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Review Article

Informationally-Assisted Mind-Body Equilibrium and Health: Specific ACC Contributions from the Perspective of the Informational Model of Consciousness

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Received: March 31, 2020; **Published:** April 28, 2020

Abstract

This paper presents an analysis of the anterior cingulate cortex (ACC) from the perspective of the Informational Model of Consciousness (IMC), which defines seven main informational components of the Informational System of the Human Body (ISHB), appearing as a bipolar info-material structure: Centre of Acquisition and Storing of Information (CASI) (projected in consciousness as Iknow - memory), Centre of Decision and Command (CDC) (Iwant - decision), Info-Emotional System (IES) (Ilove - emotions), Maintenance Informational System (MIS) (Iam - personal status), Genetic Transmission System (GTS) (Icreate - reproduction), Info-Genetic Generator (IGG) (Icreated - inherited genetic information), and Info-Connection (IC) (Ibelieve - trust, info-selection). After a presentation of the brain connected areas, a special attention is focused on ACC, as the representative area of IC, showing that imagistic and electrophysiological negative signals, defined as error-related negativity (ERN), indicates to be involved in the error detection and conflict monitoring of the data, with the contribution of the prefrontal control area of the cortex. Two main lines of experiments were analysed: (1) one of them highlighting the implication of ACC in individual error-detection data, with relevance in exhibiting the individual specificity and general features concerning the degree of academic performances, the human need of trust and confidence (particularly promoted by religion), the intervention in regulation of the emotional states and empathy, and the relation with the cognitive and affective disorders (anxiety, depression); (2) another line including aggressive impulses and acquired/inherited traits in children, men and woman. The main results of the analysis in terms of IMC could be synthetically summarised as following: (i) the observed functions of ACC fit well the earlier defined properties of Ibelieve, dedicated to administrate the certainty/uncertainty Yes/No balance (actually information), organising the info-processing with respect to survival and self-control necessities; (ii) IMC, as a cognitive model of consciousness, could help an efficient evaluation of the individual traits (particularly in trait anxiety), the patient co-participation/implication in the cognitive or similar therapies, and a suitable evaluation of the recovery improvement; (iii) the training of Ibelieve oriented to positive information (Iknow) and emo-states (Ilove), pro-life and emphatic social relations, optimistic and confidence aspirations, deeply contributes to a stable equilibrium and health state (Iam); (iv) as the epigenetic inherited/acquired traits are actually based on learning informationally-assisted processes, a mind-controlled substitution of inconvenient traits with new beneficial ones, would help the prevention/recovery of the reversible disorders.

Keywords: *Informational Model of Consciousness; Cognitive Centres; Anterior Cingulate Cortex; Error-Related Negativity; Trait Anxiety; Aggressive Impulses; Cognitive/Prevention Therapy; Equilibrium/Health (Life Equilibrium Axis).*

Abbreviations

ACC: Anterior Cingulate Cortex; CASI: Centre of Acquisition and Storing of Information; CDC: Centre of Decision and Command; IES: Info-Emotional System; MIS: Maintenance Informational System; GTS: Genetic Transmission System; IGG: Info-Genetic Generator; IMC: Informational Model of Consciousness; ISHB: Informational System of the Human Body; DNA: Deoxyribonucleic Acid; ERN: Error-Related Negativity

Introduction

The equilibrated state between mind and body has been concerned the humanity since ancient times to the present day of our informational century, because this issue is of a crucial importance not only to understand the inter-relational intimate mechanisms of such a system, where multiple disciplines like philosophy, medicine, pharmacology, physics and recently the Information Science and Technology are involved, but also to intervene efficiently in the prevention/curation of the dysfunctionalities of the body parts, particularly of the nervous system [1-3]. In the frame of such an effort, the research studies are oriented on two main directions: the understanding/adaptation/application of the ancient (Yang/Yin, Yoga - based) practices from the medical perspective [4-6]; the direct implication of the medicine and other circumscribed sciences in this field [7], starting from the accumulated scientific basis of information. The present paper is enrolled in the second category of studies, starting from the current knowledge in this field, particularly focused on the functional activity of the anterior cingulate cortex from the informational point of view. For this purpose, there were accessed two lines of researches: one of them dedicated to the relevant results about the functions of the anterior cingulate cortex, especially revealed by the electroencephalography and imaging determinations, and another one concerning the last results obtained in the modelling of consciousness and the specific properties from the informational point of view. Therefore, an analysis of the results obtained from the two categories of studies it is presented, showing the deep implication of the anterior cingulate cortex in a large and crucial category of functions concerning the mind-body relation.

