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Orestis Giotakos

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REVIEW

Timing and self distortions in psychosis: Is it an insula matter?

Orestis Giotakos

The non-profit organization Obrela

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----------**ABSTRACT**----------

The concept of timing is an interesting way to understand how the body and brain construct the concept of self, but also how self-distortions arise in the case of psychosis. Analysis of temporal representations in psychosis highlights a deficit that includes both the subjective experience of the flow of time, i.e., time perception, and the ability to process temporal information inherent to any perceptual event, i.e., perceptual timing. The representation of the self is stabilized within temporal windows, and thus the self is experienced as continuous in time. Disturbance in the sense of time, in the form of a loss of temporal continuity, has been described by phenomenologists as a central subjective experience of schizophrenia. The positive symptoms of schizophrenia are associated with overestimation of interval timing, i.e., an acceleration of the 'internal clock', while dopamine neurotransmission is likely to regulate the speed of the internal clock. Moreover, findings highlight the importance of interoceptive precision as an aspect of time perception, since accuracy in time perception is related to interoceptive accuracy and vagal activity. Insula contributes significantly to the total awareness of reality. Global emotional moments and meta-representations of the conscious self are created in the anterior insula. In psychosis, the interaction between the default-mode network and the frontoparietal executive network is disrupted by aberrant salience signals from the right anterior insula. Here, we describe the role of the insula as a key hub for the recognition of major aspects of the self, in parallel with the role of interoceptive predictive coding, which reflects the contribution of the insula to the temporality of the self. Based on the above, new insights focus on the development and implementation of rehabilitation strategies that specifically target the temporal deficits observed in psychosis. New therapeutic interventions are based on sensory education and enhancing the multisensory integration of these patients.

KEYWORDS: Time, temporality, self, psychosis**,** interoceptive, insula, salience network.

Corresponding Author: Orestis Giotakos, The non-profit organization Obrela, 112 Imittou street, 116 34, Athens, Greece, Email: info@ obrela.gr

Timing representation

Time is intuitively understood. High alertness, novel events, and focused cognitive activity are associated with an underestimation of time. Conversely, unpleasant situations, fatigue, and drowsiness are associated with an extension of subjective time. The emotional quality of the experience also seems to influence the subjective sense of time.[1] The ability to perceive time, to predict events, and to process temporal patterns are major functions of the brain. Sensory perception, motor control, cognition, and consciousness require reliable time perception,

which needs the presence of a highly accurate endogenous time calculation system.[2]

Analysis of temporal representations highlights differentiations at the perceptual level that include both the subjective experience of the flow of time (i.e., the perception of time) and the ability to process temporal information inherent in any perceptual event (i.e., perceptual timing)**.** From a phenomenological perspective, the distinction between these two concepts coincides with the distinction between structure and content. Moreover, both perceptual timing and perception of time can be explored either explicitly or implicitly. Explicit processing involves explicit judgments about the temporal properties of external stimuli, such as duration, order, or simultaneity. In contrast, implicit processing is automatically engaged whenever sensorimotor information has a temporal structure, even without receiving specific instructions to focus on time.[3] In **Box 1** are described the time parameters, the relative experiments, and the brain structures involved.

Time perception appears to be the result of the activity of a neural network rather than a single brain region. The temporal processing of various neural circuits depends on the activation of different brain regions, which allows rapid adaptations of the organism to the temporal characteristics of the environment.[8] The role of the dorsolateral prefrontal cortex, the supplementary motor area, and the right inferior frontal cortex is highlighted.[9] Other brain regions involved in time perception are the cerebellum, the left inferior insula, the left putamen, and the hippocampus.[10] Time processing appears to be carried out in different regions or networks, depending on different time durations, with the cerebellar-thalamo-cortical network being mainly involved in time intervals shorter than a second, while the corticostriatal networks are involved in time intervals from a second to a minute.[11]

Time perception also involves brain areas important for motor behavior. Damage to areas such as the cerebellum and basal ganglia, therefore, affects movement and time perception, suggesting that spatial and temporal processes work together to shape precise actions, thoughts, or emotions in specific time windows. Several neurotransmitter systems are involved in this function, especially dopamine.[12] Dopamine signaling is involved in biological rhythms, particularly in relation to feeding, reward, and activity, while time perception and reward processing interact via a common dopaminergic mechanism.[13] Dopamine antagonists, such as antipsychotics, reduce the internal clock speed, while dopamine agonists, such as amphetamine, cocaine, or cannabis, increase it.[14]

