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# INTEGRATED SELF SYSTEM: A MICROGENETIC APPROACH

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## SUMMARY

This article is dedicated to my beloved mother, Zofia Kuzak, Honorary Member of the Polish Neuropsychological Society, and my highest moral authority, to honor her 100<sup>th</sup> birthday. During the Nazi occupation, at the age of 23, she was deported to Germany and forced into slave labour at a German camp, from which she managed to escape. During this escape she had to sit for three long days high up in a tree, without food and without anything to drink, something made possible by her strong physical condition. After three days, she dared to leave the tree and, in throwing the Nazis pursuing her, she ran away not to the South - to her home in Nowy Sącz, but to the North – to Poznań, where she took refuge in the apartment of other relatives, true Polish patriots. She stayed there for the years 1943–1947, keeping the accounts at the large family grocery store. The experiences from this period influenced the formation of her own self and her identity. Her stories about times of tragedy and her ways of dealing with the darkest moments in her life contributed to the fact that I became interested in the subject of the self and identity. I have prepared two monographs and several articles on this topic. This article presents a new approach to integrated self system, associated not only with the physical organism, but also with the social and cultural world. The foundation of this approach to the self is microgenetic theory, especially its account of consciousness, of the transition from self to image, act and object, the epochal nature of this transition, and its relation to introspection, imagination and agency. The affinities of microgenetic theory to many aspects of the thought process should be evident to readers of this journal, but the theory, which was developed from studies of pathological cases, rests on a wealth of clinical detail. In brief, the micro-temporal transition from archaic to recent formations (distributed systems) in the phyletic history of the forebrain constitutes the absolute mental state, with consciousness the relation of self to image and/or object. The reader will be able also to find here the overlapping of states, the continuity of the core over successive states, and subjective time experience. However, the integrated self system is associated not only with the operation of the biological brain and its complex patterns of neural connections, but also with the activity of the social mind/brain, in terms of bonds created within social groups, as well as the cultural mind/brain creating the world of cultural values, including religious ones. I will sum up with a model of self system changing in time (4D), pulsating according to the states of mind (5D) forming different numbers of “bits” of information, as marked on the x axis, and linked to the duration of memories, marked on the y axis. The self system also depends on gravity (6D), and other hyperspace dimensions hitherto unknown in neuroscience.

**Key words:** brain, mind, time, hyperspace, self system

## INTRODUCTION

Self-embodied, conscious and self-aware *I* is the word most often used by people around the world, regardless of the culture and language they use; it is one of the most necessary words in human communication that allows you to separate yourself from the rest of the world, *I* from *Not-I*. The Self is the most mysterious and wonderful property of man – a biological and social being that is one and at the same time separate from everything that surrounds him (Pąchalska 2019). Therefore, it is important to understand the essence of one's own Self. Difficulties in defining the essence of the self are associated with its complexity and interrelationships with the body and the social and cultural world. Only a man who lives on planet Earth, or perhaps better to say in the reality, possesses embodied, conscious self.

The effective work of the brain that creates, and at the same time is created by the Self system, depends not only on its efficiency, but also on the condition of the whole organism and proper relations with the socio-cultural environment. A good example of this statement is the life experiences of the mother of the author of this paper, the healthy and joyful centenarian Zofia Kuzak (cf. Fig. 1), whose life in her youth was full of dangers and unimaginable suffering.



Fig. 1. Zofia Kuzak (born 18.01.1920), beloved mother and the highest moral authority of Maria Pąchalska, Honorary Member of the Polish Neuropsychological Society (photo near the house at Zygmuntowska Street in Nowy Sącz, summer 2019, at the age 99).  
Photo: M. Pąchalska

During the Nazi occupation, at the age of 23, she was deported to Germany and forced into slave labour in a German camp, from which she managed to escape. During this escape she was to sit for three long days high up in a tree, without food or anything to drink, something she endured thanks to her strong physical constitution. She was most frightened because dogs were being used in the search. After three days, she dared to leave the tree and, to throw her Nazi pursuer, she ran away not to the South – to her home in Nowy Sącz, but to the North - to Poznań, where she took refuge in the apartment of other relatives, true Polish patriots. She stayed there for the years 1943–1947, keeping the accounts at the large family grocery store. Her experiences from this period were to influence her formation and identity. This stay in Poznań, which at that time belonged to the Third Reich, undoubtedly had a great impact on her sensitive mind. Conversations and discussions have resulted in the recognition of life as the highest and incomparable value and an understanding of the fact that human history is not an ordered structure, but a chaotic stream of interrelated episodes and autobiographical facts that only retrospectively form a more or less ordered whole. This whole, seen from today's perspective, and shaped under the influence of experiences experienced in this „adopted home,” contains important elements of the regional culture of Wielkopolska (Greater Poland), with its characteristic features: thrift, passion for order and the rule of law. In everyday life, these features manifest themselves in the ability to wonderfully cook and bake Poznań specialties, as well as spinning and sewing. In this way, this inhabitant of Nowy Sącz, originally shaped by the cultural patterns of Małopolska (Lesser Poland), came closer to the Poznań community and culture in terms of personality and identity.

She still feels as if a part of the Poznań community and its traditional culture, especially during the celebration of the largest church holidays, such as Christmas or Easter. This is demonstrated by the dishes, traditional in this district of Poland, which still appear on the festive table, hand-decorated Easter eggs with Greater Poland patterns put into the Easter basket, as well as a great knowledge of regional songs (including church songs) that she can sing – and which she sings with great joy – even 70 years after leaving hospitable Poznań.

This example makes us aware of the importance of the socio-cultural environment not only for the proper functioning of the individual and social, and equally the cultural brain (Pąchalska and Bednarek 2019), but also for the formation of an integrated self system (embodied, conscious and self-aware) and in identity modifications.

## **SEARCHING FOR THE ESSENCE OF THE SELF**

For centuries of human history, the search is for the essence of the Self. The mainstream of the search is discussions about the interrelationships of the soul

(psyche) and the body (soma). Questions are asked regarding, among other things, the unity or divisibility of the psyche and soma (Snell 1955). Apart from the complexity and multidirectionality of these considerations, generally speaking, some scholars favour the separateness of these two entities, while others say that the psyche and soma are two sides of the same coin.

Pąchalska (2019) has emphasized that it is crucial to answer the question about the relationship between the soul (psyche) and the body (soma) in the reflection on the essence of Self and human identity. On the one hand, the reason is the need for the effective rehabilitation of people with various forms of brain damage who have a destabilized or lost Self and related identity disorders. On the other hand, the latest achievements in the field of neuroscience relate to consciousness and the Soul. In this context, O'Callaghan (2014) has asked the question: *Did scientists discover the soul?* and associates it with the latest discovery in the field of neuroscience. Koubeissi, Bartolomei, Beltagy et al. (2014) have pointed out that there is an area in the brain that they called the awareness switch. This area is the claustrum.

A 54-year-old woman with untreatable epilepsy underwent depth electrode implantation and electrical stimulation mapping. The electrode whose stimulation disrupted consciousness was between the left claustrum and anterior-dorsal insula. Stimulation by means of electrodes within 5 mm did not affect consciousness. Koubeissi, Bartolomei, Beltagy et al. (2014) studied the interdependencies among depth recording signals as a function of time by means of nonlinear regression analysis (h (2) coefficient) during stimulations that altered consciousness and stimulations of the same electrode at lower current intensities that were asymptomatic. Stimulation of the claustral electrode reproducibly resulted in a complete arrest of volitional behaviour, unresponsiveness, and amnesia without negative motor symptoms or aphasia. The disruption of consciousness did not outlast the stimulation and occurred without any epileptiform discharges. They found a significant increase in the correlation for interactions affecting the medial parietal and posterior frontal channels during stimulations that disrupted consciousness compared with those that did not. The findings suggest that the left claustrum/ anterior insula is an important part of a network that subserves consciousness and that disruption of consciousness is related to increased EEG signal synchrony within frontal-parietal networks. Deep transcranial stimulation of the claustrum enables or disables consciousness (cf. Fig. 2).

Research on the role of the claustrum is still ongoing. And although the role of the claustrum as a „switch” of consciousness is confirmed, it is known that it is only an important element of a complex network (Brown 2015), which was also pointed out by, among others, Koubeissi et al. (2014). It should be emphasized that not only consciousness is important for efficient human action, but also, and perhaps above all, a fully formed self.

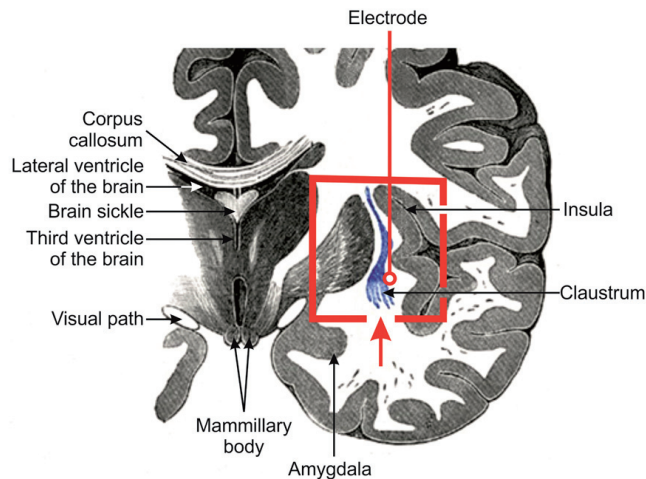


Fig. 2. Claustrum: the region in the human brain where electrical stimulation reproducibly disrupted consciousness

Source: Koubeissi, Bartolomei, Beltagy et al. (2014), modified

## UNDERSTANDING THE ESSENCE OF ONE'S OWN SELF

Understanding the essence of one's own Self requires tracing its formation in a microgenetic approach. It is particularly important to answer the question:

*Can the Self (understood as a complex biological being) be synonymous with the sense of the Self (that is, a subjective self-representation)?*

The answer is trivial on the one hand, because everybody will answer this question: No. However, this is a key question about the essence of human identity. Therefore, one should be extremely cautious in interpreting the world and the literature, where this distinction is not used or is not considered according to the microgenetic approach (see Pąchalska 2019).

## THE PROCESS OF PHYLOGENESIS: SELF AWARENESS

In this paper, self awareness is defined as the *relation of a person to external objects and bodily states*. The subject is the whole of the organism – a person – excluding the external world. The *external object* is the whole external world, perceived as outside the organism.

An object for the brain is a perceived event. An entity is a physical event postulated to exist outside perception. The external or objective world is defined

as a segment of the subjective that has been objectified. In contrast, the physical world is the world of physical entities.

The subject is antecedent to the object. The *relation* is the uni-directional process of becoming through which the subject, then the object, actualize. One can have awareness without consciousness, since the former, from an evolutionary, maturational and microgenetic standpoint, is the earlier state. But one cannot have consciousness without an implicit state of awareness, since consciousness arises on this foundation.

*Consciousness* is defined as the *relation of a Self to inner and outer objects*.<sup>1</sup> The relation arises in the process through which images and objects objectify. The relation of the self to inner objects is introspection or reflection. The relation of the self to outer objects is exteroception or perception. Conscious perception differs from object-awareness. In the latter, the subject-as-a-whole is aware of external objects. In the former, a self is conscious of objects. The self is a segment in the stream of outgoing subjectivity aware of its own priority and subjectivity.

Self representation – in its simplest form – is already present in vertebrates (Churchland 2002), as it enables the integration of complex behaviour with environmental requirements and maintenance of homeostasis. In contrast, manifestations of self-awareness can be observed in the simplest mammals (Eccles 1993). However, the highest level of self-awareness that has developed over the past 10 to 15 million years is found only in apes and humans (Gallup 1994; Parker 1996).

