Original Paper

Sleepwalking and Epilepsy: From a Many-Worlds Point of View

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Abstract

Counterpart theory refers to the view that the world consists of many real worlds, which are connected by quantum entanglement. Self-theory reveals the deep structure of the individual body and brain and the flow and its effects of information units in this structure. Based on these theories, this paper proposes a new interpretation of sleepwalking and epilepsy that penetrates the deep correlation between them. The paper proposes a hypothesis that the fundamental reason for sleepwalking and epilepsy is the information cycle caused by quantum entanglement. This information cycle includes the large cycle between an individual and her counterparts, and the small cycle within the individual itself. According to the new interpretation, this paper proposes a guiding evasion method.

Keywords

Sleepwalking, Epilepsy, Many-Worlds

1. Introduction

In my opinion, there are three worlds, namely, the possible world in logic, the many-world in physics, and the corresponding world in psychology. The possible world is the product of rational thinking and has nothing to do with experience, but it provides the basis and direction of empirical research. The many-world is a theoretical conjecture based on some empirical evidence in quantum physics. Its research object is matter and involves consciousness. Its research method focuses on observation and experiment. I combine these two worlds and propose a third world, i.e., the corresponding world. The world is also a conceptual framework for describing self, logically self-consistent, but related to matter and mind. This theory focuses on the explanation of psychological phenomena and shows its rationality indirectly through psychological effects.

The reason why I choose sleepwalking and epilepsy as the objects of discussion is that most people think there is no connection between the two, but I think there is a deep correlation between them, and

there is a certain symmetry in the symptoms. Traditional explanations of sleepwalking and epilepsy mainly come from neurology, molecular genetics, brain science, epidemiology, and psychology. Sleepwalking and epilepsy are regarded as two separate diseases, and there is no unified interpretation paradigm. Moreover, sleepwalking and epilepsy are traditionally studied in one-world, not from a many-worlds perspective of quantum theory. This paper holds that sleepwalking and epilepsy are a sort of special disease, a normal quantum entanglement effect among counterparts; they have some consistency in the formation mechanism, and can be explained in a processing mode. Before examining sleepwalking and epilepsy, I would like to introduce the counterpart theory and self theory, because the seizure mechanism and characteristics of sleepwalking and epilepsy are related to the identity between individuals and their counterparts, and the flow of quantum information in the self.

2. The Theories of Counterpart and Self

2.1 Counterparts among Many-Worlds

Logicians (Carnap, 1946; Hintikka, 1957; Kanger, 1957; Kripke, 1959, 1963; Montague, 1960) have proposed interpretations of quantified modal logic on which one thing is allowed to be in several worlds. They assume that there is a counterpart between an actual world and each possible world. The primitives of counterpart theory are the following postulates:

P_1: Nothing is in anything except a world

P_2: Nothing is in two worlds

P_3: Whatever is a counterpart is in a world

P_4: Whatever has a counterpart is in a world

P_5: Nothing is a counterpart of anything else in its world

P_6: Anything in a world is a counterpart of itself

P_7: Some world contains all and only actual things

P_8: Something is actual

David K. Lewis (1968) attempted to develop the counterpart theory, replacing "a (thing, world) pair" with "a thing in a world" and "a class of mutual counterparts" with "the same thing in several worlds." Moreover, Lewis argued that the counterpart relation will not, in general, be an equivalence relation, but a relation of similarity. Lewis argued the following:

The counterpart relation is our substitute for identity between things in different worlds. Where some would say that you are in several worlds, in which you have somewhat different properties and somewhat different things happen to you, I prefer to say that you are in the actual world and no other, but you have counterparts in several other worlds. Your counterparts resemble you closely in content and context in important respects. They resemble you more closely than do the other things in their worlds. But they are not really you. For each of them is in his own world, and only you are here in the actual world. (Lewis, 1968, p. 114)

The counterpart theory of the possible world provides modal logical support for the counterpart theory of many-worlds in the field of quantum physics. But the former cannot solve the sameness problem across the different worlds, not to mention the analysis of psychological phenomena. Inspired by the many-worlds interpretation in quantum theory (Rubin, 2005; Wallace, 2003) and the quantum entanglement principle (Ma, Zotter, Kofler, Ursin, Jennewein, Brukner, & Zeilinger, 2012; Megidish, Halevy, Shacham, Dvir, Dovrat, & Eisenberg, 2013), I present a new counterpart theory (Ma, 2017, 2018). In this theory, all possible worlds are transformed into the real or actual worlds, in which all individuals and their counterparts are also actual; an individual and her counterparts not only constitute a class of similarity but also have a quantum entanglement relationship between them, which is the fundamental basis for the sameness of counterparts across the different worlds. The theory of quantum entanglement means that two incoherent particles will transmit energy and information to each other and affect the structure of each other. Once the quantum entanglement is formed, they will form a special connection, which will not disappear no matter how far away they are separated. We stimulate one of them, and the other responds accordingly. One person has no counterpart in her own world but has counterparts in other different worlds showing different aspects. We regard these counterparts as one person because of the entanglement among them. From a philosophical point of view, we can assume that there is a certain kind of information exchange between entangled particles. That can be supported by quantum information theory, which is stated by Geffrey Bub (2019):

