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**Is the Psychoanalytic Paradigm
of Mind Still Valid?**

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Summary

In psychoanalysis the paradigm of the mind has gone through a long development path; from Freud's classic model, the Kleinian model, ego psychology, (British and American) object relations theories, Kohut's Self psychology to relational and intersubjective models. There have been many attempts to integrate psychoanalytic theories that basically include a variety of different mind theories and psychopathology. But what's missing is a "firmer" basic scientific discipline, one that integrating existing knowledge to create a better theory of how the mind-brain functions normally and in psychological disorders. Authors believe that this basic scientific discipline is neurobiology or neuroscience, the most important subfields of neuroscience are affective neuroscience, neuroscience of the Self and consciousness. In psychotherapy patients' mental disorders are not created only in early infancy, but rather the following four factors need to be considered: 1) the biological/genetic factors 2) stressogenic/childhood experiences of deprivation, 3) stressogenic/experiences of deprivation during adolescence and adulthood, and 4) lifestyle, socio-economic, and cultural factors. Psychosocial methods of communication in psychoanalysis, when successful, can change the workings of neurobiological systems. Instead of ego, super-ego and the id, or self-targeted object relations, a new (neuro) psychoanalytic model is based on the three systems: 1) the primary affective system (primarily the brainstem, parts of the diencephalon and limbic system), 2) the secondary behavioural conditioning system (basal ganglia, amygdala nucleus) and 3) the tertiary cognitive-linguistic system (primary cortico-thalamic systems). Psychotherapy takes place through the psychodynamics of these three levels of the three brain systems (affective pulsation and cognitive configuration), and the application of psychoanalytic tools (setting, free association, clarification, interpretation, support, etc.) used to communicate with the patient during the session. Psychoanalysis is a specific psycho-social, verbal and nonverbal, conscious and unconscious communication interplay between the therapist and the patient. The therapeutic goal is to achieve a lasting emotional balance - better alignment of the primary affective system with the tertiary cognitive-linguistic system affecting the psychological and social life of a patient.

How neuroscience can change psychoanalytic theory - the road to neuropsychanalysis

If we consider the advent of psychoanalysis in 1900 when Sigmund Freud's book "The Interpretation of Dreams" was published, what can we say nowadays about Psychoanalysis, a discipline that has one foot in Psychology, and the other in Psychiatry? Is this paradigm still valid? This text will attempt to answer this question. In this article Psychoanalysis and Psychoanalytic Psychotherapy will be used interchangeably as they can be considered synonyms from the perspective of the theory of the functioning of human mind and the paradigm of mental health disorders (usually a wide range of neuroses and personality disorders), and also from the perspective of the psychotherapeutic treatment of mental health problems and disorders.

Psychoanalysis has gone through many updates and changes, with Freud's classical model rejecting Carl Gustav Jung, Alfred Adler, and Wilhelm Reich along the way. It was developed further by Melanie Klein, the British and American object relations theorists, Heinz Kohut's psychology of the Self, and the relational/ intersubjective psychoanalytic model; the work of Otto Kernberg, Thomas Ogden and others have also led to further developments which cannot be fully summarised or analysed here. Even though Jacques Lacan's theoretical approach was rejected by the International Psychoanalytic Association (IPA) in the 1970's, it has now returned in part through modelling and modulating of psychoanalytic knowledge. Psychoanalysis seeks to answer questions such as What is the structure of personality? How and why did psychological problems or disorders develop in the patient? And what are the methods that can help/cure the psychotherapeutic patient or why they have failed? (Paul Wachtel, 2014).

It is significant that throughout its history, psychoanalysis was almost hermetically sealed from the contributions of other psychological and psychiatric theories about the structure of the mind and psychopathology, except for when they coincided with psychoanalysis. Many psychoanalysts have said that the atmosphere in psychoanalytic institutes more closely resembled that of religious or theological settings which foster dogma

rather than an atmosphere of natural and social sciences which are more likely to revise and reject false theories. Recently, such criticism was addressed by Otto Kernberg himself in an interview (Schwartz Casey, 2015).

When psychoanalytic models (of all schools) are operationalized they lead to a comprehensive understanding that the development of personality and psychopathology in adults (neuroses and personality disorders) are 90% the product of “family story or drama/theatre” from psychosocial and interpersonal relationships (including conscious and unconscious communication) between the baby/child and his/her parents, especially mothers in the pre/oedipal stage of development, and later on fathers in oedipal triangulation. Thus, adult psychotherapy patients are approached through transference and countertransference to develop understanding and opportunities to act on emotional interactions in (early) childhood, primarily with the patient's mother and father, and partially with brothers, sisters and other important objects/persons from this early developmental stage. Some importance is also given to the later childhood stages, the latency phase and puberty, but more so in terms of the “psychic superstructure” that is formed over the structure developed during the first three to five/six years of age – from dyad oral symbiosis to oedipal triangulation (Jay Greenberg 1991, Peter Fonagy 1999).

The importance of biology/genetics in the etiology of the patient's disorders and behaviours receive very little recognition (or none at all) in psychotherapeutic approaches. It's as though these neurobiological aspects or dimensions (not based on conscious or subconscious experiences) have little to do with the patient's feelings, thoughts, expectations, memories or behaviours. Or as if the psychological difficulties that have biological/genetic origins cannot be corrected by the psychotherapeutic process, which is largely a false belief.

Helmut Thomä and Horst Kächele (1985) point out that the psychoanalytic model is in fact a complex compilation of great psychological insights, mixed with (Greek) mythology of human nature and meta-psychological concepts. The foundation of these concepts is

based on how an adult psychotherapy patient may have felt as a baby during their interactions with his/her mother/father, and how the emotions of this baby/young child lead to certain personality traits and psychopathological types described by Freud, Klein, Winnicott, Kohut, and Mahler.

The psychotherapist usually gathers psychological insights during the sessions, through “here and now” compassion and thinking with the patient and about him/her, as well as subsequent impressions following the sessions. Insights speak to the patient's various anxieties, fears and sadness, attachment and separation, narcissistic superiority and inferiority, autonomous and affiliative behaviour, emotional and cognitive empathy, desires, shame, guilt, frustrations, anger and aggression, various fulfilled and unfulfilled fantasies. Meta-psychological concepts are usually made through subsequent thinking about the patient and his material from the analytic sessions with strong influence from the different concepts of psychoanalytic schools – e.g. “I see my narcissistic patient more in line with Kohut's approach, or in line with Kernberg”. In other words, they are always thinking in the language of some psychoanalytic school, while the other psychological models of thinking are “foreign” or a “second language” not used when thinking about the patient.

Studies about the effectiveness of psychotherapies (Jonathan Shedler, 2010) show that good therapeutic results are achieved through a specific human relationship between patient and therapist (sufficiently empathic and supportive, emotionally and cognitively balanced), rather than the use of a psychotherapeutic theory, or by the discovery of causes for mental health disorders. This does not mean at all that we should give up on good and scientific psychological theories on the functioning of the human mind in healthy or pathological cases. Today's neuroscience offers the possibility to use some psychoanalytic postulates and to create a good and pragmatic theory which is important for the quality of clinical work with patients.

In the last fifteen years the field of genetics has made great strides, but studies looking at the genetics of behaviour, personality traits and mental health

disorders have very little resonance in the psychoanalytic world. A genotype can be transformed into a multitude of phenotypes concerning behaviour, psychological profile, personality traits, temperament, and even mental health disorders. Genotype develops into phenotype, and epigenesis plays a part – through external biological, physical and social factors. These are connected with structure and the refined functional regulation of the nervous system.

Much neuroscientific research is related to genetics (e.g. gene expression of individual neurons), and today a great deal is being gained in terms of understanding human behaviour. Research on monozygotic twins that were since their birth reared separately, shows that genetic factors contribute account for 35% to 45% of fundamental traits, and in terms of neurotic disorders, anxiety-depressive and personality disorders, genetic variations account for approximately 30% to 50% (Jonathan Flint, Ralph Greenspan, & Kenneth Kendler, 2010). At the same time, parents' behaviour contributes some 10% to 20%, and individual experiences about 40% to 50% (Eric Turkheimer, 1998). Also, not all biological risk factors of mental health disorders are genetic. There are several environmental factors that are not psycho-social in nature, such as nutrition, infections, exposure to toxins, somatic disorders and diseases. There is also the important influence of the prenatal environment, which can be affected by stress during pregnancy and various other biological factors that influence intrauterine brain development (Robert Sapolsky, 2015). In addition, it should be understood that genes and environment (social and non-social environment) are highly interconnected and mutually dependent on each other, and that epigenesis is not only the psycho-social impact of environment, rather it encompasses a wide variety of external (outside the genetic codes) biological and physical factors.

While the Freudian model (and to a greater extent the theory of object relations) fell into the trap of equalizing psychopathology with lived experiences and the influence of environment, Carl Jung points out that "if you equate the psyche with consciousness, you can easily fall into the wrong notion that man is born with a blank psyche and in later years it contains nothing more

than what is gained through individual experience" (Carl G. Jung, 1974).

"Neuroscientists point out how the Brain is complex at the molecular, genetic, cellular, synaptic, neural network and at the anatomical level. It's a wonder that the number of mental disorders and neurological diseases isn't higher, considering the complexity of our brains" (Paško Rakić, 2015). Therefore, it is questionable why Psychoanalysis still insists on a model focused almost exclusively on "family story and drama/theatre" as a unique experience of psychosocial (early) childhood that creates the emotional archipelago of mind, Self and all its aberrations and distortions.