It is assumed that the development of Self Awareness was influenced by the need to search for food, especially its temporary lack (Potts 2005) and the increasing complexity of social groups (Dunbar 2009). These ecological challenges require the creation of mental representations of objects that can be reproduced and manipulated even when they are not available. They also make it possible to recognize the obligatory (causative) self that can consciously affect the environment. Therefore, survival is possible for those chimps that are able to imitate the use of tools, just like other monkeys did (in other words, those chimps that are able to learn), and those chimps that are able to predict when specific food will appear<sup>1</sup>.

The evolution of self-awareness is associated with the development of the cerebral cortex, especially the frontal lobes (Brown 2000). Recently, it was found that in apes there occurred homeostatic afferent pathways (Lamina 1) that lead directly from the spinal cord to the ventromedial posterior nucleus (VMpo). It should be noted that these pathways are more developed in the human brain (Craig 2002).

In addition, in a troop of monkeys, those individuals who have a mental representation of themselves in relation to others are able to form alliances and act in accordance with the established hierarchy in this troop. This type of cog-

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<sup>1</sup> The original meaning of consciousness was self-consciousness (Brown 2015). Locke wrote, "consciousness is the perception of what passes in a man's own mind" (Essay II, I, 19).

nitive development is also the basis for the formation of the human self system and an awareness of the existence of other people, but in this process a person uses language skills for communication.

It has now been shown that chimpanzees as well as orangutans and gorillas in early adolescence have the ability to recognize themselves in the mirror, while other monkeys do not, but this ability seems to diminish with age (Gallup 1994, Patterson and Cohen 1994; Kolb and Whishaw 2003). It is worth noting, however, that recognition in the mirror is not synonymous with self-awareness (in the full sense of the word), because the evolution of self-awareness is associated with the development of the cerebral cortex, especially the frontal lobes, which are the most developed part of the brain in man (Brown 2000; Kaczmarek 2012b; Pačhalska, Kaczmarek and Kropotov, 2014).

## **ONTOGENETIC PROCESS: SELF AWARENESS AND SELF**

The earliest representations of the self in a person occur in the perinatal period, because the newborn's nervous system allows them to perform behaviours that satisfy their basic needs. Self-awareness, understood as the ability to differentiate oneself from one's surroundings, appears in the third month of life, due to the fact that the infant determines by means of trial and error the relationship between its action and kinesthetic, proprioceptive, vestibular, tactile and visual sensations. A body schema is gradually created that allows construction in a non-personal (exocentric) space that you can move around, feeling personal agency. At the age of 7 to 12 months, babies master the task of assessing the stability of objects (Diamond and Goldman-Rakic 1989; Snow 1990), and at the age of 15 to 24 months the ability to recognize themselves in the mirror (Lewis and Brooks-Gunn 1979; Anderson 1984). Signs of embarrassment appear in the second year of life after learning to recognize oneself in the mirror. Understanding of standards and self-describing statements appear in the middle of the 2<sup>nd</sup> year (Kagan 1982). Around this time, children begin to learn about previous events, although they cannot reproduce them without outside help (Levine 2006).

Typically, human self-representation abilities appear at 3 years of age. This leads to the appearance of emotions related to self-esteem, such as shame, guilt and pride. Children begin to create narratives about the past from remembered episodes to which they can move mentally in place and time (Levine 2006). However, it is only in adolescence that the more abstract and reflective concept of the past, present and future of the self appears (Parker 1996), which are associated with a sense of continuity of the self in time (see below: longitudinal self). In early adulthood, the self system is formed, which enables self-determination of the characteristic features of oneself (Marcus 2009). This system remains relatively stable throughout life in healthy people (Finn 1986; Costa and MacCrae 1988) and undergoes modification or breaks down in mentally ill people and people with brain damage (Feinberg, 2005; Pačhalska, Kaczmarek and

Kropotov 2014). It should be noted that the social environment significantly affects the development of the Self structure. Therefore, the way of raising a child plays a big role in the process of shaping the Self. If it is excessively harsh, e.g., when parents place high demands on the child and are not satisfied with his or her achievements, then a sense of inferiority and a tendency to perfectionism are formed. Therefore, the young person becomes more demanding of themselves and has difficulties in dealing with others.

## FORMATION OF THE SELF SYSTEM AND THE SENSE OF SELF IN RELATION TO CONSCIOUSNESS

The formation of the self system, including the sense of the self, in relation to full consciousness and meta-consciousness in microgenesis is illustrated in Fig. 3. Three main types of self can be distinguished here, after Pąchalska (2019):

1. The *biological self* (primary, biological being, organism), which integrally connects with the structure and operation of the whole organism and its part (including the structure and neuronal connections of the brain) and consists in the fact that the subject feels and satisfies the drives and needs, which are literally egocentric. At this level there is no (and cannot exist) a so-called theory of mind, because it is not necessary for activities essential for survival (Brown 2003; 2005);
2. The *emotional self* (feeling itself and the environment), which exists on the next, limbic level, connecting with the operation of the emotional system and

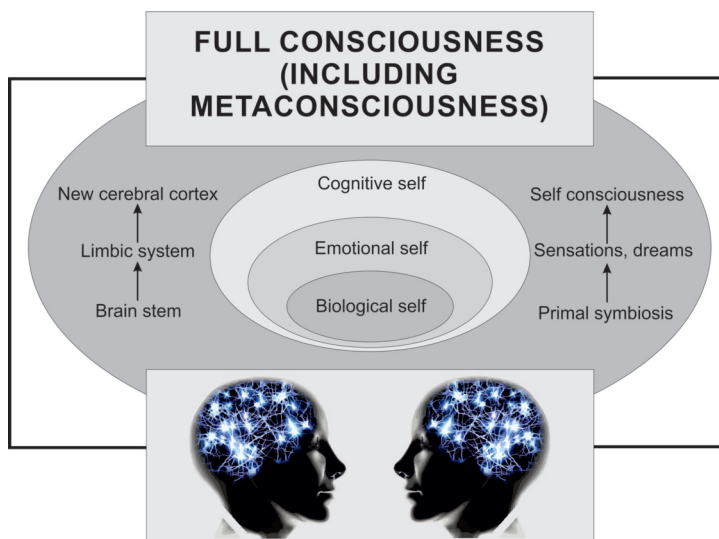


Fig. 3. Formation of the biological, emotional (feeling) and cognitive (recognizing and being recognized) self in relation to full consciousness (including metaconsciousness) in microgenesis  
Source: Pąchalska 2019, modified.



manifests itself in emotional reactions. At this level, identity is associated with the subjectivity of a person experiencing pleasant or unpleasant emotions. Only then does the *I-You* relationship become possible, and hence, the beginning of the theory of mind. At the same level, the perception of the stimulus is also separated from the body's response to this stimulus. In other words, there is a separation of perception from action, with perception becoming the subject of the posterior parts of the brain, and action – more frontal lobes. This is due to complex cortico-cortical and cortico-subcortical connections (Pąchalska, Kaczmarek and Kropotov 2014). The feeling, experiencing the self of the limbic system becomes the central object of cognition in the world of objects that are analyzed according to specific, multimodal sensual and cognitive domains. Perceptual processes, in parallel with the processes of action, tend towards more and more precisely distinguishing the component of reality surrounding a given man (Kaczmarek and Markiewicz 2009; Kaczmarek 2012a).

3. *The cognitive self* (recognizing and being recognized) being the subject of one's perception and action, connects with self-awareness and knowledge about oneself, self-sense, i.e., a subjective representation of oneself. Here, the identity is synthesized, thanks to which a person is born with a sense of identity, i.e., certainty that „I am myself” as both the object (being recognized Self) and the subject (recognizing Self) of perception. The self system - which is formed in the process of microgenesis - creates mutual relations and bonds between the biological self (primary, biological being, organism), the emotional self (feeling itself and the environment), the cognitive self (known and knowing) and self-awareness.

This system is consistent and its description is based on many years of experience and clinical experiments conducted by the author of this paper (Pąchalska 2002; 2007a;2019). However, there is still a difficulty in determining how the self system described above and the highly dynamic associated process of its emergence and continuation over time can provide a sense of identity continuity, i.e., certainty that ”I am the same person I was from birth and will be until my death” (Pąchalska 2007c).

Answering this question requires discussing the emergence of a single mental state in a microgenetic approach.

## **THE MIND AND SELF SYSTEM**

The mind is frequently defined as a result of the brain activity involving all cognitive processes as well as consciousness, subconsciousness, and self-awareness (Wygotski, Cole 1980). Some rudimentary manifestations of the mind can be also observed in primates and possibly animals quite far down the evolutionary scale. At some level of primitive mind, for example that of a bat or octopus, the relation of mind to brain is not a vexing problem, even if particular behaviors cannot be correlated with specific brain areas or processes (Brown

2015), since the self, consciousness, language, intentionality and other features of human mentation are not present in them. Hence, the inner life of an animal, if there is any, is inaccessible to us. In such animals the identification of the mind with the brain or nervous system is justified, even if the correlates of neural networks with behavior are not specified (Pąchalska 2019).

As mentality increases in complexity, its correlation with brain structures and their discrete functions becomes more elusive, while in the human mind, except for a rough approximation, it is largely opaque. A significant - not to say leading - role in the works of mind is fulfilled by language, which finds its confirmation in clinical findings.

Hence, speaking makes use of oral movement and vocalization, while perception of utterances is possible due to the level of development of auditory and visual perception in humans. The use of shorter neural connections allows for faster response time to stimuli and the creation of patterns of these connections enabling further specification of individual brain processes. At the same time, long neural connections ensure communication between distant areas and also between both hemispheres, making possible polymodal information processing. This organization of brain work underlies the formation of all the mental processes entailed in the creation of one's own self (Pąchalska 2019).

The conditions for mind are present in elementary entities, proto-psychic features that together with physical features evolve to a primitive mentality. One can ask if a semblance of mind is present in every atom or cell in the body or brain? Is mind generated by the brain as a whole or are only certain portions involved? Large areas of brain can be removed with little or no demonstrable effect on mentation, while some very local portions can be damaged with profound effects on specific cognitive functions. The conclusion is that what counts is less the brain region than the pattern of brain activity that makes consciousness and attendant capacities possible (Herzyk 2011). Since the pattern is common to all brain systems, individual systems or components can be sacrificed and mentality goes on. The mind does not ordinarily regress to animal or childhood function; rather, basic attributes - consciousness, duration, a present moment, intentional thought, dream and the unconscious, aesthetic preferences and so on - are largely spared, even with a severe compromise of language, action or perception (Kaczmarek 2017; Brown 2015).

Language may be responsible for the unique character of the human mind but, except for verbal thought, many attributes of mind persist when language is lost. More precisely, the actualization of each component of mentality suffices to sustain human psyche, even when there is disruption within a given component. In animals lacking the specialization of the human brain, this commonality of pattern - category/item transition - survives multiple ablations. This has suggested mass action or equipotentiality (Lashley 1929), holographic organization (Pribram 1984) or even the function of the brain and mind not only in space and time but also in a pulsating state in hyperspace, which is presented in the authorial synchronous memory model (cf. Fig. 4).