> Quantum entanglement is a physical resource, like energy, associated with the peculiar nonclassical correlations that are possible between separated quantum systems. Entanglement can be measured, transformed, and purified. A pair of quantum systems in an entangled state can be used as a quantum information channel to perform computational and cryptographic tasks that are impossible for classical systems. The general study of the information-processing capabilities of quantum systems is the subject of quantum information theory. (February 22)

An individual and her counterparts are in quantum superposition state, forming a quantum system, which is a coherent object governed by one wave function. An individual's consciousness and behavior will affect her counterparts. This is called nonlocality which is the main difference between classical and quantum physics. The nonlocality is also known as quantum entanglement. There is a quantum information channel (Note 1) to perform computational and cryptographic tasks between them. Quantum information exchange can only happen in the entanglement system, so the individual can only exchange quantum information with her counterparts, not with other people. If we see consciousness as a kind of quantum state, then the stronger the information-processing capabilities of quantum systems, the more complex and advanced consciousness will be. Not only that, we will have a profound understanding of self and its mind and behavior. The quantum effects may lead to certain intrinsic characteristics of the counterpart. I summarize these traits as counterpart rules. All individuals and the worlds where they live must obey these rules, which is determined by quantum effects.

The first is the rule of one-to-one correspondence. An individual has no counterpart in the same world but has only one counterpart in every other world. Individual i_1 in world w_1, individual i_2 in world w_2, individual i_3 in world w_3, ..., individual i_n in world w_n are all counterparts and constitute quantum system I which is "one person." The information exchange occurs only in the quantum system. We cannot talk about sleepwalking and epilepsy only in one-world, but also in quantum systems of many-worlds. When we think about why an individual has sleepwalking or epileptic symptoms, we need avoid traditional thinking and consider the impact of the counterpart's status on the individual.

The second is the difference rule, which means that a pair of counterparts always has some differences in body, thought, character, and experience. For example, individual i_1 does not know individual i'_1 in world w_1, but i_1's counterpart i_2 knows i'_1's counterpart i_2 counterpart in world w_2. An individual and all his counterparts are more likely to make similar choices, but also make completely different choices. Quantum superposition means that a quantum system can be in the superposition state of different quantum states. The famous theory of "Schrödinger's cat" has been vividly expressed as "a cat is randomly put in a state where alive and dead are both possibilities." According to this rule, it is impossible for an individual and all her counterparts to have sleepwalking or epilepsy at the same time.

The third is the convergence rule, which states that an individual and all her counterparts are, materially and spiritually, convergent. Hence, I name an individual and all her counterparts the one person, not the same person. The reason behind the convergence effect is that all creatures have a certain degree of difference and freedom, ensuring the richness and diversity of things. Again, consider the principle of quantum entanglement, which is similar to the convergence property of the second law of thermodynamics. When objects with different temperatures are put together, the energy of both sides will be transmitted, and eventually, the temperature of the two will be the same. According to this rule, we can infer that if an individual suffers from sleepwalking or epilepsy, most of her counterparts are in the same state, and her other counterparts also have this tendency.

The fourth is the limitation rule, which means the one-to-one correspondence between counterparts is not complete owing to the limitation of human beings and the world. The reasons are this: (a) the world is limited, (b) the population of individuals is limited, (c) the lifetime of an individual is limited, and (d) the number of an individual's counterparts is limited. Based on this rule, theoretically, an individual can no longer suffer from sleepwalking and epilepsy if all of her counterparts die.

Many worlds and all lives follow these rules. Based on the counterpart theory, I will present a new point of view about sleepwalking and epilepsy. The two share the same pathogenesis; the different symptoms of sleepwalking and epilepsy are due to different states and quantities of entangled counterpart system; the sudden flow of abnormal information from counterparts in self-structure is the root cause of sleepwalking and epilepsy.

2.2 The Structure of Self

Using the rule of correspondence and convergence, we can explain sleepwalking and epilepsy. Let us first examine the structure of the self of an individual. I think of self as consisting of body, brain, and