From the first category of studies [8-16], to which we will refer in detail below, two main directions received a special attention, one of them focused on the cognitive implication of the anterior cingulate cortex, as a balancing administrator of information between two central poles of the brain, i. e the limbic system (particularly amygdala - alarm activation component) and the prefrontal cortex, responsible of awareness decisional activities. Therefore, an analysis line was devoted to the dysfunctional mental disorders like anxiety, and another one to aggressive impulses as a motor-related response of the body. A second category of studies concerns the structure and properties of the informational system of the human body, recently revealed by the Information Model of Consciousness [17-21]. This model allows to discuss the experimental results from the encephalographic and imaging studies by using the informational concepts, revealing both the mind-body informational relation and conclusions regarding some preventive/curative ways for approaching the reversible mental disorders.

Analysis of the anterior cingulate cortex response to information

Information is extensively used day by day in almost all professional and domestic fields of activities, however little information it is actually known on the informational concepts from the point of view of physics and science of information. Information is referred to any change or event which occurs or appears in a field of observation or into a system, and the quantity of information is evaluated in probabilistic terms [2]. Actually, the variation of a physics parameter generates information. The human body and all the living structures include a huge quantity of information, able to convert them in animated systems. Although many fields involved in the studies of the human body and particularly of consciousness, agree with this statement, not a fully explanatory model of consciousness based on information was proposed up to date. Recently however, it was reported such a model, showing that the human body is actually a bipolar informational/material structure, connected to two main poles: information and matter [3,20]. Therefore, within this reported study, we have to intro-

duce first of all this model and suitable informational concepts, focusing after that a special attention on an analysis of the activity of the Anterior Cingulate Cortex (ACC) and its fundamental role for the mind/body equilibrium and health.

Informational model of consciousness (IMC): Basic concepts

By information we have to understand not only a change/variation detectable by our senses from the external and internal sources, as signals or sensations. Inside of our body billions of reactions/sec. take place at either micro and macro level. Therefore, within the IMC, it was assigned to information much larger meaning, acting during the interactions between molecules, particles and other various body material components. Actually, during an interaction between two components, the acting initiator of such a process transfers information to interacting partner, so information acts as an immaterial contributor to such a transference. More than that, information is the "binding" agent allowing the structuration of matter at any level, so information is an universal fundamental component of matter, especially of the living structures, particularly of the human body [1,2,17]. The human genetic system, represented in any human cell by the specific structure of the gigantic molecule of deoxyribonucleic acid (DNA), including a large quantity of information, is a specific particular example [21].

From the IMC point of view, the mind-body equilibrium refers to the equilibrium between information and matter and between various body components and associated processes. IMC shows that the human body is a bipolar structure, connected to information and matter [3]. As IMC recognises and defines the body as an informed-matter structure, consisting in an info-dynamic system, information plays a crucial role in the body organisation and control. Information is involved in the body reactions both in the info-reception and in the feedback circuits, including the info-decisional system which control the processes which maintain the suitable equilibrium between its components. The mind-body complex is therefore an integrated system, auto-organised and auto-controllable, able to adapt to the environment changing conditions. The mind-body continuous interactions maintain the body equilibrium.

From the informational point of view, the sensory network is dedicated to the reception and transmission of information to the data library of the informational system. The decision operational system is responsible for the conscious decision addressed to the body, and the body itself acts by means of the motor operating elements and emotionally induced actions. The sensory network is a complex structure, including besides the common externally-connected senses, the internal sensorial system projected in consciousness as angry, thirst, pain, and other sensations perceived by the informational system as inner informational signals. The body equilibrium and health is therefore a consequence of a balance between the operative and interactive processes, assuring a stable auto-controllable state, under stable and equilibrated state of the environment. The mind-body complex is able to respond to the modifications of the external conditions (if these are not too large) by two adaptive mechanisms: short/medium term response for adaptation, including free will decisions, emotional and motor reactions, and long-term adaptation by means of epigenetic processes (intervening in the genetic adaptation structure by a specific info-chain of reactions) transmissible by the genetic channels to the offspring, allowing the perpetuation of the acquired traits in the next generation. The first category of reactive adaptation, the interaction with the intervening information is short, but in the second case, this could induce significant configuration changes in the body structural components.