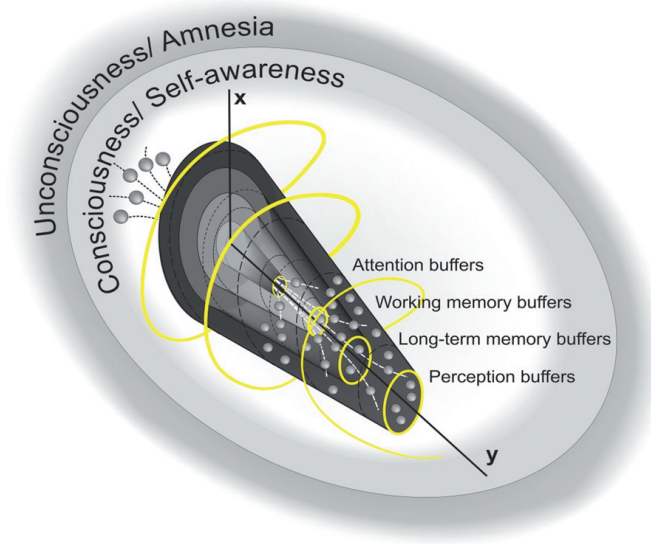


Fig. 4. Synchronous memory model  
 Source: Pąchalska, Kaczmarek and Kropotov 2014, modified.

The spatial arrangement of the model makes it possible to present on the x and y axes the relationship between the general structure of attention and memory systems (in terms of the number, content and complexity of processed elements) and the period of time necessary to process them. It can be seen that the Attention System buffers data transfers to the working memory system. This system, according to the latest data obtained in neurophysiological studies, processes the smallest number of elements in the shortest possible time: seconds or even milliseconds (Kropotov 2009; Pąchalska and Kropotov 2019). As the number of elements of information processed and / or the duration of the processing exceeds a certain threshold, we gradually move from the attention system (several stimuli, several milliseconds) to the working memory system (several to several dozen stimuli, several milliseconds to several seconds and / or minutes) depending on the capacity of the working memory buffer (see also Kropotov 2016).

In a similar way, there is a transition from the working memory system to the long-term memory system. The boundary of the transition is difficult to determine precisely and most likely it is actually not very sharp. In the human brain, a continuous process takes place, lasting from milliseconds to entire years when information is remembered, stored, reproduced and forgotten. Also semantic and episodic memory is associated with the number, time as well as the content and complexity of processed data (see Pąchalska 2007a, 2008). The differences between these types of memory mainly concern the content of information. Of course, the longest storage time is characteristic of long-term memory, which is why we put it at the basis of the presented model. It is closely related to the organization of one's self in time.

As we have already pointed out, memories stored in human memory are subject to the process of „melting” gradually: over time, we forget more and more details, but often we can remember the most important elements of a remembered event. This explains why we assume the existence of qualitative differences between the memory of near and distant events:

1. *Events near in time* are those events that have taken place in the last minutes, hours or days (sometimes longer periods) and thus create a sense of the present.
2. *Events distant in time* are, in turn, those that we recall from the past, so it is something that happened a long time ago.

The presented description concerns the mechanisms of memory action in a healthy person. However, in clinical practice we often observe selective memory impairment of near and distant events. This phenomenon is characteristic of dementive diseases (cf. Pąchalska, Bidzan and Bidzan 2015), but it also occurs after brain trauma and post-traumatic dementia. This includes, for example, subsequent unconsciousness in post-traumatic amnesia. For this reason, we placed unconsciousness and amnesia next to the memory buffer on the border of the memory model. It is important that the extraction of information from unconsciousness requires a significant allocation of brain resources. This phenomenon explains so often the occurrence of memory disorders in people with various brain dysfunctions in whom these resources have been significantly reduced (see Pąchalska 2007a; 2008).

These conditions underlie the formation of all mental processes underlying the creation of one’s own self.

## **THE ESSENCE OF A SINGLE MENTAL STATE**

The starting point for considering the continuity of the self is understanding the essence of a single mental state that underlies the process of realizing reality, including the representation of the organism. This process can develop over time and thus create self-awareness (Pąchalska, MacQueen, Brown 2012a, b; Brown 2015). The single mental state underlying the sense of self and the process of realizing reality is illustrated in Fig. 5. This state runs from the potential to the current representation (A), reaching the act-object (B) and forming the image (C). This image may be in the form of linguistic representations (including internal speech) and / or visual representations (imagination).

The model presents the most common visual representations, but it should not be forgotten that these representations also include other sensual modalities, such as: tactile, kinesthetic, olfactory and taste.

As was pointed out in another work (Pąchalska, Kaczmarek and Kropotov 2014), individual mental states develop over time and may cross the threshold of consciousness or disappear. This process is complex, involves the functioning of the brain in association with the body and is closely related to the sense of self.

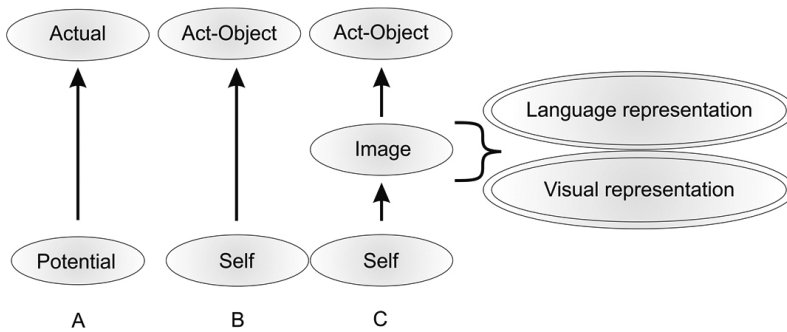


Fig.5. A single mental state underlying the process of realizing reality.  
Source: Pąchalska, Kaczmarek and Kropotov, 2014, modified.

## WHO IS IN CHARGE? THE BRAIN OR ONE'S OWN SELF?

The interpreter of the world is a complex neuronal circuit associated with the brain and Self, which enables the creation of a model of the world and the use of mental models, and thus understanding and interpreting the surrounding phenomena in the world, in particular understanding facial expressions expressing emotions, intentions of other people and their recognition and our values (Gazzaniga 2013).

*However, can such an interpreter of the world control conscious behaviour?*

In my opinion, no. This is only a psychological construct. Conscious behaviour is controlled by a human being - a person of a definite gender (male, female, child) and indefinite, having their own self who uses the help of a world interpreter.

It is worth emphasizing that only a human has such a Self that, although bombarded with an ever-increasing amount of information bits, can select and value the most important ones for getting to know oneself and the world, for one's own development and survival (Brown 2002; Pąchalska, MacQueen and Brown 2012a, Pąchalska 2019). This is to ensure actions in accordance with the accepted values, and above all to feel responsibility for one's own actions (Pąchalska 2007a). However, we need properly developed emotional processes, attention networks and sensory processes, memory, thinking and imagination, language and executive functions, which in turn determine the forms of our cognition and ways of responding to the environment.

## LOGICAL AND SPATIAL COHERENCE OF THE SELF SYSTEM

The development of the logical and spatial coherence of the self system is conditioned by the proper functioning of the entire brain. This is ensured not only

by properly functioning structures, but also by connections within each hemisphere, between both hemispheres and their connections with subcortical structures (Pąchalska, Kaczmarek and Kropotov 2014). Differences in the functioning of the right and left hemispheres of the brain within the self system are illustrated in Fig. 6.

It can be seen that the dominant hemisphere of the brain (usually the left in right-handed persons) is closely related to language functions. Therefore, it provides logical coherence possible thanks to linguistic images, which includes language models, grammar and vocabulary, as well as internal narration and dialogue. An important role is also played by the ability of linguistic expression, which is enabled by efficiently functioning articulatory organs and limbs (writing and signalling language statements). Based on this, language texts are created, among which a special role is played by narrative and external dialogue that enables contact with other people. Patterns of neural network connections that evoke thoughts (and thus behaviours) that promote the well-being of the body are permanently encoded, while useless ones disappear (Carter 1999; Pąchalska, Kaczmarek, Kropotov 2014).

The subdominant hemisphere of the brain is closely related to nonlinguistic functions (generally the right in right-handed persons). Thus, it provides spatial coherence based on nonlinguistic images: image models and „body grammar,” i.e., images evoked by facial expressions, gestures and a sequence of move-

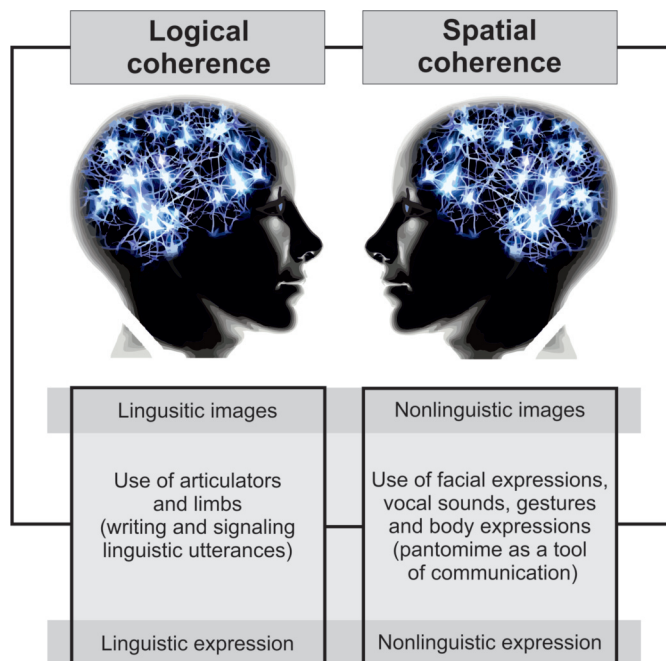


Fig. 6. Differences in the functioning of the right and left hemispheres of the brain within the Self system

Source: own elaboration

ments (pantomime). This enables, through the use of the facial expressions, phonic organs (vocalization), limbs (gestures) and the whole body (pantomime, „body language”) nonlinguistic expression. This creates nonlinguistic messages: acoustic (voice, sound) and visual (drawing, gesture).

People with brain damage exhibit disturbances in logical or spatial coherence depending on the location of the damage (structures and neural connections) in the right or left hemisphere of the brain. Linguistic representations are more or less disintegrated, which makes creating language constructions more difficult, as a result of which the process of creating ideas about yourself and the world is disturbed, which is why the image of oneself and, as a result, the whole system of the self is disintegrated. Damage to the subcortical structures and connections is also not without significance, however, the picture of disorders is different, something which is described in more detail as detailed in another work (Pąchalska, Kaczmarek, Kropotov 2014).

## **THE DEVELOPMENT OF THE MENTAL STATE IN TIME**

The nature of time is interwoven with the problem of mind and brain, whether in causal theory or a concept of becoming, particularly in any kind of replacement theory, since duration is an inherent and essential feature of the mental state as such. Further, there is a distinction to be made here between the duration of becoming in physical entities and the mind/brain state, and the phenomenal duration of the present, both of which present a challenge to the usual assumption of physical instantaneity in material entities. Of the various perspectives on time, the most common are these:

- Newtonian absolute time, which has its application in local contexts as well as clock time;
- the relational time of Einstein, which has greater import in cosmic or macro-system analysis;
- the mode of time discussed in this section, subjective time experience, which accounts *inter alia* for the duration of the present and the ordered series of events from past to future.

According to microgenetic theory, a single mental state is a temporary and transient state that appears in consciousness and immediately disappears to give way to the next state (Werner 1956, 1957; Werner and Kaplan 1956, 1963; Brown 1988). It might be compared to the theory of the „apparent present” (see also James 1890). However, the adoption of this thesis does not allow one to explain why the course of the mental state does not unfold properly in the damaged brain of some patients (Pąchalska 2007a; Pąchalska, MacQueen, Brown 2012).

In physical theory, time is a dimension of space, while subjective time depends on memory. Since Heraclitus and Parmenides, time has been conceived as either instantaneous or continuous, that is, as a series of discrete instants or points, or as an unbroken flow or stream. An alternative to these concepts, which

reflects the way time is modelled in the brain, is a process of recurrence<sup>2</sup> in a motionless point that is replaced, which makes the passage of time more like the movement of water in a fountain than the flow of a river.