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flows of information, and, as a consequence, he divide self into ex-self (external self) and in-self (internal self), which will be depicted by the schema in Figure 1. Ex-self has different function subareas: ex-sensation (which includes perception and non-perception), ex-memory, ex-display, ex-processing, ex-operation, and body. In-self also has distinct function subareas: in-sensation (which includes reception, decryption, encryption, and emission), in-memory, in-display, in-processing, in-operation, and body. There is a common connection area between ex-self and in-self: discrimination.
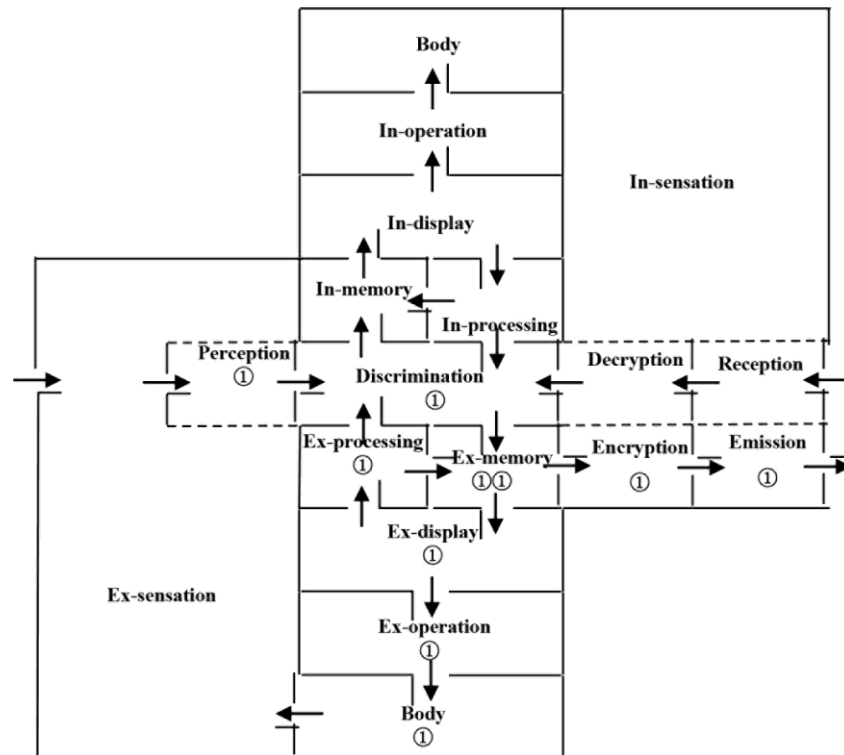
Figure 1. Self-structure: ex-self and in-self

The figure is based on Figure 3 in Ma, 2017.

The first flow in the ex-self is this:

perception→discrimination→ex-memory→ex-display→ex-operation→body→ex-sensation.

The second flow in the ex-self is this:

perception→discrimination→ex-memory→ex-processing→discrimination→ex-memory→ex-display →ex-operation→body→ex-sensation.

The third flow in the self is:

perception→discrimination→ex-memory→encryption→emission. In self-structure, there are many kinds of information flows to decide the conscious states.

The ex-sensation has two main sensory sources: (1) feelings about limb movements, such as ambulating, leaping, handshake, and the like; and the movements within the body, such as comfort, pain, anxiety, satiety, hunger, and so forth; (2) feelings about the external environment of the body,

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such as shape, size, color, sound, taste, sour, sweet, bitter, hot, hard, soft, and so on. The ex-sensation area includes the perception area and the non-perception area. A feeling generated by sensory organs constitutes a piece of information or information-unit (denoted by ① in Figure 1) in the non-perception area.

Before explaining the flow of information, we need to explain what consciousness and information-unit are. William James (1890) initially regarded consciousness as a sequence of specious moments but then believed in a continuous stream of consciousness. Alfred North Whitehead (1929, 1933) depicted consciousness as a sequence of discrete events, i.e., occasions of experience. As non-cognitive, proto-conscious events, these are part of precise physical laws not yet fully understood. Biology evolved a mechanism to orchestrate such events and to associate them with neuronal activity, leading to meaningful, cognitive, conscious moments and thence also to causal control of behavior. (Note 2) Such events are considered specifically to be moments of quantum state reduction. They need not necessarily be seen as part of current laws of the universe, but should ultimately be portrayed in science. This work is pushed forward by Penrose and Hameroff (1996, 2011), who present a theory of "orchestrated objective reduction" ("Orch OR"). In the Orch OR theory, these proto-conscious events are terminations of quantum computations (Note 3) in brain microtubules reducing by Diósi–Penrose "objective reduction" ("OR"), and having experiential qualities. According to Hameroff and Penrose (2014), "consciousness consists of discrete events at varying frequencies occurring across brain regions, for example, 40 conscious moments per second, synchronized among neurons in frontal and parietal cortex" (p. 41). Thus, we can say that an information-unit shows a discrete event or a conscious moment, and a function subarea corresponds to a brain region or a body region. In motion pictures sequential frames are perceived as continuous. Likewise the notion of consciousness as discrete events. It seems that the biological mechanism of information flow can be explained by Orch OR theory. Hameroff and Penrose (2014) state it as follows:

> An "integrate-and-fire" brain neuron, and portions of other such neurons are shown schematically with internal microtubules. In dendrites and cell body/soma involved in integration, microtubules are interrupted and of mixed polarity, interconnected by microtubule-associated proteins (MAPs) in recursive networks. Dendritic–somatic integration (with contribution from microtubule processes) can trigger axonal firings to the next synapse. Microtubules in axons are unipolar and continuous. Gap junctions synchronize dendritic membranes, and may enable entanglement and collective integration among microtubules in adjacent neurons. In Orch OR, microtubule quantum computations occur during dendritic/somatic integration, and the selected results regulate axonal firings which control behavior. (p. 42)