As it was pointed out earlier, information is expressed by binary Yes/No units, and this could be interpreted as a Good/Bad mind-body interaction. Indeed, an equilibrium state is obtained when two contrary forces/tendencies/actions are properly balanced. A particular suggestive example could be referred in the classic physics, where the action force (Yes) is equilibrated by the reaction (No), so Yes + No $\Leftrightarrow$ 0. The equilibrium of the human body is the result of billions of reactions/sec., so practically the body can be regarded as a dynamic steady state system around the Life Equilibrium Axis, as defined by IMC [21], marking the boundary between Order and Disorder state. If a "Bad"- type stimulus of high intensity, or insistently and repetitively intervenes in such operational system, dysfunctions (particularly mental diseases) of the informational system could be induced, the human organism responding himself to this "bad" direction. Information plays therefore an active/assisting role in the mind-body equilibrium and health. As the mind operates on the basis of acquired or inherited informational criteria, these also play a fundamental role for the orientation in a "good" (pro equilibrium/health) or in a contrary "bad" direction.

The cells of the nervous system act actually each of them as an informational binary (Yes/No - All or Nothing) unit [20]. As the transmission of information is also driven by chemical agents, like neurotransmitters, hormones and cell components themselves, particularly during the epigenetic processes [20,22,23], information is included, independently of the source, in a larger spectrum of phenomena. From the perspective of the Information Science, based on specific mathematics/physics tool resorts, it is therefore convenient to operate with information as a unique concept, with a high degree of use, independently of the source and operating conditions. For the study of the human organism and of consciousness, this is highly useful, opening large perspectives of application [21].

Such a general perspective assigned to information as a physical structuring/action parameter and taking into account the main functions of the Informational System of the Human Body (ISHM), represented fundamentally by the nervous systems and its functions managed by specific brain areas (Figure 1 right side), allowed to state that this could be actually described by seven components, with two informational outputs and two informational inputs as following (Figure 1 left side): the Centre of Acquisition and Storing of Information (CASI), dedicated to the perception (by external and internal sensory system) and storing of information, corresponds to the sum area of the brain involved in this function (mainly prefrontal cortex for short-term memory and hippocampus for long-term memory, the cerebellum saving the acquired motor-assisted abilities); the Centre of Decision and Command (CDC) manages the processing of information (thought, intelligence) and the transmission of the decision to the execution elements (muscles), mainly operating on the cortex hemispheres, with the participation of cerebellum, involved in muscle coordination; the Info-Emotional System (IES) is dedicated to the emotional activities, managed especially by the limbic (inner central) part of the brain (thalamus, hypothalamus, hippocampus - info-memorization, amygdala - alarm component); the MIS (Maintenance Informational System) manages automatic/autonomic functions of the organism, consisting in foods/air/water metabolic processing controlled especially by the brainstem, the last part of the brain; the Genetic Transmission System (GTS) assures the reproduction functions especially by means of the hypophysis activity; the Info-Genetic Generator (IGG) functions are operated by hypophysis and hypothalamus and concerns the body growth/development and even the aging [24]. The input information is received and stored by CASI, while the CDC decision is expressed by attitude as an informational output for adaptation. The info-genetic (matter-related information) input is connected with IGG, while the info-genetic output of information with GTS, assuring the species survival. This includes the acquired traits during the lifespan and transferred to the offspring by epigenetic processes [23].

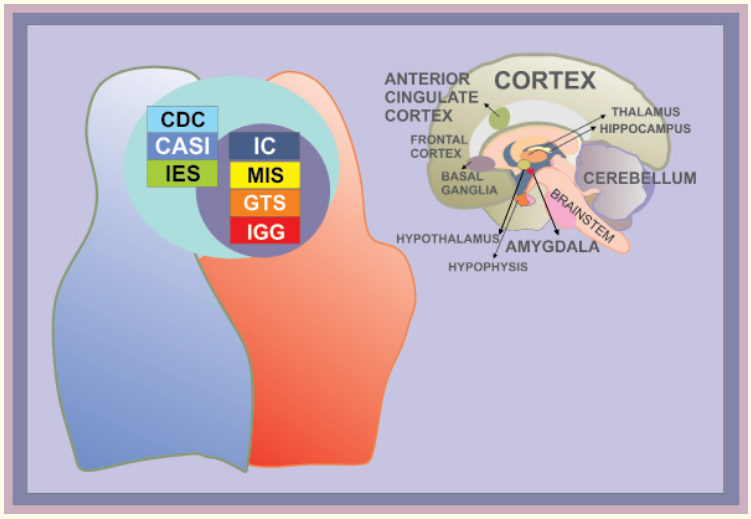

Figure 1: *The main informational brain structures (right side) and corresponding informationally defined systems (left side): CASI, CDC, IES (conscious) and MIS, GTS, IGG, IC (automatic, unconscious) components.*