Timing distortions in psychosis

Research on perceptual timing and the perception of time suggests that an impairment in the temporal aspects of early perceptual processing may constitute a critical substrate of psychotic functioning.[3] Based on this reasoning, the core symptoms of schizophrenia can be considered as manifestations of a globally disrupted time processing.[15] Therefore, there may be a common mechanism underlying these timing dimensions, which may contribute to the pathophysiology of patients with schizophrenia.[16] Temporal precision, i.e., consistency in perception, is clearly deficient in patients with schizophrenia, suggesting that patients' explicit and implicit judgments of time are significantly more variable compared to healthy controls. Psychotic patients have deficits in the explicit detection of rhythm irregularities and in the estimation of durations, ranging from milliseconds to several minutes, in a wide range of tasks, including both verbal and motor responses, affecting different sensory functions. They also have problems using implicit temporal cues to predict the appearance of targets during an attentional orienting task.[17]

Abnormalities in what we refer to as 'perceptual timing' have been proposed as a core deficit in the prodromal phase of schizophrenia. For example, a longer temporal binding window is associated with symptoms of disorganization, with the severity of hallucinations, and with higher levels of schizotypy in subclinical populations.[18,19] Perceptual timing is critical

for multisensory integration, the ability of humans to combine different sensory information from the same perceptual event into a single mental representation. The ability and intensity of multisensory integration depend on the characteristics of low-level physical stimuli, such as their timing (e.g., a pair of stimuli is more likely to be integrated if they are close in time). Research has shown that schizophrenia is characterized by distinct alterations in multisensory processing.[20] The ability to integrate sensory information has been linked to the emergence of a sense of self,[21] while a link has been found between multisensory dissociation and self-perception disorders.[22] For example, the integration of sensory information that is usually perceived as independent can cause sensory overload, alterations in sensory filters, and unclear perceived identity, causing a feeling that the individual lives in a disjointed world, a symptomatology reminiscent of what is observed at a phenomenological level in patients with schizophrenia.[23]

Positive symptoms of schizophrenia may be associated with distortions in time perception. A meta-analysis showed that positive symptoms of schizophrenia are associated with overestimation of interval timing, i.e., acceleration of the internal clock.[24] The findings are consistent with the view that accelerated time perception is associated with hypervigilance, which may underline the generation of positive symptoms. This suggests that the deficit in time perception may be an endophenotype of schizophrenia.[25] Another meta-analysis showed that time perception in schizophrenia can be shorter or longer, compared to objective time, suggesting a heterogeneous internal clock in patients with schizophrenia.[8] Similar disturbances in time processing have also been found in individuals with high schizotypy scores or in the prodromal syndrome of schizophrenia, which may be a specific vulnerability feature.[26] Finally, individuals at high risk for psychosis had poorer temporal accuracy, compared to controls, while the degree of temporal inaccuracy was associated with abnormal connectivity in cerebellar circuitry.[27]

Timing and self fragmentation in psychosis

The different views on the concept of self (**Box 2**) include, to a greater or lesser extent, the concept of time. Difficulties in integrating sensory information over time may affect the self, due to their impact on the ability to create unified representations, which lead to an uninterrupted flow of sensory inputs. Impairment in perceptual timing may also be responsible for the altered sense of temporal continuity described at a phenomenological level for psychosis. Disturbance in the sense of time, in the form of the loss of the simple continuity of past, present, and future, has been described by phenomenologists as a central subjective experience of psychosis.[38,39] Modelling intentionality in the human brain[40] also suggests a persistent failure of intentionality in psychotics, due to the inappropriateness of an intentional object or due to the absence of an intentional object altogether.[41]