To illustrate the process of creating a state of mind, you can use the metaphor of a fountain. Subsequent drops of water rise to create a variety of patterns and shapes and take on different colours thanks to the built-in automatic devices for illuminating and regulating the water jet. When they rise high and cross the peak, they begin to fall, but subsequent ones follow, and subsequent ones follow. However, when the drops rise too low, they will only form bubbles on the water and fall without reaching the top, so the fountain will not gush. All these drops are a fountain. The same happens with the state of mind: when the process of its formation in the lower structures begins, i.e., the brainstem with the midbrain, and reaches the limbic system and further up the cerebral cortex, it becomes conscious and the process of information processing in the brain begins. New connections are created and thanks to them the processes of memory, perception and imagination take place, the mind, so called mind in mind and the individual, social and cultural self system function. However, when the strength of this process is small, it does not rise to the threshold of consciousness and will collapse. This happens, for example, in the phenomenon „I have it at the tip of my tongue.” The actualization of a moment, like the surge of a fountain, is a non-temporal succession with an epochal character. A moment in the subjective life of an organism is a becoming-into-being. Being is the frame, category or collection of all the phases that constitute the process of becoming. The incompleteness of becoming is necessary for the miscibility – the becoming part of – one state in another. The continuity of adjacent states is a resolution of becoming with a momentary epoch. Time feels continuous, since we cannot grasp and hold the individual moment, when one state blends into the next. The replacement of actualities differs from a causal sequence of atomic instants, since states are assimilated prior to their existence; that is, the antecedent assimilates to the consequent, and the reverse, before either exist, each becoming an existent only after it is replaced. Again Whitehead: “each occasion presupposes the antecedent world as active in its own nature.”<sup>3</sup> The sequence of mental states entails a replacement of irreducible packets of becoming that collectively are minimal units or “drops” of experience (Brown 2015).

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<sup>2</sup> The concept of recurrence is deeply ingrained in the cyclical nature of life: circadian, lunar, seasonal, sleep/wake, vibratory and other periodic processes, the oscillatory nature of respiration, ambulation, and the rhythmic structure of speech, as well as the vibratory foundations of inorganic matter (Pąchalska 1999). These periodic or recurrent processes differ in scale, but all of them give evidence for the centrality of iteration in cognition and in the psychology of time experience. Specifically, moments in time actualize through a becoming into existence, such that each actualization comprises phases of transition within an encapsulated point. The actuality is a recurrence that exists as a moment in time, or a time-creating moment when the becoming is complete. As Whitehead put it, “half a wave tells only half the story.”<sup>2</sup> An instant refers to an isolable slice of process; a moment refers to the minimal duration of a thing, or one cycle of its existence (Brown 2015).

<sup>3</sup> *ibid.*, pp. 88-89



The experience of the present moment and the experience of the past remain inversely proportional to each other. Kępiński (1992) notes that when time and space before us shrink, they expand behind us. For example, the threat of death changes the time perspective of human life, both in old age and in times of danger. Kępiński (1972), based on the statements of his patients, noticed that in depression the sense of time changes, the future shortens, and in more severe forms of depression accompanied by suicidal thoughts or attempts, the future ceases to exist at all, becomes nothingness, i.e., death (see also Kępiński 1974). However, the present in depression becomes eternity – it is, it was and will be dark, nothing can change.

*Who am I? A person with depression asks.*

*The answer is: I am the same person that I have always been and always will be, and the possibilities of positive change are only illusions for me. I must give up all hopes.*

This kind of mnemonic closure to negative thoughts creates patterns of neuronal connections that convert and the patient cannot free himself from such memories. It leads to the strengthening of pathological identity continuity.

As noted by Pąchalska (2007a),

„It is my own self that guarantees continuity in time [...] this is my past because I am experiencing it, not someone else. On the other hand, it is the continuity of time that is the guarantor of identity: I am the person who has lived through this and no other past, I exist here and now, I have before me such a future that runs on the arrow of time, as it was stated by Arthur Eddington (1928), who puts time in a linear way.”

In the process of realizing one's own self, the development of the mental state in time plays an important role.

As shown by the latest clinical and neurophysiological research (Pąchalska, Kaczmarek and Kropotov 2014; Pąchalska, Góral-Pórola, Kropotov et al. 2017) allowing for modification of microgenetic theory, the mental state developing from the unconscious to consciousness pulsates during individual intellectual operations (Pąchalska, Kaczmarek and Kropotov 2014). The path of development of the mental state follows the serial order, which means that this state occurs:

1. *in the space of brain structures*, where it can develop from covert processes to the level of the threshold of consciousness (ascending mental state) and disappear (disappearance of the mental state) or exceed this threshold (development of the mental state) and rise even higher to the appearance of full consciousness and conscious cognition (the culmination of the mental state);
2. *in time*, in the form of pulsating individual mental states, which ensures the renewal of these states. This allows you to become more aware of reality. The time it takes to become aware of this reality may last for healthy people with a properly functioning brain, for a relatively short time, while for people with brain damage due to the destabilization of neural networks this may be more or less slow or accelerate, which in each case will lead to disorders within

cognitive and emotional processes (Pąchalska 2007a,b,c; Pąchalska, Góral-Półrola, Brown et al. 2015).

This approach to the essence of the mental state makes it possible to understand the phenomenon of developing (T1) and renewing (T2) this state in time (cf. Fig. 7) and the birth of the minimal working self, which will be described in more detail later in this paper (Pąchalska, Kaczmarek, Kropotov 2014; Pąchalska and Bednarek 2019).

In working memory, images are reproduced in subsequent mental states in the order of memory, i.e., in relation to their resemblance to the coming state, and thus to the possibility of renewing the mental state. In the current state of mind, there are images closer to the perception that takes place, i.e., images from the working memory buffer that have almost reached the character of renewed perception. The brain-mind state in T1 is replaced by the overlapping state T2 before T1 ends in time, i.e., before the next phase occurs. This explains the reoccurrence of the early phases in T1, related to the condition of the body (body and brain), individuality of the person, i.e., Self, character, disposition, capacity of working memory buffers, long-term memory resources and experience, and the durability of basic beliefs, values and personality. Later phases disappear when the whole process of realizing reality is completed to make room for new perceptions. The activity of earlier phases of the mental state in the process of the overlapping of individual phases explains the sense of self continuity in time. It should be emphasized that the early stages of mental state development are components that incorporate later states that are more susceptible to environmental influences. At the same time, the repetition of earlier phases is closely connected with the feeling of a reality that exists (Pąchalska, MacQueen and Brown 2012a).

This means that in the process of creating consciousness, one state of mind is replaced by another in a split second, which makes the apparent change replace the previous states of mind by successive states. This overlap of individual states creates a sense of continuity, while their mutual substitution creates

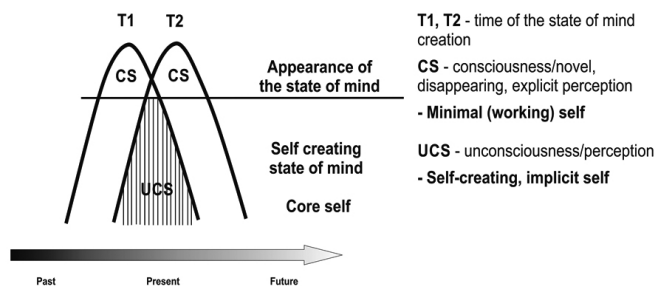


Fig. 7. Developing (T1) and renewing (T2) mental state in time: the birth of the minimal (working) self

Source: Pąchalska, MacQueen and Brown (2012b), modified

a sense of change. It is worth emphasizing that the process of becoming aware of reality may vary depending on the needs, attitude, emotional state and cognitive processes of a person (Kolańczyk 1999), as well as the criterion features of objects with which a given person interacts, and environmental conditions (Pąchalska, Kaczmarek and Kropotov 2014).

Mental states do not constitute a cumulative whole created as a result of separate processes occurring on three levels of microgeny (drives and needs, emotional and cognitive processes), but recreate the course of object (perception) formation in the mind (cf. Pąchalska, Kaczmarek, Kropotov 2014). And it is the process of creating an object representation that organizes the process of self formation in microgenesis.

## **CONTINUITY OF THE CONSCIOUS SELF'S EXISTENCE**

The layers of conscious experience reflect parallel phases in realizing the mental state (Brown 2015). The degree of development of this process determines both the content of this state and the mode of consciousness in which it is located.

The forms of consciousness referring to the stages of mental state development are:

1. Self in a dream;
2. agitation;
3. uncritical awareness of objects and activities;
4. wakefulness;
5. introspection.

In the above forms of consciousness there is a kind of „view” of objects that are in the field of view. This means that the condition for the existence of the mind is the existence of a world whose mind is aware.

A common truism holds that the self and the world are separate, physical and mental entities. However, when we see the survival of people with brain damage (e.g., patients who have been diagnosed with the spectrum of schizophrenia), we can observe the phenomenon of „merging” the world or parts of it with the self. Therefore, it should be emphasized that the existence of the self that looks at and is detached from the world is accompanied by the existence of the real world. The self is formed in the process of perception (see Pąchalska, Kaczmarek Kropotov 2014). Pąchalska, MacQueen and Brown (2012a) define this phase in the development of the state of mind by the phase of object formation preceding the formation of clear mental images. This process is much more complex in the case of the formation of the self-system, which is something beyond and more than any kind of image [cf. below, minimum (working) self].

*What makes the conscious self not blur in the world, but stay coherent and separate from it, and how is it protected?*

In the process of developing a new mental state and forming the relationship of the Self with the environment, in a sense the Self sees how the emerging configurations are formed by separating themselves from the area of images, through the area of concepts and the area of activity, into the area of objects. Brown (2015) develops the process of self-creation from the deepest layers of self-consciousness, i.e., from the Self.

In states of introspection, the mind breaks away from the world and settles in the early stages of imagination. Imagination and thinking are now the dominant mode of consciousness, but this detachment is not complete (Raichle 2010). The outside world remains, but is no longer the focus of attention. In the case of sleep, however, there is a complete detachment from the outside world, making the inner world become the central object of the dream self. In moments of reflection, which we write about in the section on dreams, the self is emphasized. In short-term partial regression, which can occur in certain mental states, a clearer self-image is recovered. A similar phenomenon occurs in a dream, as we will write about below.

## **DREAM SELF AND CONSCIOUSNESS**

The Dream Self is born during dreams, which are subjective, internally generated, hallucinatory experiences that usually involve many senses. It is well known that when the *Dream Self* „wakes up” from sleep, the *Real Self* „falls asleep.” Despite this, Dream Self retain a sense of continuity of existence (Revonsuo 2005; Revonsuo, Kallio and Sikka 2009).

*We spend all our years in a dream, but do we really know who our dream self is?*

Sleep introduces multi-sensory content into sleep from various modalities (most often visual, but also auditory, tactile, taste and olfactory), and sometimes also from one modality (most often visual, less often auditory). Sleep can generate feelings of anxiety, pain and shortness of breath. Dreams are somehow a simulation of the real world, because they usually contain fragmentary sensory-perceptive content. However, they can create an organized world of sensations, a kind of film, not still photography.