A special informational component of the ISHM is defined as Info-Connection (IC) centre, with activities in cingulate cortex, especially in the anterior cingulate cortex (ACC) [20]. This centre is an informational, antientropic pole of the organism, involved not only in the moderation of the emotional/alarm impulses and their control, but also in some phenomena like that concerning the religious and mystic experiences, near death experiences and premonition [18-20]. As entropy is related with the possible states of a system, measuring in physics the disorder degree and in information science the uncertainty, their reduction to obtain certainty, so information, is equivalent to an antientropic effect [3]. The specific informational functions of ACC and their effect will be analysed in detail below.

Analysis of the ACC activities and functions

In some previously published studies [25,26], it was shown that the ACC is involved in the error detection and conflict monitoring of the data, activating the subsequent prefrontal control area of the cortex, which determines an ulterior behavioural regulation. Such studies are based on experimental electrophysiological negative peak signal detection in ACC after approximatively 100 ms when a person initiated an incorrect response [27]. This process associated with ACC response was called error-related negativity (ERN) and was extensively used to observe the main functions and activities of ACC [25], showing that ACC acts as an administrator of the contradictory-related terms, conducting information to the frontal cortex. This acts as a moderator, involved in monitoring and compensating for error and comparator process in which representation of the intended correct response is compared to a representation of the actual response.

As the magnitude of the ERN peak depends on the personal particularities, this type of analysis is a valid tool to understand the self-regulation processes as a response to various conflicting stimuli, both of the emotional control and cognitive performances in each specific case, and their relation with the dysfunctionality traits. Among such studies, based on electroencephalography analysis, it was shown that about 47% from the variance of ERN is due to the epigenetically transferred traits [8] and the heritability of traits could be a major factor, from 50% to 80% for cognitive disorders (schizophrenia, attention deficit hyperactivity disorder and autism), and from 40% to 65% for affective disorders (major depression, anxiety disorders and substance abuse) [9]. The multiple role of ACC is referred to selective attention, working memory, language generation, and information processing, as a consequence of its rich anatomical connectivity of this region with integrating auditory, gustatory, visual and general sensory impulses, limbic, and motor areas of the cortex [27].

Starting from the observation related in a large body of researches, suggesting that religious people are happier and healthier than nonreligious people, a recent study dedicated to ACC activities shown that this is also involved in the religious experiences [10]. During these experiences, it was observed a robust activity in one region of medial prefrontal cortex, the ACC (Figure 1, right side), associated with error-related brain states, acting for the buffering them. A recent article reports that more than to be only involved in the detection of own errors and conflicting data, ACC (specifically in the gyrus region) plays a crucial role also in inter-relational activities and in the processing of social information, estimating the motivation including costs, benefits and errors associated data. Furthermore, it makes specific, testable predictions about a key mechanism that may underpin variability in socio-cognitive abilities in health and disease [11].

Another category of studies were dedicated to observe the relation between the aggressive behaviour and the activity of ACC during such episodes. The results indicate that the suppressed ACC activation is associated with a temperamental trait characterised by an impulsive and quick-tempered personality of children [12], showing the moderating role of ACC. On the basis of neuroimaging and electrocortical measurements, it was established a correlation between the aggressive-impulsive behaviour and some structural (lower volume of grey matter) and functional characteristics involving ACC and prefrontal cortex as a response to the activity of the emotional limbic (amygdala) system, ACC operating to determine the circumstances in which an effective control is needed, while the prefrontal cortex to implement the control process itself [13]. As one of the main task of ACC is therefore to signal the need for regulatory control tl the prefrontal cortex, detecting the conflict among competing target and response dispositions (so the impairment of ACC functions, shown by a reduced ERN activity), this can be used to study the impulsive aggressiveness and its mechanisms. Therefore, as the regulatory functions

of ACC operate within the neural circuit consisting in (orbitomedial) prefrontal cortex, connected with the limbic structures, determining the maintaining, inhibiting or enhancing emotional states activated especially by amygdala, the dysfunctions of ACC is an important factor, maybe a decisive one, in the engagement of antisocial and aggressive behaviour [14]. The basal ganglia (Figure 1 right side) and associated nuclei (involved in motor-learning, executive functions, behaviours and emotions), contributing to the integration of information and distribution to cortex and limbic system could be also considered as a part of this circuit [14,15]. Activation of this brain circuit during the anger arousal and other negative emotions is moderated/controlled accordingly, and the deficit of their normal activity increases the impulsive/aggression vulnerability [14].