Fragmentation of the experience of time, in the form of discontinuity, déjà vu/vecu, etc., characterizes the so-called 'anomalous time experience' in psychosis. At the phenomenological level, patients with schizophrenia report a loss of continuity in the sense of time, temporal fragmentation of self-experience, and usually feel that time is running slower or faster.[42] Abnormal temporal experience has been considered a key aspect of 'self-disorder', a key phenomenological feature of schizophrenia that suggests a structural instability of the first-person perspective. Time, indeed, is a dynamic component of consciousness, and phenomenological philosophy has interpreted the concept of time as a basic structure of the human self. Thomas Fuchs[15] reviewed the phenomenological perspective on time in psychosis and concluded that core schizophrenic symptoms, such as thought disorder, thought intrusion, auditory hallucinations, and experiences of passivity, can be described as disturbances in the transcendental constitution of internal time consciousness or the microstructure of temporality. Psychotic patients implicitly discriminate stimuli over

time, just like controls, but unlike controls, they process stimuli individually and in sequence.[43] This finding has been interpreted as evidence of disturbed predictive coding in schizophrenia, resulting in a reduced ability to predict new events, even though attention remains on current events. This leads to fragmentation in information processing, which affects the sense of temporal continuity. It is as if the sense of self requires the experience of sensory information as continuous in time, and in turn, the sense of temporal continuity (continuous in time), relies on the ability to retain the most recent past information and predict upcoming events.[44] In the case of psychosis, inappropriate corollary discharge signals flood the allocentric system, which is overwhelmed by noisy and unpredictable information. The enhanced intentionality bias, combined with the lack of a sense of agency, causes hallucinations, reinforced in parallel with inappropriate judgments of agency.[45]

Insula and sense of self

At least three distinct neural functions of self-reference have been described by neuroscientists: (a) The present-moment self-reference function (experiential focus), which is associated with the central executive network, and is composed of the dorsolateral prefrontal cortex and the posterior parietal cortex. (b) The subjective experience-related self-reference function (narrative focus) is associated with the Default Mode Network, which consists of an integrated system of autobiographical, egocentric, and social cognitive functions characterized by reflective, often non-conscious self-referential narrative thinking linking subjective experience to time, which produces one's sense of self or identity. It includes the posterior cingulate cortex, which is associated with autobiographical memory and self-referential processes, the ventromedial prefrontal cortex, which is associated with social-cognitive processes about self and others, the medial temporal lobe, which is associated with episodic memory, and the angular gyrus, which is involved in semantic processing. (c) The salience network, which acts as a 'switch', switches between activation/deactivation of the central executive network and the default mode network, depending on the degree of mental engagement. The anterior insula and the anterior cingulate cortex are involved in this. The insula has also been described as the central locus of automatic, emotional, and cognitive integration and is associated with a wide range of stimuli, including cognitive, socio-emotional, olfactory-gustatory, and interoceptive sensations, as well as the processing of pain. Therefore, the insula is a neural factor that contributes significantly to the total awareness of reality. It appears to act by tuning the mind from a state of self-referentiality of the senses to a state of complete and present-centered awareness.[46]

This triple network dysfunction theory of schizophrenia postulates that the interaction between the default-mode and the frontoparietal executive network is disrupted by aberrant salience signals from the right anterior insula.[47] Anterior insular cortex is also rich in Von Economo neurons (VENs), large projection neurons which are circumstantially associated with self-consciousness and complex social emotions. In the Seth-Critchley model,[48] fast VEN-mediated connections may enable the rapid registration of visceromotor and viscerosensory signals needed for efficient updating of generative models underlying interoceptive predictive coding. Insular dysfunction appears to be one of the biological substrates of body perception disorders in schizophrenia, as well as of the alteration of the sense of self, which is characteristic of this psychiatric pathology.[49]

Insula and sense of time

The brain is an inherently temporal organ because, in many ways, its main function is to learn from the past to better predict the future. Interoceptive inference remains influential in understanding predictive processing, since it brings closer the phenomenology of consciousness with that of emotionality, while intentionality seems to have essential relations with both consciousness and evolutionary selected functions.[50] It is argued that somatic-

physiological changes provide the basic material for the sense of time. According to Craig (2009),[51] somatic signals transmitted through the sensory pathways of the autonomic nervous system to the dorsal posterior insula provide the basis for the experience of time and for the sense of the physiological state of the body. This sense of the physiological state of the body is known as 'interoception'. Somatic signals are processed in the posterior-anterior pathway of the insula, integrating inputs from other areas of the brain, such as information from homeostatic, environmental, hedonic, motor, social, and cognitive data. Ultimately, global emotional moments and meta-representations of the conscious self are created in the anterior cerebral cortex of the insula. The accumulation of these emotional moments constitutes a subjective sense of time. In line with this theory, Wittmann et al[52] found that neural activity in the posterior insula increased linearly during the encoding of a temporal stimulus. This accumulation-like neural activity may indicate the use of somatic signals to encode temporal duration. Underestimations in interoceptive time perception have been connected to different psychological conditions characterized by a diminished processing of high salience stimuli from the body.[53]