## **WHAT IS DREAM SELF?**

*Dream Self* is the person who represents the dreamer. It is usually physically similar to it (Revonsuo 2000 a and b). It is located in the centre of the dreaming world and can generally be slightly different cognitively from the self in the real world. It may also have access to many events from autobiographical memory, but this is limited access (MacQueen 2017). Dreamer has no self-reflection, he has no self-awareness, he knows neither the past nor the future, because he does not have a coherent autobiography. Brown (2000) believes that the *Dream*

*Self* suffers from temporary amnesia, which disappears immediately after waking up. Hallucinations may also appear. When it comes to long-term memory, confabulatory dreams (the dreamer can confabulate false memories) and previously experienced events appear in the dream. In addition, the dreamer may exhibit amnesia in relation to many events. Due to memory deficits and a lack of insight into our cognition, Hobson (1988, 1997) compares dreams to delirium. Even if we consider this view too extreme, the dream self is undoubtedly completely distant from the real self, especially in terms of awareness, remembering past events and future plans. Dream Self exist only in the present time, however dreamer is without self-reflection and awareness. Dream Self cannot be aware of the past as a coherent, autobiographical narrative that has led to the present moment, and there are no plans for the future. However, when we wake up, we identify Dream Self and say: „It was me who dreamed.”

## **THE PRESENCE OF A DREAM IN DREAMS**

REM phase research confirms that sleep is in most dreams. Strauch and Meier (1996) analyzed 198 dreams obtained from 22 subjects and found that sleep was present in 90% of these dreams. In addition, they found that the dreamer was active in sleep events in over 70% of cases. In other studies based on data from 800 saved dreams, it was also found that in 90% of dreams, Dream Self is the main hero of dreams (Cicogna and Bossinelli 2001). There are many indications that as the length of sleep increases, the likelihood that the Dream Self will be the main dream character increases.

Since the Dream Self does not occur in all dreams, it seems to contradict the theories that the Self or its representation is a necessary condition for conscious experiencing. However, even a dream without the representation of self is my dream, not someone else’s dream. I have no doubt that this is my dream. Revonsuo (2005), believes that the sense of ownership is associated with the same physiological mechanisms that occur during perception in waking states. Both dreams and wakefulness experiences are realized by the same brain. So they are patterns of activity at a higher level of nervous system organization. However, they become my experience if and only if they form a memory trace and remain in the memory and can be reminded after waking from sleep (cf. Foulkes 1985). Thanks to this, it is possible to reconstruct dreams and feel that they arose in the same consciousness system that we currently have. Therefore they become part of the autobiographical memory.

## **ARE THE DREAM SELF AND THE REAL ME TWO DIFFERENT PEOPLE?**

Foulkes and Kerr (1994) collected 64 records of dreams from 4 people and asked them if these dreams were experienced from their own perspective or whether they saw themselves as an external observer. These researchers found

that in 90% of dreams, dreamers saw themselves from their own perspective, and dreams in which the subjects saw themselves as an external observer were static. In turn, Cicogna and Bosinelli (2001) noted that only in 3% of dreams there was a double representation of the subject, one who acted as a person acting in a dream and at the same time as an external observer of himself. The authors cite a record of such a dream:

I was in a kind of South American country two hundred years ago. I was riding a horse. Three men and other people who were on foot were travelling with me, We were chasing the man who was me because he had some money and I was watching the whole scene.

However, this is an exception because, as we pointed out above, the vast majority of dreams are experienced from the perspective of the dreamer.

## **DREAM ROLE**

Revonsuo and Salmivalli (1995) analyzed the semantic content of 217 records obtained from 32 healthy people. As expected the Dream Self occurred in the vast majority of dreams, as indicated by the use of the first person pronoun in the description of the person appearing in the dream. However, there was no data on the characteristics of this person. Most of these entries included descriptions of items (23%), activities (20%), other people (13%) and places (11%). Sleep was only in 10th place and only 3% of the surveyed people were able to describe them. According to these scholars, this indicates that the Dream Self, which occurs in the world of dreams, is completely embedded in the environment and completely involved in the dream. This means that the Dream Self pays very little attention to consciousness self. This probably indicates a decrease in self-awareness during dreams. Studies on 140 dream records also found that only 13% of dreamers were active alone, while 70% were interacting with other people. This means that a typical dream is an interactive social experience (Strauch and Meyer 1996). Although the heroes of dreams with whom we interact in the world of dreams are virtual products of our own brain, they inhabit our world of dreams as if they were real persons and completely independent of our Dream Self.

## **THE STRANGENESS OF DREAMS**

A characteristic feature of dreams is their weirdness, because objects, events and actions appear in shape and in connections that would be unlikely or even impossible in the real world. Revonsuo and Salmivalli (Op. cit.) conducted a study to determine to what extent the freakiness of dreams affects sleep self. To this end, they distinguished three categories in the weirdness of sleep:

1. lack of compatibility between elements or features;
2. ambiguity (sleep elements are undefined);
3. lack of continuity (individual elements suddenly appear, disappear or undergo transformation).

These authors said that disagreement was the most typical form of the bizarre context of dreams. However, the dream self does not undergo this type of transformation, as evidenced by the fact that the dream self did not differ from the real self in as much as 80%. Probably this is due to the fact that in dreams we attach little attention to our body and appearance. The largest percentage of context inconsistencies concerned thinking and language, and occurred in more than 30% of dreams. The weirdness of dreams is reflected in the brain activation pattern during the REM phase (Schwartz and Maquet 2002), since significant areas of the prefrontal cortex then show a lower level of activation. As we know, these areas are associated with planning, decision making, critical thinking and deliberate attention.

In the literature on the subject, you can find examples of dreams in which the dreamer is usually himself, although he may appear in strange clothes, he may also be at a different age. Brown (2002) states that the dreamer is generally a younger person in a dream than in reality. Sometimes, however, the dreamer is another person of a different sex or race. It may also happen that he is not a person but an animal. Bednarek (2017) presents an example of a dream given by a woman with blond hair:

It is martial law. I am a dark-haired, strongly built Japanese soldier. The enemies are probably Poles ... Later in the same dream: now I see myself in the mirror. I am a fragile blonde who is bound by chains. Suddenly I turned into a hunted dog.

Another woman surveyed described her dream during martial law:

In my dream I was a dog that a policeman kicked ... It was very cold and the snow was everywhere. When the policeman went to warm up next to the coke, I escaped ... I ran with other animals in the dark forest. Finally I caught the hare and I was happy ... but the bear took this prey.

The Dream Self was embodied in a dog-like predator who escaped to a dark forest with other hunting animals.

## **DREAMING SELF FROM NIGHTMARES**

In the vast majority of dreams, sleep is a threat, while other people are at risk relatively rarely. Revonsuo and Valli (2000) noted that the Dream Self threat occurred in 73% of students' dreams, however, in the case of children, this risk affected more than 80% (see also Valli et al. 2005). In addition, the Dream Self is the most active sleep hero who reacts to threats and defends himself or escapes. This situation affects 35%-55% of dream heroes. If the threat concerned a threat to life, then the defence attempts increased to 67%. In dreams, the consequences of threats rarely appear. Revonsuo (2006) also presents research results that indicate that in response to threat stimulation, the dreaming brain has access to emotionally charged information from autobiographical memory. The contents of nightmares correspond to the most emotionally charged memories that relate to the threats that have happened to a person in the real world.

This applies only to very threatening events from the distant past. Events not distant in time, with low risk, usually do not occur in dreams. The literature on the subject lacks a description of dreams about dangerous and dramatic events that did not take place or which even threatened, and yet they appeared in dreams (see Revonsuo, 2005). Such examples can be found in Bednarek's work (2017). The occurrence of this type of dream is explained by microgenetic theory. This is because in a dream, the self is passive, because it does not affect the appearing images and the course of events. So, there is a loss of the outside world in a dream, and the Dream Self and the world is all that the dreamer possesses, and therefore everything can appear in that dream (Brown 2002).

In a dream, when regression highlights the archaic type of thinking hidden in waking thinking, we lose the expressive level of self that we have in moments of reflection. Emotional states are beginning to dominate. Sleep space is changeable, plastic and without depth. The Dream Self and the image of objects become parts of a unified image of the world in which there is a strong connection (unification) of emotions with the objects viewed. It also causes changes in the dreamer's emotional life. Changes in perceptual qualities or tonalities of emotional images accompany changes in the behaviour of the dreamer. This is a sign of the unfinished detachment of the dreamer's emotional life from objects. Dreams appear on the way from intra-individual to extrinsic space, which means that the „rational” brain, fully aware, does not have access to sensory data from the outside world (Revonsuo 2006). In the latest works in the field of neuroscience, it is emphasized that in a dream, in the absence of consciousness, the subjective time moves evenly back and forth on the arrow of time (Germine 2017). This type of movement in time is discussed in connection with the dream record of Australian Aborigines. These dreams are extremely colourful and allow insight into the mechanism of time perception in a dream (see also Bednarek 2017).

Dreams are connected with the self system in various ways. If they are remembered, they will be activated in stories or reproduced in works of art, e.g., drawings or paintings (Pąchalska, Kaczmarek and Kropotov 2014; Bednarek 2017). This is illustrated in the picture of the nightmare dreamed by the painter Zbigniew Perzanowski (cf. Fig. 8). He was a non-commissioned army officer serving during the large Solidarity strike at Okęcie Airport in Warsaw, and later a patient at a stroke department.

During this strike, while intervening and separating the policemen and strikers, he was severely beaten and developed PTSD. This event occupied his memories for many years in the form of intrusive daydreaming (flashback) and nightmares. In this picture, he presented an apocalyptic scenery – destroyed stairs, surrounded by dry branches impossible to pass, and a tiny window with incoming light and a white bird (eagle) symbolizing the freedom in Poland that he did not yet feel. Panic fear, which evoked the dream, was caused by the fact that his Dream Self in this nightmare is metaphysical, not separated from the world, suspended in the air or in fog.





Fig. 8. Zbigniew Perzanowski: A drawing of a dream entitled "The Lost Self" related to a beating during a solidarity strike at Warsaw airport in August 1981. Distemper 40x60 m, 1982  
Source: clinical material of M. Pąchalska

That is why he has not placed himself in the drawing and gave it the title "The Lost Self." This nightmare was linked to the horrible events at the airport, reminding him of the blows of policemen on his head and the smell of the strikers' and his sweat and blood. These polymodal, terrifying images and feelings aroused the panic fear, and evoked flashbacks of the traumatic situation at the airport. Along with the above described problem, other symptoms of PTSD also appeared.

*How do you interpret this artist's presentation from the neuroscience perspective?*

The dream, like any other experiences, releases emotions, because it stimulates the reward / punishment system by creating new connections in the brain. A nightmare, like unpleasant real experiences, also flashbacks, releases negative emotions (e.g. fear) because it stimulates the lateral prefrontal cortex and strengthens the penalty system by experiences felt in dream and by talking about it after waking up. Negative emotions e.g. fear, sadness, are included in the working memory, and, they are remembered in the long term memory, if they are important for the dreamer. At the same time, the reward system is weakened (cf. Fig. 9). Accordingly, pleasant dreams or experiences release positive emotions (e.g. joy), because they stimulate the reward system by creating connections from the basal part of the frontal cortex to the anterior (emotional) part of the anterior cingulate cortex. At the same time, the penalty system is weakened.

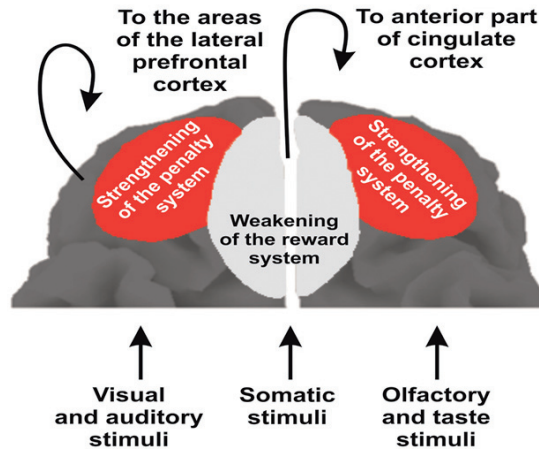


Fig. 9. The reward /penalty system: the medial part involves the processing of the reward, and the lateral part involves the processing of the penalty.