Although the general tendency is to associate aggressiveness only to men, the women also manifest their aggressiveness [16,28], especially higher towards intimate partners than towards other targets [29,30]. From an evolutionary point of view, as it was recently suggested [31], due to a lower threshold for fear among the women, a heightened amygdala reactivity to threatening stimuli may be consciously registered more strongly via anterior cingulate activity. The impact of testosterone and oxytocin specific hormones on the neural circuitry of emotion should be also considered to explain some differences between gender behaviour [31]. However, the particular circumstances (genetic inherited traits and environmental interaction as a significant variability in aggressivity, conduct disorder, adult antisocial behaviour, substance abuse and aggressivity), especially for the individuals with a childhood marked by family dismemberment, could be conditional determinant factors, either for female or man [32].

Although the official statistics shows a number of incident cases more elevated for men, the women tend to engage rather in more indirect forms of aggression (like for instance spreading rumours and info-manipulations), so in indirect types of aggression, acting for provocation/incitation. In the real world, the statistical difference is actually attenuated not only by such a pro-aggressive behaviour, but also because women are just as likely to aggress against their romantic/domestic partner as men are, probably because the fear as violence inhibitor and the level of the emotional control are also attenuated. Moreover, women are susceptible to alcohol-related and verbal aggression [33], the alcohol addiction promoting decontrolled behaviours and direct/indirect aggressive initiation/implication. Normal functionality and connectivity of the cingulate cortex of the alcohol-depended individuals were recently identified to be blunted even after a period of 4 - 8 week abstinence, predicting the level of a latter relapse risk [34]. The ERN response is enhanced among individuals with anxiety disorder, obsessive-compulsive disorder, as well as individuals with elevated levels of trait worry and obsessive-compulsive symptoms, including children and adolescents [28]. This could be a consequence of hyperactive response monitoring system, of a high sensitivity to errors in anxious individuals, or of the anxious apprehension/worry subtype of anxiety.

Results and Discussion

Mind-body informationally-assisted equilibrium and health

Within IMC, it was assigned an important and specific role to IC, reflected/defined in consciousness as the centre suggestively called Ibelieve [3,20], connected to ACC. Indeed, when this centre works with normality, it should inspires confidence, bringing in the individual momentary state and life trajectory certainty, as a selection between multiple possibilities (at least between two contrary/conflicting data), with effects experienced as protection sensation and equilibrium. The ACC functions analysed above well support the prediction of IMC. Within IMC, the following cognition centres were also defined as corresponding projections into individual consciousness of the specific functions of the informational systems specified above: Iknow (memory ⇔ CASI), Iwant (decision ⇔ CDC), Ilove (emotion ⇔ IES), Iam (self status ⇔ MIS), Icreate (reproduction ⇔ GTS) and Icreated (inheritance ⇔ Icreated). Ilove includes generically all range of emotions, centred on the life promoting/prerogative force, which is love [35-38]. Iwant is actually the attitude, as the information output for adaptation, which represents a contribution of all other centres, both as operating information source (Iknow) or as decision criteria [1]. In the light of IMC concepts and definitions, the outcomes analysed above can be discussed as follows.

As mentioned above, a consistent percent of mind diseases (more than 50/%) are due to the traits acquirement. Among them, the anxiety refers to the individual disposition to interpret a large range of environmental events as dangerous or potentially threatening, anxiety traits indicating the risk factors of further development of the depression and anxiety disorder [39]. The trait anxiety is perceived as feelings of stress, worry and life discomfort in the habitual situations of the everyday activities or events. The list of symptoms like the personality-cognitive styles, sociotropy and autonomy, dysfunctional attitude and negative inferential style show the vulnerability and potential risk factors of the individuals [40].

Among others, the cognitive therapy is one of the recommended way for the treatment of the generalized anxiety, with positive results [41]. The IMC, as a cognitive model of consciousness, could help for a better focusing on the evaluation of the individual personality and the available internal recourses for the effective co-participation during such type of therapy, or can be used in an effective form to evaluate the trait improvement in music-based therapy or other palliative naturist variants [42]. This could be done by marking on an arbitrary scale a numerical value of a certain quality associated to each cognitive centre (particularly with "confidence" for instance for Ibelieve), serving to evaluate the momentary degree of co-participation/implication, and comparing them with a reference scale or with subsequent registered results, confirming the degree/evolution of the recovery [42]. Within such therapy procedures, the implication of the centre Ibelieve is of great interest, because the firm conviction of the patient in a successful recuperation, could help the therapy effectiveness and the accelerated recovery. An optimistic positive attitude, emanated by this centre is also a stimulating/tonic factor helping the recovery.