Recently, Hashiguchi et al[54] found that activity in the right anterior insula was positively correlated with temporal duration discrimination accuracy. Teghil et al[55] conducted a meta-analytic review of neuroimaging studies to identify the neural substrates of two types of timing processing: (a) Internally based processing, which produces the main temporal representations, relying on the endogenous timing mechanism independently of the sensory environments, and (b) Externally cued processing, which detects the temporal structure of the sensory environment and integrates it with the result of internal processing to construct temporal representations. They found evidence for a partial distinction between these timing processes. The insular cortex was found to be activated during internal processing, but more strongly during external processing. Therefore, internal processing may correspond to the use of somatic signals to encode duration, while external processing may reflect the integration of inputs from various brain regions with the main representation of internal processing.

It has been proposed that accuracy in time perception is related to interoceptive accuracy and vagal activity. Uraguchi et al[56] investigated time perception in the sub-second range and found a positive relationship between interoceptive accuracy and temporal accuracy. They hypothesized that the degree of temporal accuracy may be related to the signal-to-noise ratio, or internal noise, in the body, which may also be related to interoceptive accuracy. Examining temporal precision in relation to interoceptive precision and interoceptive sensitivity, they concluded that temporal precision is also related to vagal nerve activity. Overall, the findings highlight the importance of interoceptive precision as an aspect of time perception, which future studies can now further examine in relation to vagal nerve activity.

Perspectives

A vast literature supports the involvement of the insula in psychosis,[57] but also in anorectic behavior,[58] addictive behavior,[59] alexithymia,[60] and anosognosia.[61] In **Fig. 1** is described a scenario of timing and self distortions in patients with psychosis is described, with the insula being a key domain of this process. Fermin et al[62] proposed the Insula Hierarchical Modular Adaptive Interoception Control (IMAC) model, suggesting that insula modules (granular, dysgranular, and agranular), forming parallel networks with the prefrontal cortex and striatum, are specialized to form higher-order interoceptive representations. Recently, Jiang et al,[63] using epicenter mapping on cross-sectional magnetic resonance imaging from 1,124 individuals with schizophrenia, identified that the frontoinsular cortex (a region in the ventral part of the anterior insular cortex, characterized by the unique population of von Economo neurons) may be a major epicenter of neuroanatomical pathophysiology in schizophrenia.

On the other hand, psychosis contains a significant autoimmune component.[64,65] Several lines of evidence suggest a predisposition to a pro-inflammatory state in the brain in psychosis,

while anti-inflammatory drugs could potentially counteract this predisposition.[66] Reviewing the clinical and pathophysiological similarities between demyelinating or dysmyelinating diseases and psychosis, we suggested disconnection syndrome of psychosis represents the phenomenological and behavioral outcome of a multifaceted dysmyelinating disorder, based on a lifelong process of immunogenetic dysregulation.[67] Moreover, research has intensified our understanding of immunoception and immunengrams, focusing on their manifestation in a specific brain region, the insular cortex.[68,69] Recent data revealed that immune-related information under peripheral inflammatory conditions, termed as "immunengram", was represented in specific neuronal ensembles in the insular cortex.[70]

Finally, new insights focus on the development and implementation of rehabilitation strategies that specifically target the temporal deficits observed in schizophrenia. In **Box 3,** the therapeutic interventions proposed so far in patients with psychosis are described, based on sensory training and training in multisensory integration. Integrating these strategies into the treatment of schizophrenia offers a promising direction for the improvement of temporal dysfunctions, as well as the general rehabilitation of individuals with this disorder.[3] Psychiatry must be constantly updated and apply the valuable knowledge of neuroscience, at a research, diagnostic, and therapeutic level, while psychiatrists have the obligation to apply neuroscience knowledge to clinical practice in the real world.[78] Extending, we note the concept of 'timing' is a necessary component, not only for a well-adjusted self, but also for well-designed and prioritized therapeutic interventions, both in medicine[79] and in psychiatry.[80-81]