Most psychotherapy patients haven't had particularly stressful or depriving relationships with their parents in (early) childhood, and if they have, they are insufficient to account for their mental health disorders in adulthood. Some patients are neurotic due to stressful experiences, but others are not. Some patients are so genetically/biologically vulnerable that they require exceptionally safe, nurturing and stimulating environments, and even when their parents can provide such an environment, sometimes it is not enough to reassure and resolve their fears while growing up.

The perception of a patient's parents and her/his (early) childhood cannot, as a rule, be used as a causal factor of mental health problems and disorders. We can not reduce ethology to only emotionally deficient or inadequate (lack of empathy, non-mirroring, unsupportive, non-containing) parental behaviour towards a baby/child. If the person is seeking empathy, support and tenderness in adulthood, this does not automatically mean that she/he was deprived of that during childhood. On the other hand, virtually all people, not just patients, have had experiences throughout their relationships with their parents that included stress, fear, sadness, shame, guilt, disappointment, anger, and rage – even Sigmund Freud has said that such experiences are part of the normal development of a child, who couldn't and shouldn't grow under a bell jar. Therefore, the psychoanalyst cannot, theoretically and therapeutically, proceed under

the assumption that the dominant causal factor of the mental health disorders in their adult patients was the emotional atmosphere and the psycho-social relationships they had their parents during childhood. For most psychotherapy patients (with neurotic and personality disorders) it is wrong to point the finger at the pre-oedipal (0-3 years) or the oedipal relationship (4-6 years) with their parents.

Mental health disorders stem from four groups of factors, each one of the groups can itself cause a mental health disorder at any age, but often disturbances are created by a combination of two or more groups of factors. These factors are 1) biological/genetic, 2) stressogenic/depriving childhood experiences, 3) stressogenic/depriving experiences during adolescence and adulthood, and 4) lifestyle (sleep, nutrition, recreation, socializing, hobbies), socio-economic, and cultural factors (Jerome Kagan, 2010, 2012).

The parental impact cannot be uniformly understood as a variable that follows the same pattern. Firstly, parents do not act uniformly towards their child during infancy, at the ages of five, ten or seventeen because parents are not exactly the same in their object relations throughout their lifetimes. Secondly, each child interacts and communicates with their parents not only in response to parents, but also in response to his/her own impulses and motives – e.g., children who are rebellious, difficult to raise, those who are fearful and insecure, or symbiotically bound, and so on. If we consider the attachment for example, the influence of genetics is at least as much, if not more important than parental behaviour. On the other hand, the psychoanalytic model of parents, as “good enough” or “not good enough” (Winnicott) often ignores two important facts. First, a psychoanalyst has no precise insight into the dynamics and emotional exchange between a child and his/her parents, but draws conclusions usually from the patient’s stories about their past, their behaviour, psychological symptoms, fantasies, cognitive unconscious material, current emotions, or transference behaviour associated with what has happened twenty or thirty years earlier. This kind of analysis and inference is to say the least very speculative, and is closer to astrology than science.

We point out that the psychoanalytic patient cannot be so immersed in the Self-state of the therapist, as a small child is with his/her mother, and also the therapist cannot be immersed in his patient (who is not a baby/toddler) as a mother can with her child (John Bruer, 1999; Efrat Ginot, 2015).

Secondly, for long-term explicit (episodic and semantic) memories, the brain does not record memories in adulthood “as in stone, but as in the sand” (Antonio Damasio, 2010); in children it is even more questionable due to their relationship with factual events and their memories about them. Also, implicit memory is not a realistic portrait of emotional communication between a parent and a child. Some vulnerable children may be intrinsically anxious or prone to sadness, self-pity, feelings of inferiority and shame since (due to the neurobiological structure of the mind-brain, rather than a repetition of stressful experiences) they tend to find experiences more stressful than other children.

It is also necessary to distinguish between stress, deprivation and conflict that are universally experienced as part of growing up (and in adult life) from incidences of actual abuse and neglect of children and adults. Profiling the functioning of brain-mind has shown that it tends to put emotionally charged states and events (unconsciously) in a relationship which can cause changes in cognitive structures. Each person tries to explain, not only the physical and social world around them through some cause and effect thinking, but also through their own mental states and behaviours.

It should be noted that intersubjectivity is a powerful therapeutic process between two adult states of Self, and it is very doubtfully analogous (consciously and unconsciously) to the relationship of a small child with his/her parent (Efrat Ginot, 2015). Although it is scientifically accepted that disturbances in object relations between child and parent correlate highly with possible mental health disorders, it is not scientifically confirmed that people with neurotic and personality disorders grew up mostly in stressful and depriving circumstances. There are three other groups of factors which are important for the development of mental

health disorders, and they are not related to the childhood's object relations.

Psychoanalysis considers that the factors which created disorder (object relations) in childhood should be the focus of current therapies with adult patients, which is a common misunderstanding. We cannot cure patients in purely etiological way using factors or causes that are responsible for the development of disorders in childhood. Causal factors that have created a mental disorder or chronic dissatisfaction are one thing, while treating disorders (the theory and practice of psychotherapy) is something else. Most probably due to the Sigmund Freud's flawed concept (which has been accepted by almost all psychoanalysts as well as by other psychotherapeutic schools) that there is a solid bridge between the cause of disorders (in childhood) and (today's) treatment, and that no significant change or deep cure can take place without crossing the bridge in both directions.

In the psychological domain, these are two almost completely separate processes – the emergence of the disorder and the treatment of the disorder. Helmut Thomä and Horst Kächele (1985, 1988) point out that whatever has created the disorder in childhood, whatever kind of deprivation and conflict, the adult human mind has its own neurobiological and psychological mechanisms which maintain mental health disorders in a circuit that is closed to present mental operations, regardless of the stored maps of stressful events from the past. The only way to act on the brain-mind's archipelago of the patient is the "here and now" through therapeutic change achieved with corrective (current) emotional experiences to establish affective balance for the patient.

Stephen A. Mitchell (1997, 2000) also points out that despite the strength of early representations of object relations, the adult patient is simply not a little child. In contrast to young children, the adult patient has well-developed Self states (no matter how rigid and/or chaotic they are), regardless of his/her mental health disorder. Other psychoanalysts (Peter P. Wolf, 1996; Emanuel Peterfreund, 1978; Charles Brenner, 1982) have been warning us about this for a long time,

and questioning how analysts deal with early childhood development and the mind, as this approach has little or no benefit for psychotherapy in adult patients.

The crucial point is that regardless of whether a mental health disorder was caused by adverse psychosocial factors in childhood, biological/genetic vulnerability, stressful/depriving factors in adulthood, or by socio-economic and cultural risk factors, psychoanalytic psychotherapists can help the most by effecting the affective system of mind-brain to help a person establish a sensitive and emotional balance in the present and anticipated future.

Psychoanalytic psychotherapists use empathic and skilled communication with the patient, employing verbal (and nonverbal) methods and content that sensitizes, supports, educates and sometimes confronts the patient. This allows the patient to establish a balance in the sensitive and emotional pulsations and better integration, adaptation and cognitive configuration between the primary (affective), secondary conditioning (implicit learning) and tertiary cognitive-linguistic (social and emotional) system. From this perspective, dealing with (early) childhood of a patient is useful and makes sense for the improvement of children's mental health, to help children and their parents, for child psychotherapists and psychiatrists, and in developmental psychology and neuroscience. While it is not a key factor in curing the adult patient, talking about childhood is useful in order to sensitize the patient's self in process of transfer.

Does this mean that Psychoanalysis should completely give up on the patient's childhood? Not at all. In practice every psychoanalytic psychotherapist (and authors believe therapists from other schools) should examine the events of childhood, from the earliest memories to the information that the patient has received about him/her Self from their parents. The important questions should be centred around the way the patient coped with psychological conflicts, fears and sorrows (and also happy moments) all through childhood. But this is with the purpose of building therapeutic (close human) relations and sensitization to the patient's emotional archipelago of mind-brain,

because the material from childhood is not in itself a curing factor.

Therapists know how emotionally significant it can be for a patient, for the first time in his/her life, to have a chance to make an autobiographical recapitulation of his/her life events, and what it means to be in a relationship where the therapist patiently and carefully listens and encourages the patient to tell the 'story of his/her life'. Stephen Mitchell (2000) has pointed out that ever since Freud, the interpersonal world of people has become a whole new experience – the experience of psychoanalytic communication and relationships.

Psychoanalysts or psychoanalytic psychotherapists need to think differently about their patient, not through the model of infantile psycho-social relationships of early childhood (introjection of object mother/father) or the ego-superego-id structural theory, but rather through the concept of how the patient works through his neurodynamics associated to the three systems of the brain-mind: the primary affective system (instinctive emotions and homeostatic feelings, Core Self) the secondary system (behavioural conditioning, implicit learning/memory) and the tertiary system (the cognitive – linguistic social emotions and Autobiographic Self).

The language of neuroscience and psychoanalysis – is the dialogue possible?

The brain is home to far more neurobiological processes (unconscious neurological) per unit of time, than all the (conscious and cognitively unconscious) processes and contents of the mind. This can be understood as intrinsic brain activity that is not translated directly into mental phenomena, and can be called the level of neurological unconsciousness.

During Default State Network, or DSN, when we have very little mental activity (the patient is lying quietly and trying to think about nothing) and deep non-REM dreams we have great brain activity, equal to or even greater than when a person is maximally

productive in perception, thinking, memory, expectation and emotions. The conclusion is that only a small part of these brain activities have direct expression as mental activities.