Źródło: Pąchalska, Kaczmarek i Kropotov 2014, modified

The strength and duration of these emotions are associated with the importance of the event for the dreamer. Therefore, dreams might modify the minimal (working) self, and the longitudinal (autobiographical) self, strengthening the significance of a given (negative or positive) event (see Pąchalska 2019).

As Pąchalska, Kaczmarek and Kropotov (2014; 499) note, the activation of the reward/penalty systems is not indifferent to the organism, as new connections in the brain can create new neural circuits. During sleep, the resting system works, creating a pattern of neural connections that are stimulated when we rest with open eyes or sleep, and inhibited when we perform specific tasks. Hence, it enables one to combine and evaluate data coming from outside and inside the body, because it covers the posterior part of the ACC, lateral area of the prefrontal cortex. These structures have numerous connections with areas related to cognitive activities and emotional processes, therefore, the resting system is also assigned the role of a super-irrigator, which secures the coordinated action of individual brain areas. This is loosely linked with changes in the interpreter of the world (Pąchalska, Kaczmarek and Kropotov 2014). It means that the world of dreams may have a positive or negative impact on a given person. In this way, the analysis of dreams can bring us closer to knowing the essence of humanity.

## **SELF-AWARENESS OF SLEEP IN THE PROCESS OF WAKING UP**

It is important to realize that all experience is not just about experiencing objects or introspective and intentional experiencing on a waking state, but also involves consciousness in a dream, although it is fundamentally different from that of a waking person. In the domain of the limbic system, self-image exists in „limbic”

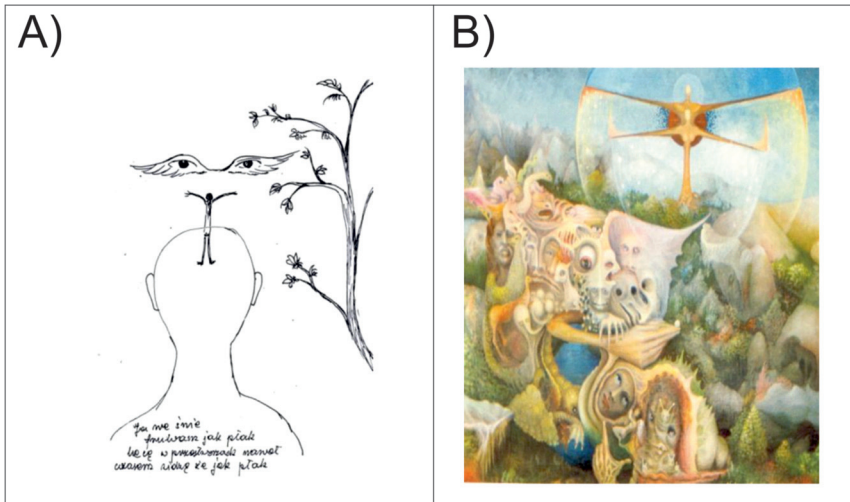


Fig. 10. Drawing (A) and painting (B) of a patient following a brain injury entitled my own self in a dream and in hallucination  
Source: Own material

time, which is fluid, cyclical. The dream self is not compatible with the self here-and-now. Self-image in a dream is verified late or not at all, e.g., in terms of appearance: age, body weight, fitness, amputation, etc. It is known from clinical practice that patients with hemiparesis or even four-limb paresis can dream that they dance, and it happens that they also dream that they are flying (cf. Fig. 10).

Brown (2015) notes that sleep and hallucinations have a lot in common because they involve changes in consciousness. According to microgenetic theory, hallucinations are classified as consciousness disorders (cf. Brown 2015). A hallmark of hallucinations is that they are more expressive than objects seen in the real world and in dreams. This is demonstrated by much clinical data, among others patient products (see Fig. 10 A and B). Hallucinations constitute a specific stage in the process of isolating perception (Grochmal-Bach and Pačhalska 2004). The occurrence of hallucinations is associated with autobiographical memory and may be the cause of delusions and false cognition, and therefore involves the modification of the self system.

*Does painting such experiences (dreams, hallucinations) strengthen or weaken connections in the brain?*

The answer to this question is not simple, although it is extremely important for designing art therapy programmes. It seems that the impact depends on the person's self system including value system, as well as the response of society, that is, reaction to the art work by the viewers of the exhibition. This problem is rather new, and requires further research (cf. Bednarek 2017; Pačhalska and Bednarek 2019).)

## MINIMAL (WORKING) SELF AND LONGITUDINAL SELF

Microgenetic theory, thanks to the interpretation of brain and mental processes in time (phylogenesis, ontogenesis and microgenesis), and in particular by defining the essence of the mental state (including creative perception) and the nature of the symptom (Brown and Pąchalska 2003; Pąchalska 2007a), creates the basis for distinguishing two basic types of self (Fig. 11) necessary for proper adaptation to the existing conditions. Therefore, we have:

1. Minimal (working) self;
2. Longitudinal self (comprehensive, autobiographical).

Attention is paid here to the importance of time in relation to the future (see: arrow), which, according to many scholars, is crucial for creating the concept of self (Brown 2000; Tulving 2002a; Pąchalska 2007c).

The minimal (working) self is a short-term specific state of mind including a working concept of self that is updated spontaneously at a given moment and in a given situation, related to both the state of the organism and the content of consciousness and self-awareness (mainly in terms of the individual and social self) (Pąchalska 2007a; 2019). It includes all information about ourselves updated in working memory at a given moment and in a given situation (see also Seeley and Miller 2005). In other words, the minimal self updates the knowledge of the individual (objective and subjective) and social (relational and collective) self. The minimal (working) self is modelled by longitudinal self.

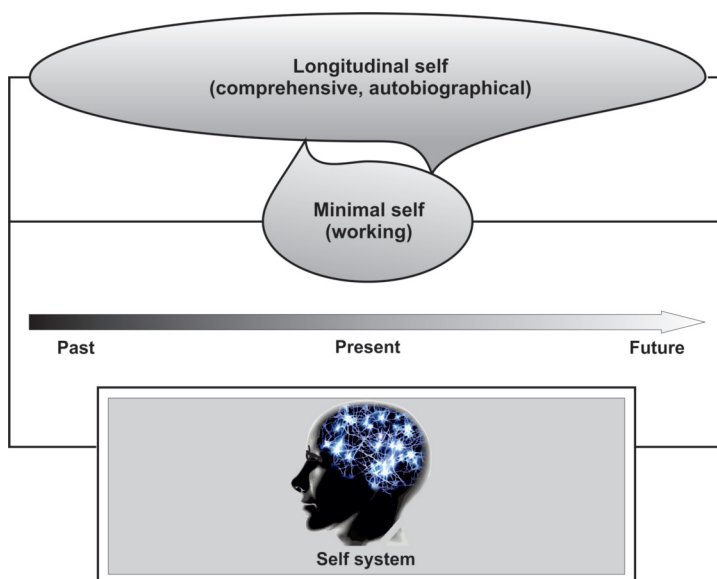


Fig. 11. Minimal (working) self in relation to the longitudinal (comprehensive, autobiographical) self. Source: Pąchalska 2019, modified

On the one hand, the minimal (working) self is associated with awareness and self-awareness (mainly in terms of the individual and social self), thanks to attention networks and cognitive and emotional processes enabling „being aware of the concept of self,” on the other - with its own longitudinal self which provides:

1. *the existence of a first-person point of view* and a sense that my sensations and experiences are mine;
2. *the perception and interpretation of internal and external reality* in relation to a given person, i.e., the knowledge that a given person possesses about their own subject, about their needs, feelings and actions, knowledge about everything that is currently happening in the mind, knowledge about what and why we are doing something.

The path of development of each personal minimal (working) self follows the path of the mental state development described above, i.e., it follows a specific order, which means that the minimal (working) self develops:

1. *in the space of brain structures*, from classified processes to the level of the threshold of consciousness (ascending mental state) to disappear (disappearance of the mental state) or to cross this threshold (development of the mental state) and rise even higher to the appearance of full consciousness and conscious cognition (climax of the mental state);
2. *in time, in the form of pulsations* of the same or other types of (minimal) self, which ensures the renewal of these states. This allows you to become more aware of reality.

The time needed to become aware of this reality may last for a relatively short period in healthy people with a properly functioning brain, while for people with brain damage due to the destabilization of neural networks, it may be more or less slower or accelerated, which in each case leads to error, and therefore to cognitive and emotional disorders (Pąchalska 2007a, Pąchalska, MacQueen and Brown 2012a).

It is worth emphasizing that even if the overall concept of self shows a certain durability, the current situation may cause its modification, while the changes resulting from this update may go back or consolidate, depending on the course of events and the assessment:

1. the organism's own condition in connection with current data enabling the organism to function at the physiological level and to satisfy the most basic needs, such as: hunger, thirst, and sexual needs;
2. social ties (with a given person or social group), seen from the perspective of the current situation. Also, these ties, even if they show some durability, may be modified as a result of the current situation, and the changes resulting from this update may reverse or consolidate, depending on the course of events and their assessment;
3. principles, norms or values seen from the perspective of the current situation. Also in this case, the current situation may modify the rules, norms and values, and the changes resulting from this update may undo or consolidate, depending on the course of events and their assessment;

4. a specific (valid at the moment) identity seen from the perspective of the current situation. In this context, it is not surprising that the main function of the minimal (working) self is to provide conditions for the formation of the longitudinal (autobiographical) self. This process takes place thanks to a short-term update of the working concept of the self seen from the perspective of the current situation.

## LONGITUDINAL SELF (AUTOBIOGRAPHICAL)

The minimal (working) self creates the basis for the process of forming the longitudinal (autobiographical) self thanks to the possibility of buffering elements of reality. At the same time, recording in the long-term memory or discarding a given update provided by the minimal (working) self from the memory takes place as a result of decisions made by the longitudinal self. This is very important due to the fact that every single brain state created in microgenesis appears on the surface only once and immediately disappears (breaks down). It is renewed in the next moment as the foundation of the next state, but not in full, because some part of this reality immediately disappears (breaks down). At T2, the state from T1 is only partially updated. This process is repeated many times until the trace of the past state disappears under the surface of consciousness, so that at the time of T3 only a small fragment of the previous whole remains. This complex process of renewing and simultaneously disappearing affects memory, as illustrated in Fig. 12. The state of the brain that appears in T1 is almost completely (with a slight vanishing) restored within milliseconds. This phenomenon provides

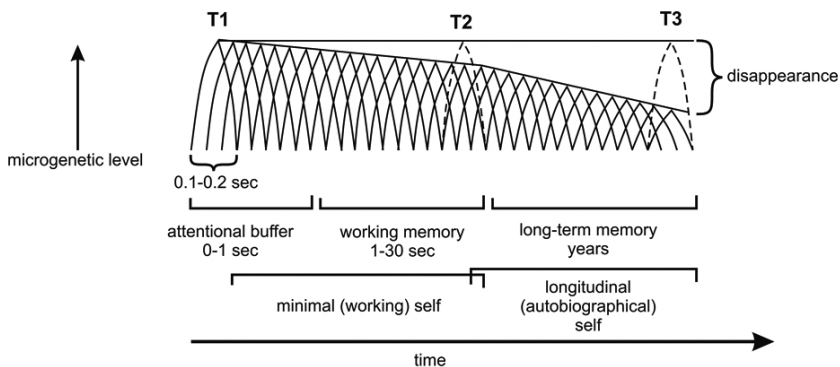


Fig. 12. Longitudinal self and buffering of reality elements to long-term memory. At the time of T2, the state of T1 has already collapsed, partly moving to working memory and retaining some of the physical features of the original perception. At the time of T3, the state with T1 no longer crosses the threshold of the conscious present, thus becoming part of long-term memory with semantic and emotional associations. The most important here is the fact that the present, or T1, emerges from long-term memory, through working and iconic memory, to perception, which means that as a result of the following disappearance (or unfinished renewal) of the state from T1, previously hidden phases appear on the surface.