In conclusion, the concept of timing is an interesting way to understand how the body and brain construct the concept of self, but also how self-distortions arise, as happens in the case of psychosis. Here, we describe the role of the insula as a key hub for the recognition of major aspects of the self, in parallel with the role of interoceptive predictive coding, which reflects the contribution of the insula to the temporality of the self. Many studies show that under- or over-activation at various points along this long neural pathway leads to mental disorders, including psychosis. By bringing this topic into focus, the rapidly developing fields of genetics, neuroimaging, and immunology are expected to further accelerate the diagnosis and treatment of this devastating disorder.

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Box 1. The concepts of Timing - experimental paradigms

Perceptual timing: The temporal resolution in processing events - The ability to process temporal information inherent in any perceptual event - Phenomenologically, it represents the content.

1. **Time perception:** The subjective experience of the flow of time - The subjective experience of the passage of time and of events duration - Phenomenologically, it represents the structure.[3]

Explicit processing of time: Involves explicit judgments about the temporal properties of external stimuli, such as duration, order or simultaneity - Activation: basal ganglia, with co-activation of the supplementary motor area, inferior frontal cortex and cerebellum.
Implicit processing of time: Automatically engaged whenever sensorimotor information has a temporal structure, even without receiving specific instructions to focus on time – Activation: left lateral prefrontal and inferior parietal cortex[3]

Explicit investigation of perceptual timing: Evaluating the simultaneity vs. asynchrony of two stimuli, the specific question "are these stimuli simultaneous?" makes it explicit, while the possibility to estimate the timeframe within which multiple stimuli are highly likely to be perceived explore timing of perception.[4]
Explicit investigation of perception of time: In duration discrimination tasks, the participant is asked to decide which interval is longer, where two time intervals are presented in sequence.[5]
Implicit investigation of Perceptual timing: In the double-flash illusion task, the instructions are for the number of perceived flashes, which indirectly gives information about the temporal resolution. Participants are asked how many flashes they perceive, and the illusion occurs when one flash simultaneously accompanied by two beeps is erroneously perceived as two flashes. An enlarged temporal integration window for audio-visual stimuli was found in schizophrenia patients.[6]
Implicit investigation of perception of time: Participants implicitly use temporal information inherent to the speed of moving sensory stimuli to predict their eventual locations, evaluating, for exmple, whether moving stimuli will collide.[7]

Box 2. The various concepts of Self

- The self as "Me", corresponding to the self as an object of experience ("I see ***Me*** in the future"), and the self as "I", reflecting the self as a subject of experience ("***I*** see me in the future") (James, Wittgenstein)[28,29]
- The 'Me' is the organized set of attitudes of others that an individual adopts, and the 'I' is an individual's response to the attitudes of others (Mead)[30]
- Self-awareness depends on social mirrors, "what is not public is not conscious" (Whitehead)[31]
- There is the 'private self', which includes the individual's knowledge of his or her own characteristics or behaviors, the 'public self', which relates to general human self-awareness, and the 'collective self', which relates to collective views of the self (Triandis)[32]
- Distinctions between ecological, interpersonal, extended, private and conceptual aspects of the self (Neisser)[33]
- The "who" (self) system contains the *other-as-self* mechanism (to perceive other people egocentrically as proxies of the self, as occurs through the processes of mentalizing and empathizing, and the *self-as-other* mechanism (to overtly depict other people during acts of communication (Brown).[34]
- The Self-Concept is made up of autobiographical knowledge and relies on all the attributes, traits, beliefs, values, social status, roles and physical characteristics we attribute to ourselves (Prebble)[35]
- The Subjective Sense of Self ("the I-self", as initially proposed by James), is made up of two hierarchically related forms of present-moment conscious self-experience: prereflective self-experience (what some philosophers call "Qualia") and self-awareness (Prebble)[35]
- The Subjective Sense of Self corresponds to both a "minimal embodied self" and a "minimal experiential self". The first one includes core biological and ecological aspects, which allow the system to distinguish between the self and the non-self. The second one contributes to an embodied sense of ownership (i.e., confers the feeling that I am the one undergoing the experience) and a sense of agency (i.e., confers the feeling that I am the one who is initiating or causing an action (Gallagher)[36]
- In the context of Chinese Buddhist culture, the theory of self is related to transforming the self into non-self, through discipline and meditation (Wang)[37]