A proactive promotion of the positive pro-life attitude and inverting confidence in the positive (Yes) alternative with respect to the negative (No) one in any action and behavioural situation (respecting the social norms), is not only a recommended beneficial practice in the recovery procedures, but also offers a high potential support for prevention, equilibrium state and health. The health is actually the result of the contribution of all involved functional factors of the organism, permanently equilibrated within a Yes/No balance, like the stationary states of other systems in our material world [43]. At intimate cellular level, the metastable association/dissociation reactions give a suggestive image on such an instable balance. As the nervous system is dedicated to absorb and process information from the environment, and this information could be deeply involved in such mechanisms [44], we dispose of two main (Yes/No) alternatives: to accept (or not) the beneficial information for our organism. The positive beneficial information is summed to the Yes-type balance, and the negative one to the contrary direction. The repetitive process of the same type of information induces molecular reconfigurations of the cell receptors [45] involved in the epigenetic mechanisms [20,35], actuating further like drug-type addictive initiator of such a process: as more information of the same type is consumed, as much as a feedback addictive reaction will be felt. This mechanism involved also in the trait acquirement is a base to advertise on what kind of information we should accept and how much repetitive support and confidence (Ibelieve) we are inclined to attribute it. Therefore, the involvement of the centre Iknow, accumulating suitable (positive) information, and of the centre Ibelieve (trust and confidence), assures a serious platform not only to avoid and prevent the mental dysfunctions and disorders, but also to accompany the recovery therapies [21,43]. The repetitive connection to Ibelieve in a positive manner, supported by the ERP tests and experiments, is a deeply involved mechanism in the stable maintenance of the health and equilibrium state, as well as in an optimum control of the inter-personal relations including the empathy, buffering the aggressive impulses. The safe of the personal health is the safe of the health of the family and of the entire community. Therefore, as the AAC is an active and determinant partner not only in the personal traits but also in empathy and inter-personal relations, the understanding and assimilation of such mechanisms add further confidence as a positive stimulus in the personal and inter-personal relations, contributing to the power reinforcing of Ibelieve personal centre itself and of the further positive feedback response.

Within IMC [20,21], there were defined as emo-states, the states associated with the emotions repetitively experienced during a large-time period. The "Bad" or "Good" feelings are our partners unconsciously invited to be part of our daily life in IES. Indeed, due to the repetitive process, the cell receptors will reconfigure their structure to receive and accept new specific chemical info-transmitters, "asking"/requesting afterwards to receive the same type of "drug", within an already created feedback auto-motivated perpetual circuit [45]. The

obsessive compulsive/impulsive conduct or disease is a similar form based on a feedback looping circuit auto-motivated and triggered/amplified by an obsession. The limitation of the informational background of Iknow (education, connexions to multiple info-sources), including decisional criteria, can limit drastically the interpretation and the suitable response to the external/internal information. The dysfunctions of IES are also deeply involved in anxious or aggressive disorders, and the moderator role of ACC between amygdala and prefrontal cortex is fundamental, as highlighted above. Therefore, the fortification of the centre Ibelieve increases the self-control aspirations and their optimal application. This fortification is referred to the acquirement of that information (involving Iknow and Ilove), which contributes and promotes the beauty and harmony moods, both in own personal life and in the inter-personal relations, flexibility and the acceptance of own errors, helping in this way the life equilibrium and health (detected in Iam).

ACC is deeply involved in emotional, self-control and anti-contradictory situation, so the training of Ibelieve as an active pro-life centre becomes an essential factor in the stability of (Iam) equilibrium and health. This training support refers to mental periodic relaxation, connection to the adequate informational sources, to music and artistic media, as well as to the practice of self-personal analysis to discover the conflicting situations and the optimal solutions, always stimulating the optimistic perspectives, trust and confidence in the life power. Ibelieve acts therefore not only as a personal surveyor, but also is able to intervene optimally in the informal and emotional relations with the community and with the real world, moderating any type of excessive behaviour. The equilibrium is a particular feature in a system of antagonistic forces, showing that neither of them gains the supremacy, and the human organism, as well as other living structures, shows/exhibits equilibrium by the healthy normal state (Life Equilibrium Axis [21]). ACC is therefore a magnificent partner in humans, with a role which cannot be sub subestimated, highly contributing to equilibrium and health, as a safe and natural info-regulator.