Source: Pąchalska (2008), modified.

a sense of continuity of the present moment and, in principle, constitutes the basic mechanism of attention, as a so-called attentional buffer. In a few seconds there will be a greater disappearance of the state, which was renewed in T1, but it will remain as an important part of the next moments, which is what defines working memory. Over time, the trace disappears beneath the surface of consciousness, so that re-bringing it to the surface requires conscious effort, or recall, because it has been transferred to long-term memory.

In contrast to the traditional model, the original „output” is not transferred again to working memory and from there to long-term memory; the features of working and long-term memory reproduce when perception breaks down.

It follows that memory disorders that concern the past (retrospective memory), the present (working memory) and the future (prospective memory) are strongly associated with the content of consciousness and self-awareness, and therefore also with the self-system, and especially the minimal self (working) and longitudinal.

This can be observed in people with language communication disorders caused by brain damage. These people live in their own world and, for example, feel social isolation even in the most loving family. This is illustrated in Fig. 13, during which the patient showed his loneliness and a sense of deep social isolation. He introduced himself as a person praying for at least telephone contact with other people. This example shows the strong need to communicate with other people so characteristic of the human species (see Pąchalska 2007a; Kaczmarek 2012a).

The need to communicate with other people is due to the fact that man is not isolated from other monads, as George Berkeley (2011) believed, but is functioning in a very complex system of cultural connections that enable him to meet various needs, comprehensive development and condition of good well-being. Mentioned here are attitudes, various emotional attitudes, acquired knowledge and experience as well as beliefs, myths, fairy tales, sagas and other creations of



Fig. 13. Drawing of a patient after TBI experiencing deep social isolation. In the drawing, the patient wrote: God, make someone call me, please  
Source: own clinical material

culture. Wilhelm Wundt has already indicated the importance of this type of product for the mental and social functioning of man (cf. Rieber and Robinson 2001, Stachowski 2000, 2013).

## **THE MAIN TASK OF THE LONGITUDINAL (AUTOBIOGRAPHICAL) SELF**

In persons with brain damage, especially after massive brain injuries, the longitudinal self breaks down and the patient drifts in the present tense. This is evident in patients with global post-traumatic amnesia. In turn, patients awakened from a coma often not only do not remember the details of their biography, but sometimes they do not know who they are (Damasio 1999; Pąchalska 2007a). It also happens that they borrow an identity from another person, recognizing it as their own for a longer or shorter time, depending on the depth of the autobiographical memory disorder (Pąchalska, Kaczmarek, Kropotov 2014). Based on this clinical observation longitudinal (autobiographical) self has the task of:

1. *the creation and conception of self* and its change in the course of life and action;
2. *ensuring the stability of the world model* and its modification in connection with changes in connection with life events taking place in the environment;
3. *ensuring a sense of subjectivity*, i.e., the agent's own actions;
4. *ensuring a sense of identity* and its modification in connection with changes and life events taking place in the environment.

Referring to the views of various authors (Reykowski 1970; Toder and Marcia 1973; Szostak 1979; Erikson 1980; Sokolik 1993; Obuchowski 2002; Grochmal-Bach and Pąchalska 2004; Pąchalska 2007c, 2019; Oleś 2009; Gazzaniga 2012, 2013) it should be stated that for the proper functioning of one's own self system, with particular emphasis on the longitudinal (autobiographical) self, we need four undisturbed functions (cf. Fig. 14):

1. *Sense of separation of self from the environment*, i.e., the belief that I am someone other than anyone (anything) else. The self system ensures that it is separate, setting the limit for the self and not-self. This is particularly important because of the complexity of the social relationships in which we live. A sense of separateness can have two aspects: (a) physical - here belongs a sense of the limits of one's own body, (b) mental - this includes the ability to distinguish one's fantasy from reality, one's own needs and emotions from the needs and emotions of others, one's own views and those of the environment. The sense of separateness of the self cannot gain extreme intensity, because then the sense of social identity is threatened (see also Sokolik 1993).
2. *Sense of unity of my own self*, i.e., the belief that I have only one self, which means that my own self cannot be multiplied (multiple personality) and have a double. Not only the behavioural patterns of different people are usually different, each person has a different identity, memories, intelligence quotient, blood pressure, visual acuity, and sexual preferences. The feeling of having



a double is one of the more common disorders we observe in patients awakened from a long-lasting coma following TBI.

3. *Sense of self-consistency*, i.e., the feeling that we are – as a person – one integrated whole. Lack of a sense of internal consistency occurs in so-called breakdowns. This happens when, for example, a person has the impression that someone else has entered into her or when their value system has changed radically. It can also happen that this change is attributed e.g., to „the devil.” In patients who have awakened from a prolonged coma, often observed is the process of the radical decomposition of the entire axiological system, which results in internal conflicts of values.
4. *Sense of continuity of the own self*, i.e., the belief that I am still the same person despite the passage of time and despite the changes taking place in me and in the environment. In the concept of self, something like the core of the concept of self is being formed. Lack of self-continuity occurs in those who feel that they have become completely different people. This frequently happens in patients treated by us following a severe TBI (Pąchalska 2003) or after experiencing a difficult life experience (Grochmal-Bach and Pąchalska 2004).
5. *The sense of having internal content* is about experiencing your own intrapsychic or internal life. Disturbances in the sense of having internal content can be observed in clinical practice most often in patients with depression, regardless of its origin (cf. Grochmal-Bach and Pąchalska 2003). In patients with depression, a sense of internal emptiness, a lack of motives for action and a loss of feelings can be observed. The creative tension between external and internal life breaks down. In extreme cases, this fact leads to the desire of self-destruction, which is manifested in suicidal thoughts and acts.

However, we should pay attention not only to the individual, but also to the social and especially the cultural self. It should be stressed that the cultural self (including regional / local) plays a huge role in creating self-image due to connections with the world of other people (society) and culture broadly understood (including civilization). It creates a solid foundation for the emergence of the mind, i.e., consciousness, self-awareness, identity and free will (see Pąchalska, Kaczmarek and Kropotov 2014).

## **MODIFIED PROCESS IMAGE OF THE SELF SYSTEM**

The proper functioning of the self system depends on the integration and interaction of all types of self. Therefore, it is proposed to integrate the concept of self including individual (objective and subjective) and social (collective and cultural) (Jarymowicz and Szustrowa 1984; Oleś 2009; Pąchalska 2019). This concept, however should include the minimal (working) and longitudinal (autobiographical) self, which is the basis for the formation of the self system. Therefore, I have developed a modified model of the self system, which requires the nesting of the minimal (working) and longitudinal (autobiographical) Self, and a change

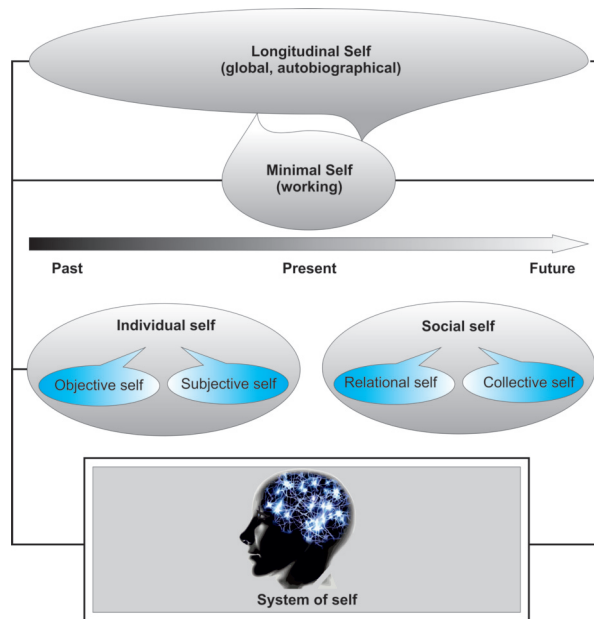


Fig. 14. Modified, process model of the self system  
Source: study by M. Pąchalska.

in understanding of the concepts of individual and social Self in terms of thought process (cf. Fig.14). Therefore:

1. The individual self includes:

- A) the objective self, understood as the organism, i.e., in Goldstein's (1995) approach, the body together with its states and processes occurring in it. The objective self has consciousness, but it lacks self-awareness and meta-consciousness (awareness of mental operations on its own subject). In Obuchowski's (1993) approach, the subject does not express their own thoughts but acts according to ready-made schemes: they are not the author of themselves. As soon as you realize the existence of the outside world, your objective self also becomes the object of perception. This process enables the subjective self to be formed;
- B) the subjective self, having consciousness, self-awareness and meta-consciousness, enabling one to know oneself and act in accordance with one's own needs and values as well as the requirements of the environment. In Obuchowski's view (op. cit.), the subjective man is the Author of Himself, who has a sense of separateness, autonomy, has insight (introspection), the possibility of self-assessment and self-control and creativity (see Pąchalska 2008). The subjective self conditions the appearance of individual identity.

2. The social self, includes:

- A) the relational self, understood as an image and description of the Me – You (interactions), from an individual and social perspective taking into

account relationships with other important people and social groups around which, according to Richard Brown (1987), social identity develops.

B) the cultural self, understood as an image and description of the Us – Them from an individual and social perspective including nesting in the culture or subculture of a given social group around which cultural identity develops.

Summing up, the modified processual approach to the self-system takes into account the concept of nesting of the minimal (working) and longitudinal (autobiographical) self in the individual and social self in the processual approach, and creates the basis for the development of the self system. It also allows for a better explanation of the disintegration or lost of this system in people with various kinds of brain damage. It also allows for more effective rehabilitation interactions to be offered to these people (see also Prigatano 2012).

## INDIVIDUAL, SOCIAL AND CULTURAL CONDITIONS OF THE SELF

The Conscious Self creates an image of itself and the world in connection with its organism and the socio-cultural arena, especially with its own social group. The organism ensures survival and development, and the socio-cultural arena provides norms and rules of social life as well as cultural values and patterns. In this discourse between different types of the individual, social and cultural self, a unique interpreter of the world is created for each person and only for them (see: Gazzaniga 2013). Its creation consists of the action of related factors (cf. Fig. 15), which include:

1. *Brains and its codes*, i.e., undisturbed electric and chemical code;

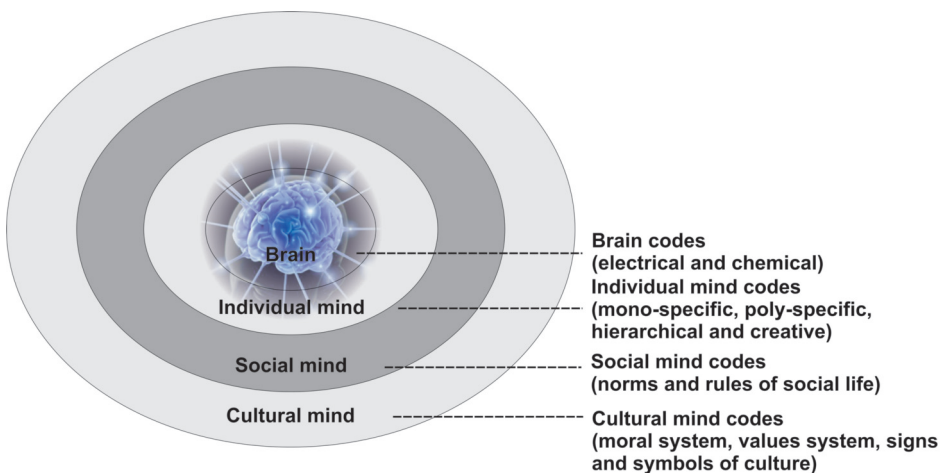


Fig. 15. Hierarchy of individual, social and cultural brain and mind codes  
Source: own study

2. *The individual mind and its codes*, i.e., mono-specific, poly-specific, hierarchical and creative codes, developing on the basis of cognitive processes (including linguistic and non-linguistic communication) and emotional processes. This ensures metacognition, self-esteem and self-regulation;
3. *The social mind and its codes*, i.e., norms and rules of social life ensuring conflict-free functioning and integration into society;
4. *Cultural mind and its codes*, i.e., recognized as its own moral systems created by nesting in a socio-cultural environment, as well as its own system of values and signs and symbols of culture.