Box 3. Sensory therapeutic training, as temporal recalibration, in psychotic patients

- Mindful awareness in body-oriented therapy develops the distinct interoceptive awareness capacities of identifying, accessing, and appraising internal bodily signals that are identified in physiological models as the critical components of interoception for emotion regulation.[71]
- Body psychotherapy is beneficial for a wide spectrum of psychic suffering. A total of 2,180 references were screened, of which 113 studies were scrutinized in detail and 18 RCTs finally included.[72]
- Positive effect of dance movement therapy,[73] group body psychotherapy,[74] and body-oriented psychological therapy,[75] on negative symptoms in schizophrenia (multicenter randomized controlled trials).
- Dance/movement therapy is a holistic approach to diminish health discrepancies and promote wellness for people with schizophrenia[76]
- Music therapy seems to help people with schizophrenia (18 RCTs studies with a total 1215 participants that compared music therapy with standard care, placebo therapy or no treatment).[77]

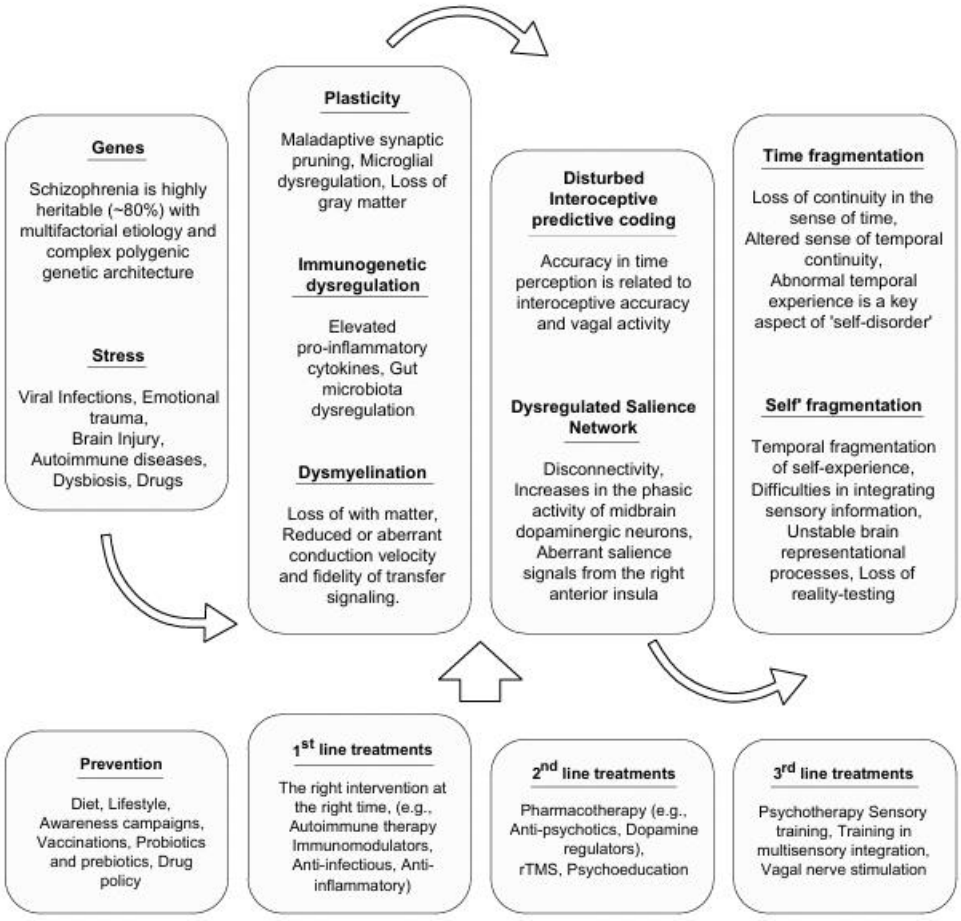

Figure 1. A scenario of distortions of timing and self, in patients with psychosis is depicted, with the insula being a major factor in this process. Therapeutic treatment follows the presumed progression of the disease over time.