From this, it appears that the fact that dendritic–somatic integration can trigger axonal firings to the next synapse shows that information-units flow from one area to another, and all subareas in self seem to be microtubule (Note 4) quantum computers. Not only that, Vlatko Vedral (2018) claims that the bits

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of information are the universe's basic units, and the universe as a whole is a giant quantum computer. If consciousness is an intrinsic feature of the action of the universe, then its reflection on individuals and their counterparts is information-flow. Such information flows are generated within an individual and between an individual and her counterparts. The information flow within an individual constitutes a small cycle, while the information flow between an individual and her counterpart constitutes a large cycle. The external representation of the small cycle is the neural activity of the brain; the external representation of the large cycle is quantum entanglement. (Note 5) The neural activity and quantum entanglement discussed by the Orch OR theory are confined to the small cycle. If the theory is extended to the large cycle, the understanding of sleepwalking and epilepsy will be more in-depth.

There are many circular routes of information, which affect an individual's conscious states and behavior. For instance, there is a small circular route within a self: perception→discrimination→ex-memory→ex-display→ex-processing→discrimination→ex-memory →ex-display. This type of small circle can be used to explain why a person can remember what she once remembered, or to explain why a person can successfully recall the same event over and over again. There exist two large circular routes between the individual i_1 and her counterpart i_2:

1). (i_1) (perception→discrimination→ex-memory→encryption→emission)→

→(i_2) (reception→decryption→discrimination→in-memory→in-display→in-operation→body);

2). (i_1) (perception→discrimination→ex-memory→encryption→emission)→

→(i_2)(reception→decryption→discrimination→ex-memory→ex-display→ex-operation→body).

The first large circular route can explain why i_2 sleepwalks, and the second large circular route can show how epilepsy happens to i_2.

Let's look at how information flows within a self or between the self and her counterparts and explain the conscious state caused by the information flows. A discrete proto-conscious event triggered by the environment or body constitutes an information-unit in the ex-sensation. The information-unit (denoted by ①) flows from the non-perception area into the perception area for the first time. The individual knows what she is feeling in the perception area, but does not know what she is feeling in the non-perception area. The function of the non-perception area in ex-sensation is similar to a camera, which records information, say, a scenic spot, but cannot perceive it. Only when the information-unit flows into the perception area can the individual know what happens. Unlike a simple circuit in a camera, a brain neuron with internal microtubules in the subareas constitutes microtubule quantum computers. The function of different subareas is the result of microtubule quantum computation. According to the Orch OR doctrine, within the individual of one-world, the flow of information is accompanied by dendritic–somatic integration that triggers axonal firings to the next synapse. The information-units from the perception first flow into the discrimination area, to be identified and shunted to other areas. In general, those from the ex-sensation flow into the ex-memory area, and those from the in-sensation flow into the in-memory area. In discrimination, those from the ex-processing area sometimes flow into the in-memory and those from the in-processing area into the ex-memory.

Those in the ex-memory are cloned, each occupies a position forever. The identical one then flows into the encryption area and is encrypted there. After that, the encryptions flow into the emission area to be emitted to the individual's counterparts. Those in the ex-memory motivated by others are cloned (Note 6) and the identical ones flow into the ex-display area.

When the information-unit of event A occupies a position in the ex-memory area, the individual doesn't know the content of event A. But when the information-unit flows into the ex-display area and releases its information, the individual knows the content of event A. This is so-called "recall," or "recollection." "An individual knows event A" constitutes event B, which will be recorded in her brain, converting to a new unit with the released information. If the new event flows into the ex-processing area, then into the ex-memory (to be cloned there), and then into the ex-display and releases the information, the individual will remember her memories, that is, she will know she knows the even A. The process can recur again and again. One or two closed valves (Note 7) may prevent the information units from flowing into the ex-display; due to some problems in the brain (e.g., neuronal damage, microtubule blockage), the ex-memory may fail to clone the information unit, or the ex-processing may not connect the information unit with others. In this way, the information unit cannot or is difficult to be searched for, found, and transferred. Thus it is hard for the ex-display to release the information, resulting in forgetting.

The numerous information-units in the ex-display flow into the ex-operation area, generating enough energy to open the valve to the body and manipulate the body. Some information-units flow into the ex-processing, and then into the ex-memory for duplication. The information-unit in the ex-processing is analyzed by the microtubule quantum computer. The so-called "cognitive processes" usually refers to the process of dealing with information in that area, which manifests the difference between the higher and lower selves. The information-unit processed in the ex-processing flows into the ex-memory for storage. Some information, if needed, flows into the in-memory through discrimination.

The so-called "sixth sense" actually comes from the in-sensation. An individual's in-sensation is directly relevant to her counterparts. The in-sensation consists of four sub-areas: encryption, emission, reception, and decryption. Whenever an information-unit is stored in the ex-memory area, it will be cloned. The clone flows into the encryption area for encryption and then flows to the emission area for the counterparts. The information-unit coming from counterparts is received by the reception, and then it flows into the decryption area for decryption. After decryption, it flows into the discrimination area. In general, an individual and her counterparts can decrypt the information-unit with each other, because they are "one person." Different from the small cycle, the large cycle occurs between an individual and her counterpart. We can explain the neural activity of the brain through entanglement and collective integration among microtubules in adjacent neurons. But there is no material channel between an individual and her counterpart. Hence we'd better explain the mechanism of a large cycle by quantum entanglement.