The acquirement of a certain trait is actually a learning process assisted by information. This process involves an insistently repetitive chain of the same habit, as it was recently shown [23], starting from the acquirement of information (Iknow), passing by decision (Iwant), emotional system, as a reactive response of body to information (Ilove), to become a stereotype (automatically executed - like Iam specific processes) and epigenetically transmitted (Icreate). Taking into account such a repetitive learning process, it is plausible to suppose that the acquisition of a trait, demonstrated to induce mental dysfunctions, could be suppressed applying a substituting process, as a prevention/recovery treatment. This is possible by an appropriate use of the functions of Ibelive centre, centred this time on a reverse objective, suitably selected to moderate or stop the acquired trait and substitute the older habit. Ibelieve plays from this point again a decisive role, inspiring force to decision (Iwant) in the prevention/recovery process. As the acquirement process is specific to learning, a fundamental mechanism for adaptation, this may be operative in such a process, following a specific way of repetition, this time oriented to a new objective, pro-mental control and healthy. On the other hands, the inherited or acquired habits, detected as involved in a mental dysfunction, could be also removed/replaced by means of a similar repetitive process, to substitute the previous informational stereotype algorithm. In such a process, a close implication of the patient's centres Iknow (experience), Iwant (personal decision), Ibelive (trust in the process success) and Ilove (body emotional implication) is imprescriptible.

The ISHB operates with information, received both from external or internal sources, the last one useful for the momentary evaluation of the personal status (Iam), or from memory (Iknow, including emotional memory) [36]. During the info-analysis for decision making (Iwant), the decision criteria play actually a decisive role [35]. These criteria are a result of the inherited, acquired information and socio-cultural and religious habits, especially during the first years of childhood, when the nervous system is still under a formation/development accelerated process. The family ambient and school educational contribution play a fundamental role during this period. Therefore, a deep personal analysis of the inherited/acquired habits of the adult may contribute to highlight the obsoleted decision criteria, which do not correspond/fit actually the present reality requirements. The adaptation should not only be treated as a natural spontaneous process. Understanding the natural mechanisms going to safe (or not) health results, contributes/determines a correct attitude with respect to the possible mistakes, allowing to consciously apply the learned life lessons. The decision to change the older decision criteria is not always a comfortable process, but it is surely a convenient and in same cases obligatory for healthy recovery and body wellness. During a recov-

ery/reorientation/relearning process, all informational centres are practically involved: Icreated is to be changed, Iwant to decide with confidence (Ibelieve), Ilove deeply involving the body itself, Iam with an important role to assure the robustness/power of the organism, with a final effect on the future personal status (recovered Iam) and on that of the offspring (Icreate).

The properties referred to the value of the self-control strength, particularly in relation to the firm task motivation, task monitoring, operating processes, and context-specific recruitment attributed to ACC activity and functions experimentally observed [46], engaged in a recovery/relearning or learning process, corresponds actually concisely and synthetically in terms of IMC with the properties and power of the centre Ibelieve defined earlier. This is also valid when the academic performance are analysed. According to the experimental findings, the large signal ACC ERN response are correlated to academic performances and greater ability to engage cognitive-control mechanisms when needed, with improved real-world performance [26].

As it was outlined above, ACC could act as a compensator/moderator centre between the alarm component of the brain (amygdala) and the prefrontal cognitive-control area of the cortex, comparatively analysing/selecting a suitable direction of the future decision. ACC is therefore deeply involved in the decisional operations, characterising a particular behaviour of the individuals. Therefore, the centre Ibelieve (related to ACC specific activities), reveals the possibility to control the excessive emotional impulses involved in anxiety and its consequences, by (re)-education: a repetitive process with a well-established objective, anti-oriented to such an automatic-pattern (stereotypical) tendency, sustained by the power of Ibelieve (certainty on this successful unique alternative), by Iknow (additional/selective pro-objective information), and by Iwant + Ilove, mobilises the internal mechanisms and resources for the acquirement of a new informational circuit pathway for a mind-controlled beneficial behavioural trait.