PSYCHIATRIKI

ΑΝΑΣΚΟΠΗΣΗ

Παραμορφώσεις χρόνου και εαυτού στην ψύχωση: Μήπως είναι θέμα της νήσου;

Ορέστης Γιωτάκος

Μη Κερδοσκοπικός Οργανισμός Ομπρέλα

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----------**ΠΕΡΙΛΗΨΗ**----------

Η έννοια του χρόνου είναι ένας ενδιαφέρων τόπος για να κατανοήσουμε πώς το σώμα και ο εγκέφαλος κατασκευάζουν την έννοια του εαυτού, αλλά και πώς προκύπτουν οι παραμορφώσεις του εαυτού στην περίπτωση της ψύχωσης. Επίσης, η ανάλυση των χρονικών αναπαραστάσεων στην ψύχωση αναδεικνύει ένα έλλειμμα που περιλαμβάνει τόσο την υποκειμενική εμπειρία της ροής του χρόνου, δηλαδή την αντίληψη του χρόνου, όσο και την ικανότητα επεξεργασίας χρονικών πληροφοριών, που είναι εγγενείς σε οποιοδήποτε αντιληπτικό γεγονός, δηλαδή τον αντιληπτικό χρονισμό. Η αναπαράσταση του εαυτού σταθεροποιείται εντός χρονικών παραθύρων και έτσι ο εαυτός βιώνεται ως συνεχής στο χρόνο. Η διαταραχή στην έννοια του χρόνου, με τη μορφή απώλειας της χρονικής συνέχειας, έχει περιγραφεί από τους φαινομενολόγους ως κεντρική υποκειμενική εμπειρία της σχιζοφρένειας. Τα θετικά συμπτώματα της σχιζοφρένειας σχετίζονται με υπερεκτίμηση του χρονισμού των διαστημάτων, δηλαδή μια επιτάχυνση του «εσωτερικού ρολογιού», ενώ η ντοπαμίνη ρυθμίζει πιθανόν την ταχύτητα αυτού. Επιπλέον, τα ευρήματα υπογραμμίζουν τη σημασία της ενδοδεκτικής ακρίβειας, ως πτυχή της αντίληψης του χρόνου, καθώς και την εγκυρότητα αντίληψης του χρόνου, που σχετίζεται με την ενδοδεκτική ακρίβεια και την πνευμονογαστρική δραστηριότητα. Η νήσος του Reil συμβάλλει σημαντικά στην πλήρη επίγνωση της πραγματικότητας. Στην πρόσθια νήσο δημιουργούνται οι συνολικές συναισθηματικές στιγμές και μετα-αναπαραστάσεις του συνειδητού εαυτού. Στην ψύχωση, η αλληλεπίδραση μεταξύ του δικτύου προεπιλεγμένης λειτουργίας και του μετωποβρεγματικού εκτελεστικού δικτύου διαταράσσεται από την ανώμαλη σηματοδότηση της δεξιάς πρόσθιας νήσου. Εδώ περιγράφουμε τον ρόλο της νήσου του Reil, ως βασικό νευρωνικό κόμβο για την αναγνώριση σημαντικών πτυχών του εαυτού, παράλληλα με τον ρόλο της ενδοδεκτικής προγνωστικής κωδικοποίησης, η οποία αντανακλά τη συμβολή της νήσου στη χρονικότητα του εαυτού. Με βάση τα παραπάνω, νέες πρακτικές εστιάζουν στην ανάπτυξη και εφαρμογή στρατηγικών αποκατάστασης που στοχεύουν ειδικά στα χρονικά ελλείμματα που παρατηρούνται στην ψύχωση. Οι θεραπευτικές παρεμβάσεις βασίζονται στην αισθητηριακή εκπαίδευση και την ενίσχυση της πολυαισθητηριακής ολοκλήρωσης των ασθενών.

ΛΕΞΕΙΣ ΕΥΡΕΤΗΡΙΟΥ: Χρόνος, χρονισμός, εαυτός, ψύχωση, νήσος, ενδοδεκτικό σύστημα, σύστημα διακριτότητας.

Επιμελητής συγγραφέας: Ορέστης Γιωτάκος, Μη Κερδοσκοπικός Οργανισμός Ομπρέλα, Υμηττού 112, 116 34 Αθήνα, Διεύθυνση e-mail: info@obrela.gr