The language of psychoanalysis and neuroscience is usually so different that it is difficult to find a simultaneous translator of neurobiological functions and processes in psychotherapeutic language. These are two different levels of functioning – brain (neurobiological) and mind (psychological) levels.

Let's look at neuroscientific display of the functioning of one anatomical structure of the brain: the habenula, a relatively small subcortical nuclei located in the diencephalon, is a part of the epithalamus, and is divided into lateral (limbic) and medial (motor) parts. The medial habenular nucleus sends afferent fibres to interpeduncular nuclei (IPN) in the midbrain (mesencephalon) and towards myelin lamellae glands. This nucleus receives afferent signals from the septofimbrial nucleus of the interfascicle nucleus, ventral tegmental area (VTA) and locus coeruleus (LC). Most roads end in the lateral nucleus. The lateral habenular nucleus sends fibres to the core and adjacent raphe reticular formation of the mesencephalon (midbrain), the parts of the substantia nigra pars compacta (SNc), ventral or ventral tegmental area (VTA), and hypothalamus and the basal forebrain. Furthermore, the lateral habenula is a powerful monoamine neurotransmitter modulator and functions as a relay station for various inputs. Studies show that the connection tract to habenula comes from caudate, putamen, hypothalamus, frontal cortex and nucleus accumbens (NAc) as afferent fibres. By contrast, outgoing, efferent connections were found with the IPN core, periaqueductal grey (PAG) and raphe nuclei, VTA and SNc. Research shows that the habenula is an important brain structure in many peripheral and cognitive functions, such as forecasting information about rewards, stress, depression and pain processing. The medial habenula plays an important role in motor functions, the primary reinforcement and hedonistic states, while the importance of the lateral habenula lies in memory, anxiety, predicting rewards and depression (Van Kerhof, Damsteegt, Trezza, Voorin, 2013).

Mark Solms (2013, 2015) points out that the brain is not only an information processing object, but also an intentional subject. There cannot be two types of minds, one psychoanalytic and the other neuroscientific. There is only one kind of human mind (respecting the individual differences among people). Authors believe that out of all the neuroscientifically-based models of mind and models from the field of Psychotherapy/Psychoanalysis, the most relevant are those relating to affective neuroscience, neuroscience of Self and consciousness.

What does the concept of mind-brain interfaces look like for affective neuroscientists? Now we will explore some reflections on the research of J. Panksepp and A. Damasio, by looking at the anatomy of the Core (Affective) Self, primary instinctive emotions and homeostatic bodily feelings. Jaak Panksepp (2012) points out that current evidence indicates that the primary affective experiences are the result of the subcortical medial system (SCMS) which displays in the upper brainstem (midbrain, hypothalamus) and in the thalamus. These anatomical structures are strongly related to the anterior medial cingulate, insular and frontal cortex, as well as orbitofrontal cortical zones. Raw feelings of SCMS “validate” the body states, with the environment provoking emotional responses to life’s challenging (prototypical) events.

The most important structures in supporting Core Self and primary affect could be the deep layers of the superior motor colliculi and the periaqueductal gray area (PAG), that are associated with the ventral tegmental area (VTA), a source for the mesolimbic dopamine system that supplies the basal ganglia and the medial pre-frontal regions and hypothalamic circuits. PAG is the most concentrated structure of (affective) consciousness in the brain: the dorsal part generates unpleasant/negative, while the ventral part pleasant/positive feelings and emotions (Mark Solms, 2015).

PAG is the most ancient, highly concentrated instinctive emotional zone of convergence within the brain. This is the structure of the midbrain, located in the upper part of the brainstem, richly linked to other structures and pathways. The epicentre of the primary

emotions and Core biological Self is the periaqueductal gray area, which is a focal structure of Core Self, primary emotions and homeostatic feelings, because it is richly associated with higher and lower brain functions.

There are anatomical neural substrates underlying homeostatic feelings, the primary emotions, as well as the Core Self. Homeostatic, visceral feelings are also driven by a nucleus tractus solitari (NTS) and other visceral nuclei of the pons and the medulla oblongata (Zurak, 2016). These anatomical structures together with the ascending reticular activating system (ARAS) are the basis of the phenomenon of consciousness. Consequently there are two interrelated and simultaneously activated types of awareness, primary affective awareness (containing instinctive emotions, homeostatic feelings and Core Self) and higher cognitive-linguistic awareness (opinion, anticipation, memory, association, understanding of events in and around us, Autobiographic Self, etc.).

Todd Feinberg and Jon Mallatt (2016) explain primary awareness through neurobiological naturalism, emphasizing that “the difficult problem of neuroscience” how the brain creates a conscious mind, can be solved with neuro-ontological subjective characteristics of consciousness. There are four characteristics of subjective awareness: 1) Referral: conscious experience is always directed towards the outside world, the body or emotional state, but does not apply to neurons that produce consciousness, 2) Mental unity: consciousness is united and bound in a relatively unified space (field) of consciousness in contrast with different sets of individual neurons that are creating it, 3) Mental causation: shows how the subjective mind can have a causal effect on behaviour, body and the outside world, and 4) Qualia: the quality of subjective experience attributed to colours, pain, sounds, etc.

Large differences in brain anatomy mean that the gap between the brain and the psyche cannot be explained only by one or more characteristic physical properties of the brain in creating awareness. Even within different animal species the neural basis of consciousness reveals significant differences in the

brain's architecture that creates a subjective experience. These authors point out that there are three aspects (and experiences) of awareness – exteroceptive, interoceptive ideas and affective experiences. These three aspects of consciousness are associated with different anatomical regions of the brain and different brain architectures. Although some neuroscientists believe that all three aspects of consciousness arise exclusively from the cerebral cortex and the thalamus, there is ample evidence that affects originate in subcortical structures in vertebrates and mammals, and that the neural circuits for exteroceptive and affective aspect of consciousness are differently organized as well.

António Damasio (2010) posits a proto Self which is the precursor of the neurobiological-mental construction of the Core Self and the higher Autobiographic Self (which includes the cognitive-linguistic structure of the brain). Furthermore, it is essential to differentiate between feelings and emotions, where feelings are primarily leaning on interceptors, visceral, feeling states of homeostatic regulation of the Body, while emotions (with internal and external triggers) are qualitatively different affective states of differentiated emotions, such as fear, sadness, anger, jealousy, guilt or pride.

Emotions are generally conscious phenomena (Freud also spoke about this); the brain-mind is evolutionarily designed to create conscious (physical) feelings and primary emotions as biological values for regulation of life. If the subcortical nuclei and circuits that generate primary affects are sufficiently stimulated, affects will always occur. Only when these systems are innervated to a lesser extent, can the frontal cortex suppress affects.

It should also be noted that unconscious processes are not simply created by defence mechanisms (repression, dissociation), separated from the conscious processes. Rather it is the usual mode of functioning of the brain. Nor are the unconscious processes of the Self more important than the conscious mind. Unconscious processes are constantly, from moment to moment, in dynamic interaction with conscious processes, and this true in mental health disorders and mental Health in general. There are no sensations, affects, thoughts,

memories, expectations or behaviours, which are not created by unconscious processes or the neurological unconscious (this is not the psychoanalytic unconscious based on memorized experiences) because this is the way that the brain-mind works. Unconscious processes represents the higher level of the synchronized functioning of the brain-mind, they have a pervasive influence and play out in every one of our mental and behavioural manifestations, as well as in all relationships, including the ones seen in psychotherapy (Ginot, 2015).

There are therefore three levels of unconscious systems of the brain-mind; the unconscious is not only at the level of psychodynamic unconscious (cognitive unconscious maps of explicit memory), or the level of implicit unconscious, conditioning learning/memory or behaviour. The deepest level of unconscious is a neurological or neurobiological unconscious which is implemented in the actual work of the brainmind; it is like the unconscious functioning of our internal organs, akin, for example, to liver metabolism. The first and second level of unconscious are related to psycho-social experiences, while the third unconscious is not related to that, instead it is related to the biology of the body/brain.

The brain is considered an extremely complex nonlinear open system, and even though the emphasis here is on (deep) subcortical brain areas, the cortical or cortico-thalamic regions of brain circuits are still crucial for behaviour and mental function. These regions include the orbitofrontal cortex, the anterior cingulate cortex, the insula, the ventral medial and dorsal prefrontal cortices, the dorsal lateral prefrontal (i.e. working memory), anterior associative areas of the prefrontal, parietal and temporal associative areas of the cortex, as well language functions of the left hemisphere.

Lisa F. Barrett understands this interaction of subcortical and cortical anatomy regions of the brain throughout the interceptors network and control network. This large scale neural network functionally generates interplay of body budget (visceral) feelings, emotions and cognition.

She stresses that instances of emotion are constructed throughout the entire brain by multiple brain networks in collaboration. Ingredients going into this construction include interoception, concepts and social reality.

Interoceptive predictions provide information about the state of the body (budget) and ultimately produce basic, affective feelings of pleasure, displeasure, arousal and calmness. Concepts are embodied knowledge (from your culture), including emotion concepts. Social reality provides the collective agreement and language that makes the perception of emotion possible among people who share the same culture. Likewise, emotions are commonly thought of as being discrete and distinct – fear, anger, happiness – while affect (visceral body feeling), produced by interoception, is continuous (Barrett, 2017/2).