It should be emphasized that persons with brain damage may either be under-developed, destabilized or have lost one or more of the above codes of brain and individual, social and cultural mind. This happens in the case of people with brain damage (especially to the right hemisphere), which is evident even in semantic dementia (SD) (Mendez, & Ramírez-Bermúdez 2011). The conducted neurophysiological and neuropsychological research of such patients, especially in the later period of the disease (see Pąchalska and Kropotov 2019), shows impairment of executive components. Besides an inability to recall from the episodic memory, the subject suffers from executive dysfunction. All executive components are impaired (cf. Fig.16).

In the case of my examined patient the processing in the right inferior temporal cortex was significantly delayed. Processing in the parietal cortex was significantly faster than in norms. This imbalance in timing of the processing in the dorsal and right ventral visual streams created an inability to correctly extract information from the long term episodic memory. Words lose their meaning and semantic dementia increases, and self-awareness and meta-consciousness

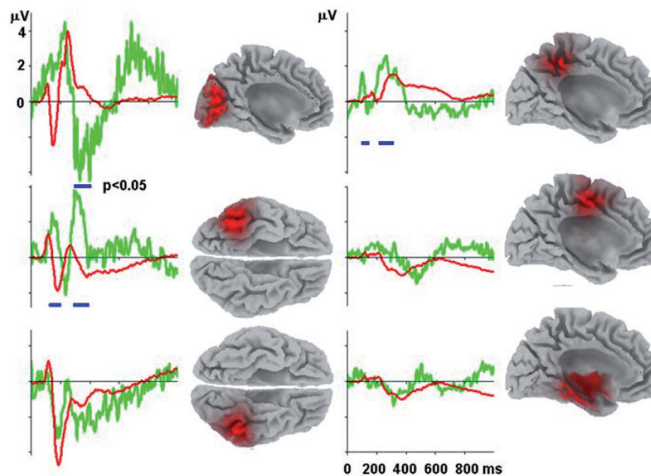


Fig. 16. Impairment of independent components in the patient: all executive components are impaired  
 Source: Pąchalska and Kropotov 2019

disorders appear. The patient lives in an unreal world and can develop delusional misidentification syndrome (DMS), with the most common Cotard syndrome, as in the case of my patient (Mendez and Ramírez-Bermúdez 2011). A closer analysis of the disorders that occur in people with SD, as the disease progresses, shows that as the neurodegenerative disease is progressing over time, both the individual, as well as social and cultural self may disintegrate.

## INDIVIDUAL, SOCIAL AND CULTURAL SELF

Individual, social and cultural self are associated with three basic self sub-systems (cf. Fig. 17):

1. *Awareness* that relates to the most frequently asked question about our identity: Who am I? In terms of civil law, this means sex, place of birth, origin, occupation, etc. This basic level of consciousness is often disturbed in the case of brain damage, as a result of which, e.g. the afflicted, after waking up from a coma, do not know who they are.
2. *Self-awareness*, i.e., awareness of myself and the state of my own mind, which mainly involves the questions: What I am like? And how do other people perceive me? Answering these questions requires a developed skill of introspection, or insight into yourself. It is also strongly associated with personality. In the cultural aspect, it is particularly important how others see us, because this fact significantly affects our self-esteem. This process reflects the popular saying that „other people are our mirror.”
3. *Meta-consciousness*, involving questions: What values do I accept? What is my place in the world? The answer to the question about recognized values determines our perception of ourselves, the world and our behaviour. In turn, the answer to the question about our place in the world has a social and cultural aspect.

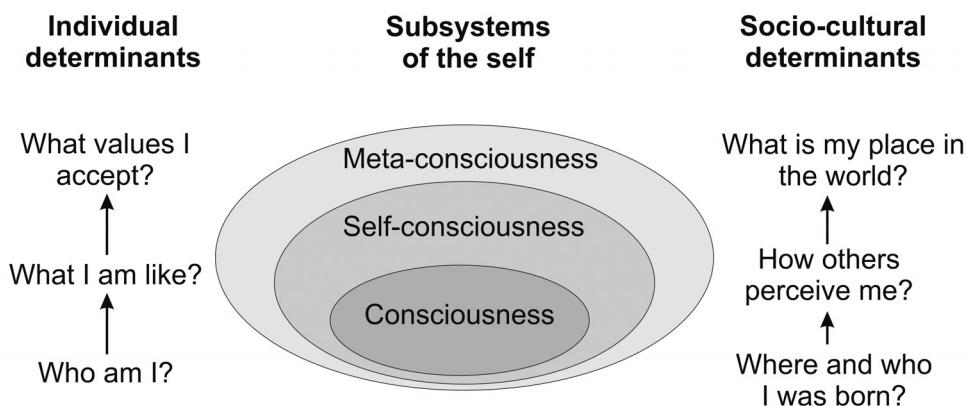


Fig. 17. Individual and cultural conditions of the self system  
Source: own elaboration

Recognized values are strongly embedded in culture and next to other cultural factors influence the shaping of our meta-consciousness. However, they can constitute a kind of self-limitation, which is manifested by various types of fundamentalism. This means that our meta-consciousness is also influenced by cultural conditions, among which should be mentioned a generational and procreative family, a group of friends, belonging to a social group, nationality, regionalism (cf. Bednarek 2016), a religion, etc. It should be emphasized that meta-consciousness is closely related to the development of the language system, which was described by Basil Bernstein (1990) with the developed code concept. In Polish, the developed code concept corresponds to the literary language (Kaczmarek 2012a).

It is worth noting, however, that the ability to use a literary language is not a sufficient condition to have a meta-consciousness. It also requires the skill of self-reflection and the actual interiorisation (internalization) of recognized values (Brown 2005). However, this is also not enough. It turns out that it is necessary to properly embed these skills in culture. As an example, as was proposed by Bednarek (2016), the renaissance of the meta-consciousness can be used by people belonging to the local / regional community affiliated to larger or smaller communities with different value systems, lifestyles etc. This author notes that no culture or even subculture of narrow groups achieves such a degree of integration or absolute compulsory culture patterns, especially in today's world. Also, contemporary regional cultures will be characterized only by a certain degree of internal integration, which will always be accompanied by some degree of openness to cultural patterns outside of its system. Therefore, going along with this way of reasoning, meta-consciousness requires both the skill of self-reflection, real interiorization (internalization) of recognized values, as well as their embedding in culture or subculture broadly understood (see also Paleczny and Talewicz-Kwiatkowska 2014).

*How to associate the organism with microgenesis of the self system formation?*

The roots of feeling in instinctual drive appear as a bias of unconscious disposition, yet the presence of choice implies the possibility of unfettered choosing, while the mitigation of will to voluntary feeling allows the allocation of irresistible impulse to measured implementation. These evolutionary and maturational trends import will to volition, and transfer action directed by drive through a decisional self. Agency occurs within the limits of the possible, occasioned by the parcellation of core categories to competing concepts, the muting of impulse to desire. It is also linked to the emergence of a self and the appearance – illusory or not – of conscious duration that unites past and present in temporal order. The changing present is positioned between the before, as past, and the after as an oncoming future.

Consistent with the concept of the parcellation of thought and perception, action also is not selected out of an array of possibilities but results from the elimination of alternatives, even when the act feels directed, it is difficult to

support a deterministic account of action as a resultant of a causal chain. Since knowledge can influence choice through the recurrence and strengthening of tendency, and since the act arises in the transition of the self to ideation, it is unlikely that decisions are forecast by causal bias. A series of mental states necessary for duration coupled with the temporal lag in perception underlie the pre-activation of decision and action. If the arousal of neural events prior to a conscious decision generates a state in which a final decision is not pre-determined, given that “unconscious thought” is creative as well as habitual, free will remains a possibility in spite of indications to the contrary. Naturally, the self is not free of personal experience, values and emotions, and the options to be considered tend to be limited, usually binary, yet within the constraints of outer conditions and inner disposition, the self can still decide and decision can influence action. Freedom is not unlimited but it does hold within a certain range. Yet it must be added that the impact of personal decision, however free and real it may be, shrinks to a trifle in contrast to the lot we are shackled to.

In this way, the self-system changing in time (4D), pulsating according to the states of mind (5D) forming different number of “bits” of information, as marked on the x axis, and linked to the duration of memories, marked on the y axis. The self system also depends on gravity (6D ), and other hyperspace dimensions not known so far in neuroscience (Kaku 1995; 2011), which is illustrated by the changing background colour on the chart, schematically illustrated in Fig. 18. Further studies are required to discover the role of these dimensions for the self system.

In sum, it should be emphasized that the proposed approach to the self system, processual in nature, explains the coherence, unity, continuity and separateness of the conscious and self-aware Self most fully. In brain damaged patients, all these

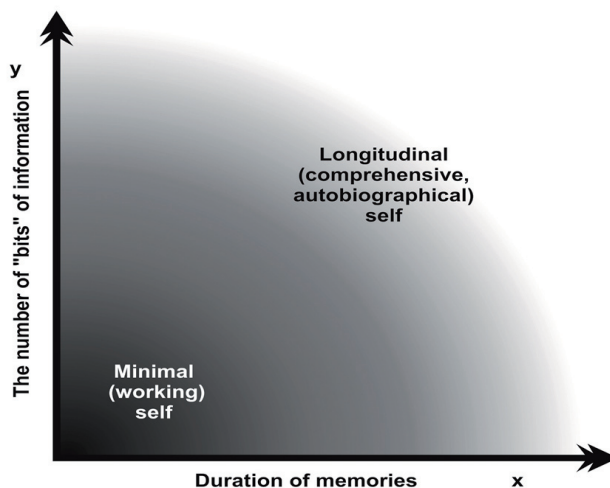


Fig. 18. The self system in hyperspatial dimensions  
Source: Pąchalska 2019, modified

features may be impaired leading to the loss and breakdown of the self (see also Grochmal-Bach and Pąchalska 2004). However, such persons may still participate, even to a minimal extent, in social life. Various rehabilitation programmes, especially those that offer group therapy, art therapy, milieu therapy, as clinical experience shows, enable the process of reintegration of the lost self, both individual and social.

It is worth remembering that the formation of the individual and social self depends on its proper and harmonious nesting in the socio-cultural environment. The fulfilment of these conditions allows not only for the development of one's self, but also the discovery of one's own place in the world and satisfactory participation in social life and cultural benefits.

Many children and adults with various types of brain damage are not so lucky, because immaturity (in children) or modifications, and even loss (in adults) of their own selves may follow. It should be expected that a closer understanding of the essence of one's own self will result in the future in the development of new, even more perfect strategies for the diagnosis and neuropsychological rehabilitation, which will reduce identity disorders and regain one's self.

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