The information-unit in the in-memory has two sources: one source is the decrypted information in the decryption, which flows, via discrimination, into the in-memory; the other source is that generating directly in the ex-sensation or discrimination, which flows into the in-memory. Once the information-units from the counterparts enter the memory area, they will be stored forever. When the valves of ex-self are closed and those of in-self are open, the information-units from the counterparts in the in-memory flow into the in-display area. When the valves of ex-self are nearly open and those of in-self are closed, the information-units from the counterparts can also flow into the in-display area and can release the information there. The external manifestation of information flow is quantum entanglement and neural discharge. The direction of information flow is not determined by the valve state, but by convergence effect and quantum entanglement. No matter if the valve is opening or closing, the information flow can pass through and manipulate the valve state.

There will be no dream if all of an individual's counterparts die, or if different counterparts of an individual have different behaviors in different environments. The identical information-units from different counterparts of an individual constitute an organized information-package. The information-units with different information cannot form an information-package. An information-package generates more energy in the brain than an information-unit. The more identical are information-units contained in an information-package, the larger the information-package is, and the more energy the information-package generates in the self. A dream appears, if and only if an information-package from different counterparts flows into the in-display area, and releases its information there. The information released is an image, sound, or emotion. Information release is accompanied by a discharge. Once the information of the package is released in the in-display area, it will not flow into the in-operation. The path of information flow to form dreams is this: reception→decryption→discrimination→in-memory→in-display. Dreams don not necessarily lead to sleepwalking. It is only in this case that sleepwalking occurs, that is, enough of the individual's counterparts have identical behavior in their identical environments. The reason for this is that the stronger the information-packet energy, the stronger the convergence effect among the counterparts. Hence the information-package cannot open the valve to the body to turn the dream into sleepwalking until the energy of the information-package is strong enough.

The ex-self does not necessarily affect all information-units in the in-self, since it sometimes perceives them in the in-display, and sometimes it doesn't. Their behaviors are recorded by the in-display and become new information-units that flow into the in-processing or in-operation. The different information-units coming from the ex-processing or counterparts in the in-display flow into the in-processing, becoming an information-pair, an information-chain, an information-group, or an information-net. During the work of in-processing, numerous information-units from the ex-processing might flow, via the discrimination, into the in-memory and in-processing. In this process, information-units in the in-processing may release the information, leading to inspiration or insight. The information-unit from counterparts might combine with others in the area, but ex-self or in-self

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cannot be aware of it. The recorded events in the area become new information-units. Some new ones flow through the discrimination, into the ex-memory, and other identical ones flow directly into the in-memory.

The super information-package in the in-operation unlocks the valve to the body and flows into the body to manipulate it. It is the super information-package in the in-operation that causes so-called "unconscious action" or "habitual action" happening under the circumstance of waking ex-consciousness or sleepwalking occurring in the case where ex-consciousness largely loses. An individual's limbs manipulated by the super information-package in her in-operation area nearly keep in step with those of her counterparts, and when these activities occur, the ex-self cannot perceive them.

The information-package containing action instructions flows, via the ex-sensation and discrimination, into the ex-memory. It is stored in the ex-memory forever even if not detected by the ex-sensation. Those in the ex-memory are cloned and flow into the encryption for encryption, and into the emission for emitting. Those not detected and recorded by the ex-sensation do not flow, from the ex-memory, into the ex-display to form memory. In the in-operation, once they open the valve to the body, the body takes such actions as sleepwalking, where the ex-self cannot intervene. In the ex-operation, once they open the valve to the body, the body takes such actions as epilepsy, where the in-self cannot intervene. If the ex-sensation fails to record the actions or the display area fails to release the information, the sleepwalker and epileptic cannot recall what happened during their incubation period.

Ex-self and in-self are two aspects of the self. Ex-self is closely related to its environment, while in-self has closer ties with its counterpart worlds. The ex-self is more active in perceiving and manipulating the body. The in-self is more passive, leading to an unconscious appearance. The ex-self can sometimes remember her last conscious moment, but cannot instantaneously perceive the behavior in the in-self. Sometimes, the more inert the ex-self is, the more active the in-self is; the more active the ex-self is, the more inert the in-self is.

An individual's ex-self and in-self are generally well coordinated. For example, the information-units in the ex-self flow into the in-self and arouse the behavior of the in-self, and those in the in-self flow into the ex-self and release their information there. There are three sorts of information circulation movements: those in the ex-self and those in the in-self; those between the ex-self and the in-self in a self; and those between an individual and her counterparts.