Cognitive-linguistic systems are important for cognitive functioning and regulation; it is these systems which allow for the thinking, acting, planning, reasoning, problem solving, concepts making, categorization, episodic, long-term and working memory, control and disposal of drives and affects, psychological defence mechanisms, abstract thinking, symbolization, learning, language functions, personality characteristics, social and mixed emotions, and the Autobiographic Self.

The importance of integration of cognitive and emotional structures is emphasized by the neuroscientist Luiz Pessoa (2013), who believes that it is better not to talk about the emotional and cognitive as different entities, but instead to see them as mental phenomena through their interaction. This leads to the question: “What cognitive emotional interactions are important to understand certain complex behaviour X?” For L. Pessoa, mental processes integrate cognitive and emotional structures because multiple neural circuits and networks include both affective and cognitive processing.

Many behaviours and experiences of people with psychological problems or mental health disorders continue to have affective-cognitive integration. In

paranoia, fear is often accompanied by sophisticated cognitive ideas and expectations. In clinical psychotherapy, it is often noted that cognition is not an antidote to irrational impulses or painful emotions, but is integrated into the pathology itself. In many other non-pathological situations, such as when you are falling in love or when one is greatly fascinated by something or highly motivated, cognition is also powered with affective pulsations (Porges, 2001).

It is well known that the brain’s subcortical and cortical areas are massively associated, but now we wish to emphasize that. Antonio Damasio, Jaak Panksepp, Mark Solms and other authors point out that subcortical nuclei are crucial for generating and modulating the primary affects, the Core Self and consciousness, and thus for human behaviour, psychological life and psychotherapy.

In Affective Neuronal Darwinism (Toronchuk & Ellis, 2013), neuronal plasticity determines which neurons survive, and in that process the neurotrophic brain-derived neurotrophic factor (BDNF) and monoamine neurotransmitters such as serotonin, dopamine, norepinephrine and epinephrine which all play a critical role.

Neurotrophins promote the activity on which the refinement of neural circuits and networks is dependant, including that rendered by selecting simultaneously active neurons. The complex interaction between neurotrophins, monoamines, cytokinin and information processes of the brain affects neuronal survival and plasticity. However, under adverse conditions it can lead to the emergence of psychiatric conditions and neurodegenerative diseases. Due to earlier maturation of the brainstem relative to the forebrain (telencephalon and diencephalon), the authors suggest that early activity in emotional circles affects the rewiring (reconnection) of the higher brain areas and neurotrophins and neurotransmitter levels. The levels of neurotrophins (BDNF) and nerve growth factor are modulated by the activities of the primary emotional system, so it is reasonable to suggest that rewiring (reconnection) the brain circuits will be affected by nature, timing and the amount of activation on

emotional circles during early life. Furthermore, endocrine and immune systems play a key role in neural networking and there is growing evidence that highlights the importance of the immune system in development, plasticity and behavioural disorders.

Anil Seth and Karl Friston (2016) state that the brain is not an elaborate stimulus-response link but a statistical organ that actively generates explanations for the stimuli it encounters in terms of hypotheses that are tested against sensory evidence, in other words, PREDICTION. They emphasize the recent shift in conceptions of interoception and its relationship to hierarchical inference in the brain. Interoceptive inference is a process by which bodily states are regulated by autonomic reflexes that are enslaved by descending predictions from deep generative models of our internal and external milieu. This re-conceptualization illuminates several issues in cognitive and clinical neuroscience with implications for experiences of selfhood and emotion. Seth and Friston first contextualize interoception in terms of active (Bayesian) inference in the brain, highlighting its enactivist (embodied) aspects. They then consider the key role of uncertainty or precision and how this might translate into neuromodulation.

In general terms, the (predictive coding) process theory for active inference described above speaks to the synaptic mechanisms that might underlie false inference in psychiatric conditions. Briefly, the formal constraints implicit in predictive coding require a modulatory gain control on ascending prediction errors. This theory exemplifies how one can understand functional (hysterical) symptoms as false inference about the causes of abnormal sensations, movements, or their absence.

Mark Solms (2013) finds fault with the psychoanalytic slogan: “where (unconscious) id was, there shall ego (conscious) be”; according to neuroscience it would be more accurate to state “where ego was, id shall come.” There is therefore a need to activate free and balanced pulsing of the id – the primary affective system that operates mainly in analogue mode, and the affective system that should be

harmonized with cortical cognitive-linguistic, social-autobiographical system, which works mainly in digital mode. The tertiary cognitive system can operate through a feedback loop to the primary affective systems. In almost every psychological disorder we see an imbalance, rigidity or chaos in the pulsations of the primary affective system, which disrupt the functioning of the cognitive configurations of the mind-brain.

Jaak Panksepp (2006) states that the primary understanding of the emotional system as emotional endophenotypes helps better psychotherapeutic understanding of raw and painful emotions/feelings in patients, when it gives us, among other things, a clearer explanation of the sources of their suffering, which are better explanations than those stemming from methapsychological hypotheses. In addition, it should be noted that all psychotherapeutic schools tend to ignore the importance of biology/genetics in personality structures and mental health disorders, and they tend to exaggerate the importance of psycho-social experiences.

According to genetic research of mental health disorders, genetic influences explain 42% of variation in Borderline Personality Disorder (BPD) characteristics both in men and women. The study showed that heritability is approximately equal in countries where the research was conducted – in the Netherlands, Belgium, and Australia (Distel, Trulli, Derom, Thiery, Grimmer, Martin, et al., 2008). Thus, the research has shown that for many patients with Borderline Personality Disorder, stressful life experiences (childhood or adulthood) are insufficient as lone causes, but rather it is the biological/genetic vulnerability or imbalance that gives rise to the disorder.

Peter Fonagy (2003) suggests that patients with Borderline Personality Disorder (BPD), especially in social interactions, under great stress, often tend to perceive and act in a “black and white” mode. The reasons why a person is prone to experiencing these situations in a particular manner and these particular patterns of behaviour and social interactions can be explained by various etiological factors. In fact, we are not suggesting the raising of the pedestal of causal determinism, largely

because we are not able to demonstrate such determinations.

The theory of the brain-mind interface, the structure of personality and behaviour patterns which is advocated by the authors, implies an important role in the configuration, hierarchy and dynamics of these three Systems: Primary (affective), Secondary (conditioned), and Tertiary (cognitive-linguistic). The affects are complex phenomena involving different emotions, primary emotions, social emotions, mixed emotions. The emotional-cognitive schemes are generated and integrated in different areas of the brain. The affects are not created only by outside events or memories (anticipation) of affective states, but by homeostatic control systems of the body.

Antonio Damasio sees homeostasis as the fundamental property of life that governs everything that living cells do, whether they are individual living cells, or a complex system such as the human body. The word homeostasis does not mean balance or equilibrium, because if our organism was in equilibrium, we would be dead. The principle of homeostasis functions as the forceful projection into the future. So large is the scale of this enterprise that its effects can begin at the lower physiological level and manifest themselves at the higher levels of function, namely, cognition.

Homeostasis and life regulation are usually seen as synonymous, but this is too narrow a concept. The homeostatic process strives for more than a mere steady state, not only managing simple physiological operations like thermostat regulation. On the contrary, there are shades and grades of regulation. There are steps along scales that ultimately correspond to the greater or lesser perfection of the regulatory process. This process corresponds to what is commonly experienced as feelings. Here, there are two closely related notions at play: the first being the relative goodness or badness of a given life state, which is the basis for the second, which is the feeling associated to it (Damasio, 2018).

The foundation of the new psychoanalytic

paradigm, refers not so much to the things that should be raised into consciousness, or to teaching the ego in sophisticated ways to reflect on the (unconscious) psychological conditions and developments in relationships with the environment, even though this still takes place. The basis of this new paradigm is how you psychotherapeutically handle the qualitative nuances of consciousness phenomena to balance the pulsations of the primary affective system. This is achieved by means of the corrective emotional experience from session to session, a strategy proposed by psychoanalyst Franz Alexander (1946).

The basis of therapeutic theory and practice is dealing with different phenomena, namely, exteroceptive, interoceptive and affective awareness, as well as revealing unconsciously mapped content. In short, it can be said that psychoanalytic psychotherapy is a specific psycho-social, verbal and nonverbal, conscious and unconscious, communication game between patient and therapist. Communication between neuroscience and psychoanalytic psychotherapy is not only possible, but also necessary if we wish to construct a better model of the psyche or "Mental Apparatus" and psychological functioning in healthy people and people with mental health disorders.

Structure and dynamics of the brain-mind: back to Freud?

Mind, Self and Consciousness are concepts that are intertwined phenomenologically or even act as basically the same phenomenon. In the psychoanalytic conceptualization of the human mind, there are many discussions of Self, Consciousness and the Unconscious, with explanations of the cause and effect of these phenomena, their structure and relationships with psychological conflicts, disorders or transfer phenomena.

Neuroscience can define these specific terms in the following simplified way. Self is the "I" or the protagonist, a subject that is experiencing something. The mind is a projection of the current collection of mental images of the brain on the screen of

Consciousness. The mind only comes in three forms, that is, the brain has three types of film projection of the mind and they are: sensory, affective, and cognitive (thoughts). Consciousness is a screen onto which the brain is projecting the (sensory, affective, and cognitive) movie of the mind.

Self, mind and consciousness are three fundamentally different phenomena that are interconnected, and are presumed to have been created from a variety of neurobiological circuits and networks (Damasio, 2010).

