determined by the blood, or respiration, or appropriate food – these are only manifestations of life. What is actually alive is the body, perceived as an appropriately ordered organic whole, a microcosm which possesses an internal force in itself, maintaining unity and wholeness. Illness is a breach of this unity. The doctor's task is to remove that which is restricting the body's inherent power so that the health may be regained, helping the organism to heal itself because nature is the true healer. Thorough observation and examination of the patient – recognition of his/her reality without preconceived opinions – is the first condition of medical intervention.

A traditional approach to dysfunction in the musculoskeletal system (e.g. a "frozen" shoulder) as it is presented in books on medicine and in the Danish health system, is analytic of nature in separating the totality in order to focus on detail. Hence, a "frozen" shoulder will be perceived in isolation from the rest of the body, and it will typically be treated with painkilling medicine or with exercises taking their point of departure in the shoulder itself (often carried out by a physio therapist), or with a nerve block, so the patient doesn't feel the pain. These kinds of treatments are inexpedient in the long run, in that they have exclusively been symptom oriented, and not perceived the shoulder as part of the entire body, which again is part of an even larger body (society and its design).

According to PAS* experience, a “frozen” shoulder can be the effect of a whip lash damage, causing tonic tension in the muscles of the back, especially the large trapezius muscle. Hence, the muscles of the back of the patient do not function as they are supposed to: carrying, protecting, moving, and energizing. Instead, they become loading to the joints, and they pull the vertebral column out of its normal shape, causing disturbing impulses to the cerebellum, which registers the balance of the body. The unbalance sends a message to thalamus, which decoys the sensoric messages to the cerebral hemispheres, so the motoric movements are badly executed. This is felt by the patient as muscle fatigue, pain, and reduced muscle function.

As a final stage in a holistic procedure, one has to consider how the design of the environment must be regarded as important in the overall wellbeing of the patient. Such a consideration will bring a bodily awareness into everyday human practices; this could include the design of immediate surroundings in the work field such as chairs, tables, digital equipment, etc.

**The Keys of PAS**

The PAS* concept operates with a number of “keys”, functioning as access points to activating areas under the brain's control:

1. **The linkage between the big toe and thalamus:** By examining the big toe's ability to yield resistance and relax, a Golgi-tendon activation of thalamus is performed, whereby the muscles reopen for communication between the cerebellum and cortex.
2. **The linkage between the inside of the thigh and the autonomous nervous system:** Through an activation of the Golgi-tendon organs of the inside of the
thigh/ the abductor group, hypothalamus is activated. The hypothalamus controls many functions: temperature, hormones, metabolism, thirst, hunger, sexual behavior, anxiety, anger, and various rhythms of activity. In connection with PAS® the focus is primarily on the linkage to the autonomous nervous system and on hormonal response.

3. The communication key: When the head is bent forward and then slowly moved "back in place", as when saluting obediently, the brain stem, pons, is activated. This enables communication between the cerebellum and the cortex. Then the muscular movements are controlled by will, naturally and correctly.

The linkage between sound and energy: When sound is made in connection with movement, the pituitary gland is activated. This subsequently stimulates mitochondria in the muscles cells to release energy to the brain which is used in the PAS® treatment. This linkage is also utilized in the specially developed exercise program of an hour’s length. The exercise program is a thorough workout of the entire body aiming at a well working connection between brain and body.

The anxiety linkage: Should a patient experience a whiplash lesion, shock and concussion, the connection between the limbic system and the cortex is blocked. This results in a lack of ability of the cortex’ rational array of the anxiety, often felt as a consequence of traumas. Through PAS® treatment the connection is re-established. Additionally it has been proven as a pivotal part of the recovery process when the PAS® specialist corrects the anxiety provoking stories and traumas that the client is often contained in. The re-narration of an experienced trauma, involving a severe feeling of anxiety, can well take its point of departure in the model (figure 1) where the “anxiety provoking” appeal is linked to a low degree of fulfillment of the literary mind.

A substantial amount of patients present dysfunctions that have their origin in an unnoticed and untreated whiplash lesion which may have happened 10, 20, or 30 years or longer back in time. A whip lash lesion can be conceived as a straining of the brain stem prohibiting proper communication and thereby control with the body. This inhibition of such a central communication pathway causes so severe disturbances of the brain stem that a movement can no longer be carried out purposely by the cortex. This subsequently results in a degree of disbursement and dysfunctional disturbances. The movements which are nevertheless carried out are reflex movements, activated through the cerebellum. With a whip lash lesion there are dramatic communication disturbances between the brain stem, the cortex, the encephalon, the cerebellum, and the sensory cell ganglia and the periphery nerve’s contact with the gray matter of the spinal cord. As previously eluted to, these functions are pivotal for the body to maintain balance. Consequently the muscles cannot carry out a movement without locking the joints in the back, due to the severed communication between Golgi-tendon organs and the cerebellum. This results in reduced efficiency because the speed at which the impulse is delayed to the arms and legs has been decreased. Reaction speed is significantly decreased which causes many complications in everyday life, just as one becomes more prone to industrial injury.

With any kind of pain in the body, the sympathetic nerves and the encephalon are shut off (by thalamus) which disables the motoric center in the cortex to be activated. The back muscles are after whip lash damage in tonic tension, and the big trapezius in particular, which is involved in holding the head, is very tense. Therefore the back muscles of patients with whip lash damage do not function correctly in functions like carrying, protecting, moving, and energizing. Instead of alleviating the joints, their dysfunction increases the load to the joints alongside a dislocation of the backbone. That initiates a chain of events, again disturbing impulses to the cerebellum which constantly monitor the equilibrium and balance of the body. The imbalance is communicated to the encephalon which redirects the sensory messages to the cortex and prevents the motoric movements to be carried out properly. This is felt by the patient as muscle fatigue and reduced muscle function.

The imbalance in the back bone also affects the nervous system radiating from the spinal cord itself. The nerve roots, radiating from the back and taking care of the body’s functions, will be in a state of compression. Depending on the nerves that are affected, a dysfunction of the respecting areas of the body will occur.

References

Davidsen—Proprioceptive Activation System

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