3. Interpretation: Sleepwalking and Epilepsy

3.1 Characteristics and Causes of Sleepwalking and Epilepsy

Neurology has different explanations for sleepwalking and epilepsy, and takes them as diseases with different natures and gives different treatment suggestions. Concerning the definition of sleepwalking and that of epilepsy, William C. Shiel Jr. (2016) states the following:

Sleepwalking, also known as somnambulism, is a behavior disorder that occurs during deep sleep and results in an individual either walking or performing complex behaviors while still asleep. Sleepwalking is more common in children than in adults and more likely to occur in people who are sleep deprived. The person may be difficult to awaken and will likely not remember anything about sleepwalking once they wake up. Sedatives tend to exacerbate rather than cure sleepwalking. The best measures are preventive: Ensure that the sleepwalker is in a safe room for walking and cannot accidentally fall through an open window or downstairs. Some types of sleepwalking are related to seizure disorders, bipolar disorders, and other neurological conditions, but most cases are transitory and due to unknown causes. (August 18) When nerve cells in the brain fire electrical impulses at a rate of up to four times higher than normal, this causes a sort of electrical storm in the brain, known as a seizure. A pattern of repeated seizures is referred to as epilepsy. Known causes include head injuries, brain tumors, lead poisoning, maldevelopment of the brain, genetic and infectious illnesses. But in fully half of cases, no cause can be found. Medication controls seizures for the majority of patients. Epilepsy is not a form of mental illness or intellectual dysfunction. Most individuals equate epilepsy with convulsions, but epileptic seizures can produce many different symptoms; two large groups of seizures are termed partial and generalized. Absence seizures produce symptoms of disconnection from surrounding stimuli; the patient appears "absent from their body" and stares off vacantly for a few seconds and then appears normal and has no memory of the incident. These types of seizures may begin about age 4 to 14; some individuals may experience many per day. (May 11)

People generally don't think that sleepwalking and epilepsy have a common formation mechanism, although it has been found that "some types of sleepwalking are related to seizure disorders." Comparing the two, it is not hard to find the following common points: (1) they are functional disorders of the brain; (2) they occur most frequently in children; (3) Sleepwalkers and epileptics have no memory of the incident; (4) drug therapy is basically ineffective and even harmful; (5) the best measure is preventive; (6) the cause remains unknown. Now that some types of sleepwalking are associated with epilepsy, we can further assume that sleepwalking has some deep relationship with epilepsy. Therefore, I infer that sleepwalking and epilepsy may have the same formation mechanism at the quantum level. Combined with the Orch OR theory, the counterpart theory, and the information-flow theory, this mechanism can be deeply explained.

The information generated by quantum entanglement from the counterparts causes sleepwalking and epilepsy. When an individual is awake, her actions are more likely to be recorded and sent to her counterparts; when she is dormant, she is more likely to receive information from her counterparts.(Note 8) In most situations, no matter what the hour of day or night, regardless of the individual's conscious states, the disorganized information-units from the counterpart will pass through the discrimination into the memory areas (including in-memory and ex-memory) and be stored and no

longer flow. But in the special situation, there are four possible flow paths of information from counterparts in the self, each path leads to different mental functions. In the dormant or sleep state, if a small information-package in the in-memory area flows into the in-display area and releases its information there, dreams will occur; if a small information-package in the ex-memory area flows into the ex-display area and releases its information, nightmares will come into being. In the awake state, if a small information-package in the in-memory area flows into the in-display area and releases the information, inspiration or epiphany will occur; if an information-unit or an information-package in the ex-memory area flows into the ex-display area and releases its information there, the memory will appear.

Sleepwalking and epilepsy occur in very special circumstances. This is related to the conscious state and the information from counterparts. Conscious states such as awake, dormant, meditation, is determined by the number and degree of valve closure in the self. This closure may be conscious or unconscious. For example, if you close your eyes, you close your visual channels; if you plug your ears, you close your hearing channels. When an information-package is very large, it will inevitably generate a great deal of energy in the individual's brain, breaking into the valve from the display area to the operation and eventually reaches the body and releases its information there. The process of releasing information emerges as an abnormal and excessive discharge of nerve cells or neurons in the brain. Drugs can affect the state of body and consciousness. For example, general anesthesia can cause many valves of the body and brain to close. In this case, sleepwalking and epilepsy will not occur. Some drugs can inhibit sleepwalking or epileptic seizures, the same is true.