Consciousness is the capacity for any (sensory, affective, cognitive) experience that the mind creates. The screen of Consciousness and the projections of the mind are decoding mechanisms of the brain, which make it possible to decode neurophysiological processes into experience on a screen, using the contents of the system of the sensory, affective and cognitive mind.

But the brain has through evolution added an additional element – the protagonist of the film on the screen (the contents of the mind) – and that protagonist is the Self. The Self does not sit between the brain (the “project”) and the screen of Consciousness, it appears on the screen as soon as the brain begins to project a “movie” of the mind onto the screen; the Self is in the film, and it is the one experiencing the movie (Tononi & Koch, 2015).

So we could talk of three levels of unconsciousness: cognitive or psychoanalytic unconscious (cortico-thalamic network), implicit or procedural unconscious learning/memory (behavioural conditioning, neural networks of basal ganglia, and the amygdala complex) (Mancia, 2016), and the neurological or neurobiological level of unconscious (specific clusters of structures, networks and chemical processes throughout the brain).

The main difference between the above and Sigmund Freud’s unconscious is that the unconscious is never firmly separated from the conscious processes of the brain-mind; it is still “buzzing” in the background, and is not separate from the broader context of mental and social functioning. Repetition of past experiences

(representation), is not the main task of psychotherapy, but interaction with the internal (interoceptors, body budget) and external environments, stimulated by concept making and prediction. Humans are remarkable animals that can create purely mental concepts that influence the state of our body. The social and physical are intimately linked via body and brain, and our ability to move effectively between the social and physical depends on a set of skills that we can learn. This is how psychotherapy can help to connect the patient’s brain to the reality of his social world (Barrett, 2017/1).

Mental defences such as avoidance are automatically guided (without a Self System) and implemented through the emotional systems and the amygdala in response to adverse physiological-affective, hyper- and hypo- states of excitement. Mental defences are trying to establish homeostasis (Panksepp & Beaven, 2012; LeDoux, 2015; Schore, 2012). Neuroscientist Robert Burton (2013), explains that for the brain, it doesn’t matter whether something is conscious or unconscious, as it does not distinguish between the two ways of processing. The brain is interested in adaptation and management of biological life values, homeostasis, prioritising biological needs over psycho-social ones.

Consciousness is that extra space in the brain-mind interface that allows more complex reasoning and intentionality (behaviour). Therefore, mental functioning and behaviour require constant coordination and dynamics of the unconscious and conscious. Within unconscious processing, people have fewer alternatives for thinking and behaviour; the process of evolution of the brain has added awareness in higher animals and people as conscious processing allows better adaptation and more complex (especially social) behaviour (Block, 2007).

We are not advocating a return to Sigmund Freud or any other psychoanalyst author. We rather believe it is important to use psychoanalytic “know-how” techniques in practice (free association, interpretation, clarification, empathy, etc) based on contemporary affective neuroscience, and not on a causal explanation of object relationship theory of how a disorder is developed. In most cases, there is no need to ascribe the

mental disorders to psychoanalytic all-explanatory relationships with the mother / father in (early) childhood, as well as the relationship with the psychoanalyst as a repetition of those pre-oedipal and oedipal psychological developmental stories when working with adult neurotic patients.

Today's neuroscience can state that the ego and super-ego are principally a part of the tertiary cognitive-language system that includes reasoning, planning, cognitive control, long-term episodic and semantic memory and working memory (RAM), associative, integration, sensory, motor, hearing and speaking regions. This cognitive-language system largely works unconsciously, through perceptive sensorium (external body) and autobiographical memorized maps which store memories and anticipation models. The human tertiary (cognitive language) system is the most complex mammalian brain system. It contains a giant network of associations, symbolization, capacity for abstract thinking, memory maps, anticipatory expectations, autobiographical stories, imagination, cause and affect understanding, constant reshuffling of our own images of ourselves and the Other (Self-Other configurations) in different contexts and in different spatial and time sequences.

This system constantly interacts with the primary, deep subcortical, instinctive affective system, which not only provides an affective compass for the biological values of life, but is also the very consciousness of the Reticular Activation System (Solms, 2013).

The cognitive language system provides us with the opportunity to reflect upon our own existence and the existence of other people, creating a world view and value system, giving sense and meaning to our society, spirituality, world or personal cosmology, but is also a way of providing cognitive illusion, the unconscious, beliefs in myths, in concepts that are invisible and non-existent. This system creates/gives the intellectual power and creativity in science, but also imagination in art.

Based on research in affective neuroscience, J. Panksepp and L. Beaven (2012) came up with the

following schema for the three systems of emotional control of the brain-mind: 1) the tertiary, or the cognitive-language system, 2) the secondary, or the behavioural-conditioning system, and 3) the primary, or the affective system. The authors believe that this is a better theory of the mind structure or mental faculty, when compared to Sigmund Freud's conceptualization of mind with its notions of ego, super-ego, and id, the object relations theory (M. Klein, D. Winnicott, R. Fairbairn, T. Ogden, etc.), or O. Kohut's Self Psychology as well as thinking on the mind's apparatus from psychoanalytic relationists/intersubjectivists. Classical psychoanalytic terms can be used occasionally as familiar symbolic metaphors, but they are not proofs that stem from good contemporary scientific theory about "Psyche" or mental apparatus. Panksepp understands the brain-mind function as having three different but connected systems, namely, the primary affective system, the secondary behavioural-conditioning system, and the Tertiary cognitive-linguistic system.

The primary system

The primary system is the basis for biological control and regulation in life in humans and animals. This system can produce any homeostatic sense or primary instinctive emotion and awareness about feelings and behaviours, but with the need of the tertiary system to appoint cognitive understanding of emotions. The primary affective system is closest to (but far more sophisticated than) the classical psychoanalytic structure of the Id. This system generates instinctive affects and affective consciousness although it is generated from the deepest subcortical structures – the brainstem (especially in the midbrain, in periaqueductal gray, or PAG), the hypothalamus, the deeper parts of the limbic system and the central amygdala.

The primary affective system contains homeostatic (body budget, visceral) feelings, primary or instinctive emotions, and the core Self.

Homeostatic feelings, which come from

interoceptors (homeostatic oscillation of different visceral body systems) are old internal world (abdomen, thorax, skin, along with associated chemical processes), and the newer internal world of the body's skeleton and voluntary musculature. Homeostatic feelings are primarily related to visceral signals emerging from the older body structures. They provide the valence value which modulates the emergence of the primary emotional operative systems. These feelings need to be distinguished from emotions. They are the foundation for the emergence of emotion, but also powerful modulators of the quantity and quality of emotional and cognitive activation. Ultimately, they are related to valence and the energy charge of the person (Damasio, 2018.)

There are three groups of dichotomous homeostatic (body budget) feelings: 1) pleasure (enjoyment)-displeasure (pain), 2) energization (vitality)-fatigue (lethargy), and 3) feelings of tension-relaxation. In his research in affective neuroscience, Jaak Panksepp has identified at least seven primary emotional systems in mammalian brains. They are as follows: 1. SEEKING, 2. RAGE, 3. FEAR, 4. LUST, 5. CARE, 6. PANIC/GRIEF 7. PLAY (Panksepp, 1998). In the primary emotional operative system there emerged a certain type of neuronal signal which Panksepp calls FEAR or PANIC or CARE, however not the psychological phenomena described as fear, panic or care. These are complex cortical operations from another, higher level of mental operations (from the tertiary level).

We can say that social and other emotions are largely derived from primary emotions. For example, Helen Fisher points out that sexuality involves three different neural circuits: desire (sex drive), attachment to the connection, and romantic love. Desire or libido is mostly regulated by testosterone, attachment by oxytocin, and romantic fervour by dopamine. There are also differences between sexual desire and sexual satisfaction (Fisher, 2006). Needless to say, these affective systems function as part of a feedback loop. If affective circuits are imbalanced, too excitable or lack excitability, the path to psychological problems and disorders opens. The primary affective system is the basis of the core Self.

The secondary system

The secondary system is the classical conditioning system. This implies that psychoanalytical psychotherapy is partially a corrective emotional experience or positive affective conditioning (Wachtel, 2008).

The tertiary system

The tertiary system allows the psychoanalyst and his/her patient to think and communicate with each other using sophisticated words through intra- and inter-psychological dialogue (Bolognini, 2015), and provides a rich conscious "movie in his/her head" together with huge anticipatory and memory banks of mapped data. This system is machine for CONCEPTS and PREDICTION (prediction error) as well as a basis for autobiographic or ideographical self.

The tertiary system continuously processes pulsations from the primary system. For instance, the separation stress that activates a primary emotional system separation (PANIC/grief) and, at the tertiary level it gets scattered in a multitude of possible social emotions (guilt, shame, rejection feelings, worthlessness, and inferiority, etc.), which requires complex cognitive processing over the instinctive emotional system (Zellner, 2011).

Damasio (2018) uses a different name for the description of phenomena entering in the tertiary system, calling it "Enriching Minds", a kind of mind that differentiates humans from other mammals and primates. The Enriching mind consists of the following processes: 1. Integration of images at multiple cortical sites including the entorhinal cortex and the related hippocampal circuitry; 2. Image abstraction and metaphor; 3. Memory: image-based learning and mechanisms of recall, search engines and PREDICTION of the immediate future based on continuous memory searches; 4. Building of CONCEPTS from images of objects and events, including the class of events known as feelings; 5. Verbal translation of objects and events;

6. Generation of narrative continuities; 7. Reasoning and imagination; 8. Construction of large-scale narratives integrating fictional elements and feelings; 9. Creativity.