The enlargement of the informational area and sources (Iknow), and the recalibration of the decisional criteria, act as beneficial factors both in the buffering of the impulsive actions and anxious states. The solving of contradictory conflicting situations is the task of the conscious informational system, apt to freely decide, but the suitable solution is found only if a suitable and sufficient range of informational data are available. Before to ask/expect from the organism to act/react itself automatically to the external information or internal impulses, we have the opportunity to prepare it for a non-precipitated reaction. The talk with the inner voice is an useful method to avoid the non-controlled situations. The silent voice of those are not longer, understood actually as the inherited or acquired impulses during the childhood, are to be analysed carefully: when this silent voice refers to the predispositions, abilities or talents promoting positive and constructive impulses for life and the professional vocation, then non-conflicting inner information between intention and the silent voice should be recorded [47]. Recent researches add new data on the contribution of the inner voice to the equilibrium state and body healthy, showing that the verbal "speech"/"talks" and commands addressed to our own body impulses helping the self-control and the initiation or not of an action [48], confirm these results. Simple commands lanced consciously by our inner voice (Iwant) show a positive effect/influence for the moderation of the reactive impulses.

Conclusion

The analysis of ACC functions experimentally observed by EEG and ERN procedures, confirm the ACC direct implication in emotional, cognitive and decisional brain activities, with consequences either favourable (self-control, academic performances) or not (men/women impulsive and aggressive behaviour, anxious and disorder diseases) for the equilibrium/health of the human organism. The extensive data were discussed from the perspective of the Informational Model of Consciousness, which establishes as a pivotal reference information, which is a decisive agent/component intervening actively in these processes. The human body appears as a bipolar info-matter structure, information playing therefore an essential role in the intercommunication with the environment and reactive adaptation and with the body itself. As a part of the organism, supported especially by the nervous system, the Informational System of the Human Body is composed by seven informational components which were defined as CASI (memory and sensory circuits, reflected in consciousness as

the cognitive centre Iknow), CDC (info-processing and decision - Iwant), IES (emotions - Ilove), MIS (personal status - Iam), GTS (genetic transmission - Icreate), IGG (info-genetic inheritance - Icreated) and IC (info-Yes/No regulator and trust - Ibelieve).

The presented analysis shows first of all that the experimental ERN data well support the earlier definition of Ibelieve, as a centre devoted to the selection of suitable version from the conflicting Yes/No data, according to the survival necessities (amygdala alarm instinctive signals) or self-control requirements for an adequate reactive response. This correspond actually to the administration of the certainty/uncertainty balance, which in terms of information science signifies the administration of information itself. As ACC selects from a potentially large range of informational states only a certain one, according to the survival necessities, this is also an antientropic informational pole of the organism.

The implication of ACC (Inelieve) centre in body equilibrium and health (reflected by Iam), highlights the main following conclusions: (i) taking into account the variability factors depending on the particular individual personality, the IMC - as a cognitive model of consciousness, could help an efficient evaluation of the individual traits (particularly in trait anxiety), in order to prescribe an adequate treatment and to detect the available internal recourses of patient for his/her effective co-participation during the cognitive or similar therapies, or can be used in an effective form of the evaluation of the recovery improvement; (ii) the proactive promotion of the positive pro-life attitude (Iwant) and trust in the positive result (Ibelieve) in any action and behavioural situation (within the social norms), is a recommended beneficial practice both in the recovery procedures, as well as in prevention and equilibrium/health assurance, an optimistic positive component feedback emanated by the Ibelieve centre being a stimulating/tonic factor; (iii) the involvement of the centre Iknow, connected and selectively accumulating suitable (positive) information, and of the centre Ibelieve (trust and confidence), assure a positive germinating platform not only to avoid and prevent the mental dysfunctions and disorders, but also to accompany the recovery therapies; (iv) the fortification of the centre Ibelieve by the connection/acquirement of positive beneficial information (involving Iknow and Ilove) contributing/promoting the beauty and harmony moods and positive emo-states, both in own personal life and in the inter-personal relations, increases the self-control aspirations and their optimal application; (v) training of Ibelieve as an active pro-life centre becomes an essential factor in the stability of (Iam) equilibrium and healthy (Life Equilibrium Axis), the training support referring to mental periodic relaxation, connection to the adequate informational sources, to music/artistic media, as well as to the practice of self-personal analysis and corrections; (vi) taking into account that the trait acquirement is actually a learning informationally-assisted process, the acquired and even inherited traits or obsolete decision criteria could be substituted by mind-controlled implication, during a repetitive process for a new implementing trait/criterion, beneficial this time to the mental health; (vii) a maintenance of a fluidic communication with the inner voice, lancing suitable vocal commends when it is necessary, reinforces the power of Ibelieve and the acquirement of the expected results; (viii) cultivation of empathy and non-judgmental/non-critical behaviour towards others.

Acknowledgements

To my son Adrian Gaiseanu and my daughter Ana Gaiseanu.

Conflict of Interest

No financial interest or conflict of interest exist.

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