3.2 How to Look at Sleepwalking?

The occurrence of sleepwalking must satisfy four basic conditions, that is, (1) the individual is in a dormant state; (2) the information-package from the individual's counterparts is very large; (3) the information package contains the information that is consistent with the individual's surroundings; (4) the route of information is this: reception→decryption→discrimination→in-memory→in-display→in-operation→body (Figure 2). Let us try to illustrate it in detail. Imagine the reception area receives an information-package (denoted by ②), which comes from a hundred different counterparts, and which flows, after decryption, into discrimination, and into the in-memory area where the information-package are stored and cloned, and then into the in-display area. Note that the energy carried by a small information-package is not enough to "break through" the valve to the in-operation area, so it has to release its information in the in-display area, leading to a dream; while the energy carried by a large information package is enough to "open" the valve to the in-operation area, so it does not release its information in the in-display area to form a dream, but enter the in-operation area to release its information and manipulate the body, resulting in sleepwalking.
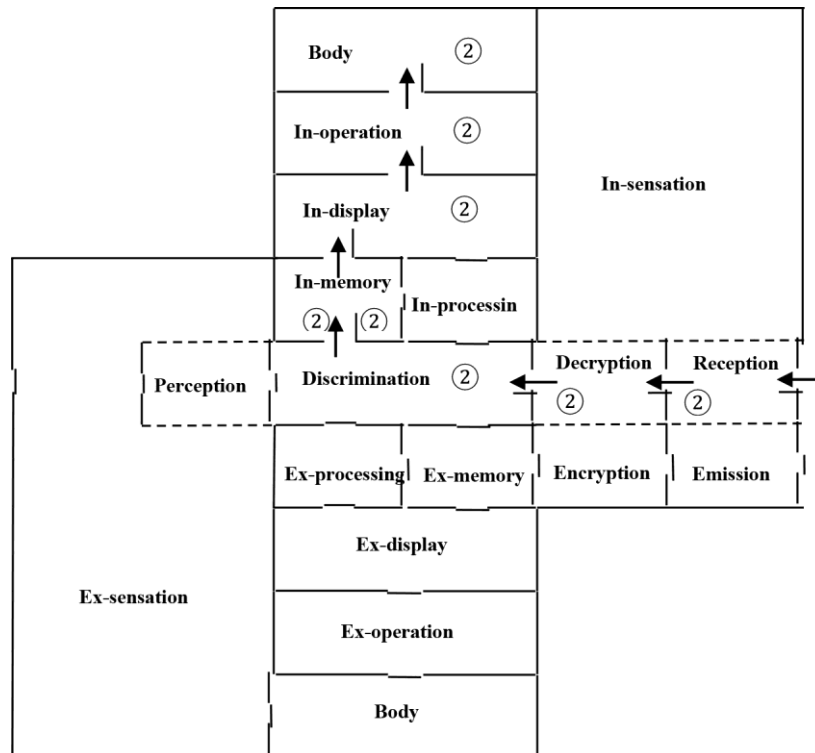
Figure 2. Sleepwalking in self.

The figure not only shows the valve states during sleepwalking but also shows the route of information-package causing sleepwalking: reception→decryption→discrimination→in-memory→in-display→in-operation→body. The figure was adapted from Ma, 2017

The sleepwalker is in a dormant state all the time. All valves in the ex-self are closing, so the external information cannot enter into the ex-sensation. At the same time, most of her counterparts are waking, and it happens that she and her counterparts' behaviors and surroundings are strikingly consistent. She is walking or performing complex behaviors during deep sleep, like a puppet manipulated behind the scenes. Her walking posture is the same as usual. Her eyes are half open or fully open, but can see nothing since her vision cannot work (its internal valve is closed). It's hard to wake her up because her hearing valve is also closed. Still, her behavior is in harmony with her surroundings. These are caused by the correspondence and convergence effect of counterpart.

According to the limitation rule and the convergence rule, the younger an individual is, the more counterparts she has, so the number of children's counterparts exceeds that of adults. And the more counterparts an individual has, the more information the individual receives. As a result, sleepwalking is more common in children than in adults. According to the convergence rule, the individual and all her counterparts should be consistent in mental states. If all or most of the individual's counterparts are awake, but the individual is dormant, then based on the quantum entanglement, the individual will be

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forced to tend to the awake state. That may explain why sleepwalking is more likely to occur in people who are sleep deprived.

When sleepwalking occurs, the information-package from the counterparts do not release information in the in-display area, but directly use energy to "break through" the valve to the in-operation area, and then manipulate the body. Sleepwalkers cannot perceive the behavior of sleepwalking, so the ex-memory fails to store the information of the behavior. Therefore, after sleepwalking, the sleepwalker cannot remember her sleepwalking experience. Moreover, her counterparts cannot receive the information from her. That's why one cannot dream of sleepwalking.