In previous theories of emotions, the three levels of emotional systems connected to three different levels of the brain-mind system were often intermingled or not recognized (Panksepp, 2008).

The cortex is not the centre of consciousness (and overall psychological life) as contemporary neuroscience has clarified, thus erasing earlier cortex-centric misconceptions (Parvizi, 2009). For instance, although the interoceptive network consists of cortical regions (aCC, pCC, Insula, vmPFC, dmPFC), they can't work at all without brain stem regions (Barrett, 2017).

In the book "The Myth of Executive Functioning" (2014), Leonard Koziol adopts an evolutionary/neuroscience perspective to explore the cornerstones of cognitive organization, including memory, planning, decision-making, and adaptation to novel circumstances. He emphasises subcortical contributions to cognition in stimulus processing and in the relationship between movement and thought. He argues that there is no "executive" in executive functioning independent of the task used to assess it, and discusses the limitations of a cortico-centric approach to understanding the brain-behavior relationship, calling for a greater knowledge of large-scale brain systems.

Koziol recommends replacing the term "executive functioning" with the concept of a "cognitive control system", which is an extension of the vertically organized brain. He describes how cognitive control evolved in order to allow the individual to interact with the environment in an adaptive fashion, and persuasively argues that "executive functioning" is an arbitrary construct that lacks an agreed-upon definition.

Successful adaptive functioning is conceptualized as involving the two types of cognitive control: rapid automatic cognition which takes place the majority of the time, and slower, conscious, effortful cognition

which takes place when faced with a problem not easily solved by previous experience.

The cortico-striatal-thalamic loop of the brain are critical for reward, motivation, formation of habits, and motivational learning. These loops exist throughout childhood and adulthood and undergo important cascade changes in connectivity patterns and is also important in the brain's vertical organization, in motor-affective and somatosensory functions, i.e. in cognitive control. (Koziol, 2014.)

The brain's internal model is predictive, not reactive. The popular hypothesis is that the brain's simulations function as Bayesian (statistic-mathematic) filters for incoming sensory input, driving action and constructing perception and other psychological phenomena, including emotion. Simulations are thought to function as prediction signals that continuously anticipate events in the sensory environment (Barrett, 2017/2).

A hypothesis of how a brain functions, the free energy principle (also known as active inference or predictive coding), tries to explain how (biological) systems maintain their order (non-equilibrium steady-state) by restricting themselves to a limited number of states. It posits that biological systems minimise a free energy functional of their internal states, which entail beliefs about hidden states in their environment.

The implicit minimisation of variational free energy is formally related to variational Bayesian mathematical statistic methods and was originally introduced by Karl Friston as an explanation for embodied perception in neuroscience, where it is also known as active inference or predictive coding. Active inference is related to optimal control by replacing value or cost-to-go functions with prior beliefs about state transitions or flow, active inference we can understand as synchrony in function of the Self.

The free energy formulation that advances Helmholtz's agenda to find principles of brain function is based on conservation laws and neuronal energy. It rests on advances in statistical physics, theoretical biology and machine learning to explain a remarkable

range of facts about brain structure and function. This might have just scratched the surface of what this formulation offers. For example, it is becoming clear that the Bayesian brain is just one facet of the free energy principle and that perception is an inevitable consequence of active exchange with the environment. Furthermore, one can see easily how constructs like memory, attention, value, reinforcement and salience might disclose their simple relationships within this framework.

It states that any adaptive change in the brain will minimize free energy. This minimisation could be over evolutionary time (during natural selection) or milliseconds (during perceptual synthesis). In fact, the principle applies to any biological system that resists a tendency to disorder, from single-cell organisms to social networks. The free energy principle is an attempt to explain structure and function of the brain, starting from the very fact that we exist, and this fact places constraints on our interactions with the world (Friston, 2010).

Active inference has been used to address a range of issues in cognitive neuroscience, brain function and neuropsychiatry, including: action observation, mirror neurons, saccades and visual search, eye movements, sleep, illusions, attention, action selection, hysteria and psychosis.

Mark Solms (2013) has drawn some parallel reasonings between Freud's Personality Structural Theory and the Consciousness inner states. Two aspects of body are represented in the brain. They are represented differently and associated with different aspects of consciousness: the external body ("body image") and the internal body.

The internal body is based on interoceptors, it is an aspect of the body's internal milieu, it is the visceral, the autonomic body. Interoceptive structure not only monitors but also regulates the state of the body (homeostasis). The internal body functions largely automatically, but it also arouses the external body to serve its vital needs in the external world. It is important to note that a hierarchical relationship exists between

two aspects of body representation. Although the flow of information is both "bottom-up" and "top-down" the functional integrity of the cortex (corticothalamic system) is contingent upon brainstem (internal body) activation. Internal body has been synonymous with Id, and basically consciousness.

External body arises not in, but rather from unimodal cortical maps (somatosensory cortex). Neuroanatomically it is represented in somatotopic maps on the cortical surface, which are projections of sensory receptors, on the surface of the body, relayed via modality-specific thalamic and cranial nerve pathways. It does not coincide with the somatosensory cortex alone, it includes the projection zone of all the sensory modalities. The same system of corticothalamic mechanisms (together with motor maps) perceives other external objects, so the external body is represented "as an object". External Body Ego (composed by sensory and motor representations) and learned representations are essentially unconscious, but they can become conscious through the constant instinctive-affective projection (cathexis) of subcortical structures into the cognitive cortex. The external body (Ego) is basically unconsciousness (Solms, 2013).

A brain did not evolve for rationality, happiness or accurate perception. All brains accomplish the same core task to efficiently ensure resources for the physiological system within an animal's body (i.e. its internal milieu) so that an animal can grow, survive and reproduce. This balancing act is called homeostasis or allostasis (Sterling & Laughlin, 2015).

For a brain to effectively regulate its body in the world (homeostasis), it runs an internal model of that body in the world. An internal model is a metabolic investment, implemented by intrinsic activity (in humans it occupies 20% out of total energy consumed). Modelling the world "accurately" in some detached disembodied manner would be metabolically reckless. Instead, the brain models the world from the perspective of its body's physiological needs (homeostasis). As a consequence, a brain's internal model includes not only the relevant statistical regularities in the extrapersonal world, but also the

statistical regularities of internal milieu. Collectively, the representation and utilization of these internal sensations is called interoception. Whatever the brain is doing – thinking, feeling, perceiving, emoting – it is also regulating its autonomic nervous system, immune system, endocrine system, gastrointestinal system, or cardiovascular system, as resources are spent in seeking and securing more resources. Interoceptors stimulate the creation of a homeostatic (bodily) body feeling. These feelings are constantly present in the range of pleasure (pleasure) - discomfort (pain), energy level - exhaustion and relaxation - tension. Homeostatic feelings are not emotions, they are a simpler form of affect, which consists of valence (pleasures) and levels of excitement (tension-relaxation). These are the feelings that are constantly present (at least in the background) as opposed to emotions that we have occasionally, and homeostasis (interoceptors) is the main building element for the emergence of feelings and later emotions. Without interoceptors we would not notice or care for our physical and social surroundings, or for anything else, and they could not survive long enough. Interoceptor networks allow our brain to construct the environment in which it lives (Barrett, 2017/2; Craig, 2015; Damasio, 2018; Critchely & Garafinkel, 2017).

Neuroscience teaches us that perception of the internal world is not in fact the “interior”, thoughts, feelings, fantasies, expectations, associations, memories - all of them are mental simulations for coping with the outside world. Inside are interoceptors, inner body, internal miles, and the affects that result from it. Cognition (thinking) is always a mental simulation, verbally expressed or unexpressed, created through language or images that require inputs from the outside.

L.F. Barrett (2017/1) points out that emotions are a construction of the world, not a reaction to it. She represents the theory of constructed emotions in the following way. Emotions are constructed throughout the entire brain by multiple brain networks in collaboration, so emotions should be modelled holistically, as whole brain-body phenomena in context. Her key hypothesis is that the dynamics of the default mode, salience and frontoparietal control networks form a computational core of a brain’s dynamic internal

working model of the body in the world, entraining sensory and motor systems to create multi-sensory representations of someone who has a body, all in service of allostasis (homeostasis).

Ingredients going into the construction of emotions include interoception, concepts, and social reality. Interoceptive prediction provides information about the state of the body and ultimately produce basic, affective feelings of pleasure, displeasure, arousal, and calmness. Emotions are commonly thought of as discrete and distinct (fear, anger, happiness) and they are constructed at a given moment, the brain has predicted and categorized the present moment via interoceptive predictions and the emotion concepts from one’s culture to construct an instance of emotions, just as one perceives discrete colors. Affects (homeostatic feelings) are continuous, while emotions are occasionally created.

Allostasis or homeostasis (predictively regulating the internal milieu) and interoception (representing the internal milieu) are the anatomical and functional core of the nervous system. In this way, Barrett, like Damasio (2018), views distinctions between the central and peripheral nervous systems as historical, rather than as being scientifically accurate. Concepts are embodied knowledge (from culture), including emotion concepts. Social reality provides the collective agreement and language that makes the perception of emotion possible among people who share a culture (Barrett, 2017/2).

In psychotherapy, we can see that each psychotherapy patient has more or less a universal overall affective repertoire, comprised of homeostatic (body budget) feelings, emotions as well as a repertoire of concepts and prediction, that all together make up the cognitive-emotional scheme. For psychotherapy, it is important to understand the feeling and emotional hierarchical structure of control of the brain-mind. It is necessary to separate the important emotions from those that are less important in psychotherapy and communication with the patient, and try to better understand how affective pulsations are connected to concepts and prediction that make cognitive configurations and thus form cognitive-affective schemas. The aim and essence of the work is exercising

(enactment) of a patient's feelings and emotions during the session and outside of it, in real life.

Core self and autobiographic self

During conscious states Core Self appears, and it is the carrier or platform for primary affective feelings and emotions that we share with mammals. Core Self is generated in subcortical structures and circuits, primarily at the level of the brain stem, the same neural circuit which also generates the very basis of consciousness phenomena. The Autobiographic or Idiographic (Identity) Self is generated from the cognitive-linguistic cortical system-areas of cognitive-emotional schemas, and memory maps.

The mind exists and can function without a "Self" according to Damasio (2010), but then it is the lower level of consciousness or (cognitively) unconscious functioning. For achieving full consciousness, the Self needs to come to mind.

Consciousness can be described as a brain's screen, onto which sensory, affective, and cognitive contents are projecting. So the "movie on screen" in the evolution of humans has led to the fact that with awareness comes a protagonist, the subject who is experiencing the contents. This entity, the first person singular – I, or Self, originates in fact together with brain's projections (sensory, affective, and cognitive) onto the screen.

Primary consciousness is universal neurobiological mechanism in higher evolutionary animals (some vertebrates and mammals). Theodor Feinberg and Johnson Mallatt (2016) compare it with metabolism and other basic biological functions. These authors emphasize that there are three kinds of aspects (experience) of awareness: exteroceptive images (all outside events), interoceptive images (internal events, from mental thoughts, memories, fantasies to internal sensations of the body) and affective experiences. These three aspects of consciousness are associated with different anatomical regions of the brain and brain circuitry.

The Self, from a neurobiological perspective, is not some unique anatomical structure located in one place, or a specific neural circuit, it is rather a complex system of clusters of neurons (nuclei) and network of interconnections, than an anatomical structure of the brain. For Antonio Damasio the Self is more a functional construction of related parts of the brain (Damasio, 2010).

The Self is not a monolithic structure but it consists of two fundamental different neuro-biological-anatomical, psychological and experiential systems, which are: the Core (Affective) Self and the Autobiographic (Identity or Ideographic) Self. The full awareness or the full "movie in the head", occurs when the Self appears in the psychological functioning of a human. Neuro-psychological research shows that many of these processes are in charge of preserving a sense of well-being of a person, and for the successful adaptation to the challenges and dangers.

Efrat Ginot (2015) presents a wrong assumption that there is an agency of the Self that unconsciously decides what to put into consciousness and what to keep in it, because it is unacceptable for the Self. This conceptualization is extremely problematic. It seems like a delusion that there would be central agency that we would call the unconscious Self. Neuroscience believes that there is no one central agency of Self, conscious or unconscious, to intervene or control psychological defence activities.

Defence reactions are a result of joint synchronized automatic responses from interactions with the environment that threaten any adaptation efforts (Ginot, 2015). Furthermore, as memory research (Dudai, 2011) has shown, in the absence of re-remembering (explicit memory reactivation), long-term memory is subject to amnesic enzymes, this is not repression, but deletion. When we want to remember something, we think about it. Whether we remember it immediately, after two hours, the next day, or not at all, does not depend on us (Self). The pursuit of voluntarily forcing the memory is essentially illusory process. If we are to get the desired result we will have the feeling that our efforts contributed to it, but how successful this was

depends only on the functioning of the brain, and not on our will, effort, wishes or feelings. This is cognitive unconscious processing, rather than the Self (Burton, 2013).

Neuroscience talks about unconscious processes, but not about the unconscious Self, since the coherent Self always appears with the conscious. We cannot speak of a repressed or dissociated Self. What can be dissociated is cognitive (memory) consisting of perceptual and affective contents (maps) that flow in space and time. Unconscious maps are where information is stored, information about perceptions, thoughts, memories, expectations, affective states, interpersonal relationships, behaviours. Some of these maps may at some point be active in a way that effects the conscious and the Self or the person's behaviour without the consciousness of the process.

In any case, the unconscious is not an enclosed space (a "basement" or tank) outside of consciousness. Neuroscience tells us that the conscious and unconscious are in constant interaction, and the psychotherapeutic process cannot claim that one is more important than the other. Unconscious mind maps are different (experienced, behavioural) programs facing the conscious mind and the Self, and the conscious mind and the Self are constantly effecting unconscious maps, by remodelling or deleting the contents of unconscious maps, e.g., through affective Self-regulation.

Antonio Damasio (2010) points out that the story about the Self starts with the neurological machinery of a protoSelf, which is the precursor of the neurobiological-mental constructions of the Core Self and the higher Autobiographic Self. ProtoSelf is a crucial step needed to constitute the Core Self. It is an integrated collection of separate neural patterns, which from moment to moment map the most stable aspects of the physical/biochemical structures. Maps of protoSelf are different in that they do not generate only visceral images of the Body, but also sensory images as well. At the basic states of consciousness, the Core Self is generated from deep subcortical structures, primarily at the level of the brain stem and parts of the

diencephalon (hypothalamus). In creating the Core Self, the brain introduces something that had not been present – a protagonist – to the mind and consciousness, the main character in the theatre of life (Self). Once the protagonist (Self) is available, and when it is associated with some of the contents, a process of subjectivity is inevitably created.

Self is not consciousness, but a separate phenomenon, strongly associated with mind and Consciousness, and the Self is essential for coherent functioning. The Core Self is not a psycho-social phenomenon and has very little to do with experience and learning, it is primarily neurobiological machinery. The Autobiographic Self is based on the Core Self (and disappears without the foundation of Core Self), but for the development and functioning of the Autobiographic Self, experiences, learning and the social world are crucial. This higher Self – Autobiographic (idiographic or identity) is generated at the level of the cognitive-linguistic cortex (cortico-thalamic system). This system is an area of higher cognitive functions, language, social emotions, and cognitive-emotional schemes. People are usually most familiar with the Autobiographic Self, which includes identities, memories and anticipation, and this kind of Self is especially rich in people, thanks to a sophisticated and rich cognitive function, the product of the most developed cortex in the mammalian world. We need the Self for proper functioning, because a mind without the Self represents a lower level of or unconscious level of functioning (Damasio, 2014).

Anatomically speaking, and according to Antonio Damasio (2010), the Core (Affective) Self, as well as the primary affective systems contain structures vital to the biological value of life. Among the nuclei involved in the management of the state of the Body, we find the nucleus tractus solitarius (NTS) and the parabrachial nucleus (PBN). These represent the first line of the bodily, primordial feelings.

The upper part of the brainstem, or the midbrain, also includes the periaqueductal grey (PAG), whose activity results in the behavioural and chemical responses that are an integral part of the regulation of life, as well as an important part in generating instinctive

emotions and homeostatic (bodily) feelings.

PAG's nuclei are associated with the hypothalamus, PBN, NTS, area postrema, and with deeper layers of the superior colliculi. Probably all these anatomical structures are involved in coordination and construction of the Core Self. These complex anatomies suggest that, while the classical nuclei of the ascending reticular activation system (ARAS) are associated with sleep cycles, other nuclei of the brainstem are involved in the functioning of consciousness, as containers of standard biological value. Neural circuits and networks of these subcortical nuclei embody the "know how" of what to do, how to act when certain messages activate nuclei.

The functioning of the nuclei of the Core Self and primary affects containing this "know how" is fundamentally different from the cortical cognitive areas of the brain that contain sophisticated maps of "high-resolution" knowledge. Feelings and emotions that are experienced through the body's interceptive information are essential for the formation of the Core Self. This physiological/affective nucleus constantly feeds continuity of the Core Self and the Autobiographic Self, through the brain regions that range from brain stem to the thalamus and the cortex.

Antonio Damasio (2010) points out that the Autobiographic Self originates in the mind when the objects of personal biography generate pulsations of the Core Self, which currently contains a large scale of coherent patterns. Schemes of Autobiographic Self show patterns of neural connections to and from the posteromedial cortex (PMC), which includes the following anatomical structures: parietal associative cortex, dorsolateral prefrontal cortex (DLPFC), premotor cortex, FEF- frontal eye field, entorhinal cortex, VMPFC - ventromedial prefrontal cortex; ACC - anterior cingulate cortex, insula, thalamus (dorsal/intralaminar), basal forebrain (BF), claustrum, caudate/putamen, the nucleus accumbens, amygdala, periaqueductal grey (PAG), pons, and cerebellum.

The Autobiographic (idiosyncratic) Self allows multiple different organizations of Self (and object relations) that are partially overlapped and time and

contextually variable. It is in part changeable, and the structure and functioning of the cortex provides the possibility of multiple "I" identities that can be connected or disconnected.

Integration of disconnected parts of the Autobiographic Self or multiple identity of Self (and objects/subjects) may be one of the tasks of psychoanalytic psychotherapy. This type of Self is well described in the works of Stephen Mitchell (1997) in relational psychoanalysis. The Autobiographic Self creates identities that a person carries throughout her/his history and present life, as well as in the anticipated future, while the Core Self is always singular, unique, always "just" one, with a sense of unchangeability throughout life from infancy to the end of life.

The Core Self is related to the regulation of the internal body, the visceral physiological processes which always take place in a very narrow range (otherwise illness or death will transpire), but it is not related to the external body, which changes from birth to adulthood and aging (Damasio, 2010).

The Self is not a unique and coherent mental structure. Daniel Kahneman (2011), based on his psychological research, mentions two separate entities of the Self: an Experiential Self and a Memory Self. The Experiential Self is current, always activated in the "here and now" and has nothing to do with the history or future of a person. The historical Self (or memory Self) is exclusively related to the memorized experiences and anticipatory expectations that are based on these stored experiences. Mixing of, or non-recognition of these two basic types of Self leads to psychological and conceptual confusion about human experiences, thinking and behaviour. D. Kahneman (2011) points out that this can result in incorrect psychological concepts, and to the shortcomings of many psychological theories and schools of psychotherapy. Experiential Self corresponds to the Core Self, and the Memory Self corresponds to Autobiographic Self.

Lisa F. Barrett states that the Self, like emotions, is a concept made up of the interoceptive and control brain

network. These networks contain subcortical nuclei such as the periaqueductal gray (PAG), the parabrachial nucleus (PBN), and the nucleus tractus solitarius (NTS), hypothalamus, ventral striatum, thalamus, and cortical areas such as the insulae, anterior cingulate cortex, posterior cingulate, dorsomedial prefrontal cortex, (dmPC), ventromedial prefrontal cortex (vmPC), orbitofrontal cortex and frontoparietal large scale network. A large portion of this area is included in the default mode network (DMN) and salience network.

The brain constructs instances of the Self by simulation, with each instance fitting a person's goals at that particular moment. Social psychologists say that we have multiple selves, but in fact we have repertoire of instances of single, goal-based concepts called "The (autobiographic) Self" in which the goal shifts based on context.

How does our brain keep track of all the varied instances of our Self, as an infant, a young child, an adolescent, a middle-aged adult, and an older adult? Because one part of us has remained constant – we always have a body. Every concept we have ever learned includes the state of body (as interoceptive predictions) at the time of learning. The Self is constructed anew at every moment by the same predictive, core system that constructs emotion, including pair of networks (interoceptive and control), among others, as they categorize the continuous stream of sensations from body and from the world (self is part of social reality). As a matter of fact, a portion of the interoceptive network, called the "default mode network" (DMN), has been called the "self system". That brain area consistently increases in activity during self-reflection. Barrett understands the Self as a concept, like emotion, perception and cognition. If the brain is a generator of concepts, then it generates (simulates) the construct (core and autobiographical) of self in relation to contextual internal and external reality (Barrett, 2017/1).

Similar to Damasio, the constancy of self gives us the Core Self, not the Autobiographical Self, and the Core Self is created from visceral interoceptive signals, from the "inner body" rather than the "outer body".

Mark Solms (2013) together with the neuroscientific research of Jaak Panksepp (2008, 2016) and Antonio Damasio (2010, 2018), and Bud AD Craig (2015) underlines the importance of the Core (affective) Self as a platform or carrier where primary feelings and emotions take place, which are generally conscious rather than unconscious.

Synthesis for a new (neuro-) psychoanalytic theory

The brain is created through evolution to more or less harmoniously manage the organism through the process we call life. The brain is in constant contact with the body through the interoceptor and participates in regulating the homeostasis of the organism.

Mind-brain affects the body, and in turn the body affects mind-brain. With the constant intense interaction with the body, which is the foundation of affective life, the brain-mind is also interacting with the social and non-social outside world. This relationship with outside world creates mental simulations that we call thinking, memory and expectations. The brain is not the system that primarily responds to stimuli, although it is the system that creates concepts and prediction. We could say that the brain is not only a machine that generates affect, but a machine that constantly generates predictions (as well as prediction errors) on the basis of concept making. This process is also a function of harmonious managing of the organism throughout the life process.

At every waking moment, the brain uses past experience (not the infantile past, but the whole past), organized as concepts, to guide actions and give sensations meaning, a process known as categorization (Barrett, 2017/1). The mind is not just the function of our brain, but also the mind-brain-body of other people, the physical environment, culture, and social reality. In this process of generating affects, concepts and predications (prediction errors) in relation to interceptions of the visceral body and the external, social and physical environment, dissonance, rigidity and chaos can occur, reflected in mental problems and disorders.

In a way, we can say that psychoanalytic psychotherapy is closer to a “physical” therapy or “fitness training”, rather than literature, philosophy, poetry, humanism, cinema or theatre performances. In fact, these are all included in the psychoanalytic process, but (cognitive-linguistic) talking about life, the past, discovery and the creation of associative links, the search for meaning and purpose is not as powerful as the experience of affect (feelings and emotions) in therapy sessions and beyond. Affects have the strongest impact on the functioning of the brain-mind, both positively and negatively, and with therapy we act on the “feeling and emotional muscles” of a person.

Therefore, the main goal of psychotherapy is not intellectualizing of affects or detection of unconscious elements in motivation and behaviour. This is a secondary objective that represents more the means of communication that fills the space and time of the session. Although psychoanalysis implements many creative, conscious and unconscious psycho-social games, it is not primarily a romanticized story and a family novel about moms, dads and childhood, about good and bad people (objects) in and around us.

Patient experiences and behaviours are not guided in their Self and the world by exclusively memorized maps of internalized objects. How someone behaves depends on a multitude of factors: biological, psychological, socio-cultural, past experiences, current state and anticipated expectations. We can look at this factor as an affective realism (there is no cognition or perceptions without affective brain processing), constant creation of concepts and prediction (prediction error) and social (from interpersonal relationships to social codes of society) and physical reality.

Crucially, the psychotherapeutic processes vitalizes, adjusts and balances affective systems, this is more a reprogramming process rather than the pursuit of meaning, sense, and detection of causal factors for imbalanced systems. Psychotherapy, when successful, acts on body budget feelings, drives (motivation–emotions), and on cognitive concepts that feed prediction in the brain-mind machine, lending meaning to a patient’s experience and behaviour.

Psychoanalysis subjectivity, the first-person singularity, puts Self at the centre of the psychotherapeutic process. In short, psychotherapy aims to achieve affective balance and in such a way bring balance to the Affective Core and cognitive Autobiographic Self.

The psychoanalytic relationship takes place through: A) psychodynamics of the three levels of brain-mind systems, and also by using B) therapeutic tools (Čorlukić, 2014).

A) Psychodynamics of the three levels of the mind-brain systems are: 1) the primary, secondary and tertiary system through feelings and emotional pulsation and cognitive configuration, 2) the defence mechanisms (repression, reactive formation, rationalization, somatization, introjection, identification, projection, projective-identification, dissociation, acting out, sublimation, etc.), 3) transfer-countertransference and intersubjectivity, affective and cognitive interactions and relationships, attachment, social needs, separation-differentiation, the boundaries of Self and others, unconscious object maps, and conscious relationships with others.

B) The therapeutic tools used in psychoanalytic settings are as follows: therapist internal disposition, empathy, working alliance, free associations, clarifications, interpretations, confrontations, mirroring, transference, countertransference, dream analysis, etc.

The three levels of the brain-mind interface

1. The tertiary cognitive-linguistic system (primarily cortico-thalamic regions of the brain): its main task is to think through simulations of external objects and events and to intellectualize emotion. This system contains cognitive functions, executive functions, working memory, long-term memory maps, reasoning, cognitive control, making concepts, prediction, integrative functions, associations, imagination, symbolic thought, is where social reality is created as well as a range of social, mixed emotions and cognitive emotional

schemas, verbal translation, language (grammar) and large scale of narratives. The tertiary system enables maintenance of the Autobiographical Self, existing culture and social reality (economics, law, humanism, morality, etc).

2. The secondary system of behavioural conditioning is a system of implicit learning/memory, created through positive and negative classical conditioning (basal ganglia, basolateral amygdala) which creates an emotional habit and routine behaviour, but also the symptoms of trauma, especially intensely stressful/depriving experiences from early childhood. This is a completely unconscious system that cannot become conscious, much in the same way that we are not conscious of the moment when we learned/adopted any motor skill. This system is the basis for classical conditioning, while instrumental conditioning uses the tertiary cognitive system.

3. The primary affective system is made of homeostatic (visceral, body budget) feelings, primary or instinctual emotions and the Core Self. Homeostatic feelings are very important for psychological life, because they can qualitatively and quantitatively affect the primary emotions, and the general emotional tone of a person. Ultimately, they are a question of valence and energy charge of a person, but they are a basic building material for creating emotions and cognitions too. There are three groups of dichotomous homeostatic feelings: 1) pleasure (enjoyment) – displeasure (pain), 2) energization (vitality) - fatigue (lethargy), and 3) feelings of tension-relaxation.

It should be noted that all three systems function in extraordinarily connected way and that there are in fact artificial boundaries between cognitive, affective and social neuroscience.

Psychotherapy works on homeostatic (body-budget) feelings, primary and social emotions, and constantly influences and interacts with (tertiary) cognitive systems: the creation of concepts (images), prediction, prediction error and correction. Through these affective and cognitive systems, it also acts and affects the harmony of the core and autobiographical

self (Damasio 2018, Barrett 2017/2). Psychoanalytic psychotherapy or psychoanalysis is a specific psychosocial, verbal and nonverbal, conscious and unconscious, communication play between the therapeutic pair (client-therapist) with a goal of balancing the primary affective system with cognitive linguistic system or affective pulsation with cognitive configurations. Essentially, psychotherapy is an affective learning and cognitive meaning experiences that happen from session to session.

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