3.3 How to Understand Epilepsy?

Epilepsy and sleepwalking have a common formation mechanism, but they are different in the case of formation, physical and mental states, symptoms, and other details. The occurrence of epilepsy must meet the following basic conditions: (1) the individual is in an awake state; (2) the information package from the individual's counterparts contains a huge amount of organized information; (3) the information-package contains the information that is identical with the individual's surroundings; (4) the route of information is this: reception→decryption→discrimination→ex-memory→ex-display→ex-operation→body (Figure 3).
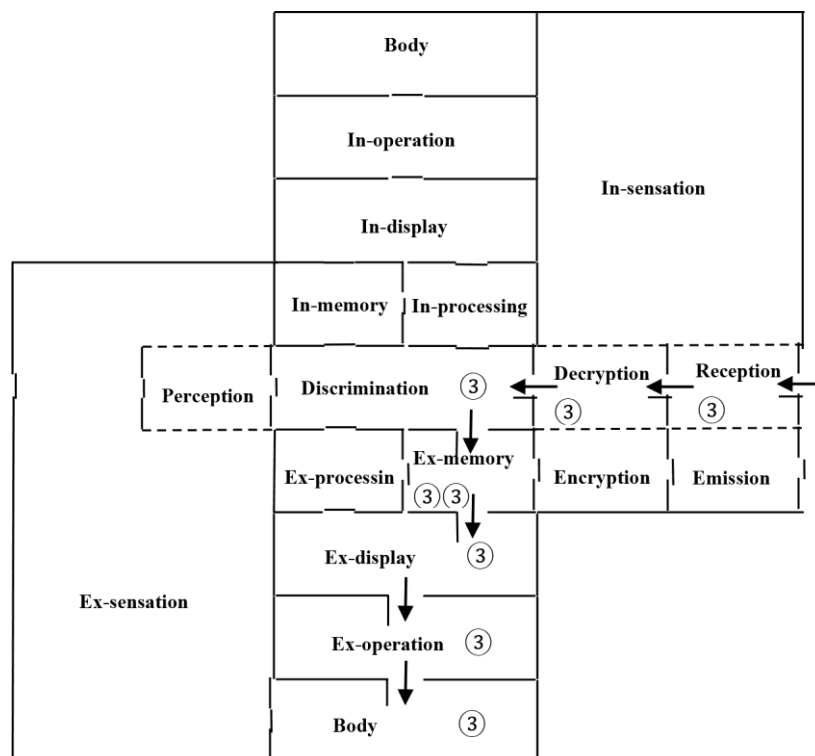
Figure 3. Epilepsy in self.

The figure shows the valve states during epilepsy and the route of the information package leading to epilepsy: reception→decryption→discrimination→ex-memory→ex-display→ex-operation→body.

Suppose an awake individual's reception area receives an information-package (denoted by ③), which comes from her one hundred counterparts, and which flows, after decryption, into discrimination, and into the ex-memory area where they are stored and cloned, and then into the ex-display area. Pay attention to distinguish the initial mental states of the individual when this type of route is generated. If the individual is dormant, the valves of the ex-self are closing, while some valves of the ex-self are opened for a large amount of energy goes through the route, the nightmare may occur instead of epilepsy. When the nightmare occurs, the information-package releases energy in the ex-display area and only a small amount of energy affects the ex-operation area and the body. Therefore, during a nightmare, the individual may feel something pressing on her body, producing a terrible cry from her. Only when the individual is naturally awake and the information-package flows into the ex-display area, and into the ex-operation and body areas to release information, can epilepsy occur. Below is an interesting description of epilepsy:

> There are many different types of seizures, and an international classification system based on various criteria has been developed to help distinguish between these. One of the main distinctions between seizure types is between partial (or focal) seizures versus generalized seizures. Partial seizures start in a circumscribed set of nerve cells (the "epileptic focus") in one hemisphere of the brain and spread from there. Generalized seizures involve both sides of the brain from the onset, although they may sometimes involve only a small part of the two hemispheres in a symmetrical manner. Most epileptic seizures last between a few seconds and a few minutes. They may be isolated, or occur in series. Repeated seizures, where one seizure cannot be separated from the next, or where consciousness is not regained between two seizures, are called "status epilepticus." This may be a life-threatening condition. (Commission on Classification and Terminology of the International League Against Epilepsy, 2003, pp. 15-16)

Roughly speaking, the ex-self and the in-self may represent two hemispheres of the brain. However, the two hemispheres are different from the "two hemispheres" we know. The fact that "partial seizures start in a circumscribed set of nerve cells (the 'epileptic focus') in one hemisphere of the brain and spread from there" could mean that information-package generates energy and releases information mainly in the ex-self area. The fact that "generalized seizures involve both sides of the brain from the onset, although they may sometimes involve only a small part of the two hemispheres in a symmetrical manner" may indicate that when epilepsy occurs, although the information-package mainly releases energy in the ex-self, the valves of in-self are also slightly opening. In brief, the type of epilepsy may be determined by the amount of information contained in the information-package and the valve states in self. The energy of quantum is discontinuous and can only be taken as an integral multiple of the basic unit of energy. The information-package from the counterparts contains a large number of identical discrete events, and its transmission is also discontinuous. Hence epilepsy involves multiple seizures of discontinuity, and the duration of each seizure is short. Status epilepticus means multiple

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information-packages go into the ex-self to generate energy and release information. This is also a form of quantum entanglement and collective integration among microtubules in adjacent neurons, and among those of counterparts.

Before the occurrence of epilepsy, the epileptic is in a conscious state. When epilepsy occurs, she is in an unconscious state; most or all of her counterparts are sleeping, and by chance, their surroundings are highly consistent. Her valves in ex-self are opening, and those in the in-self are closing, so the information-package flows into the ex-self instead of into in-self. According to the convergence rule, an individual's behavior must be consistent with her counterparts, especially when these counterparts have identical behavior. The reason why epilepsy occurs is that the awake individual is forced to enter the dormant state, which is not required by the individual itself. This process is unnatural and must be subject to some kind of resistance from the body, leading to the symptoms of epilepsy.

The symptoms of epilepsy vary from person to person, because different people's counterparts may have different conditions. Some people have a strange sensation before each seizure. Sensations may be tingling, smelling an odor that is not actually there, or emotional changes. Epileptics have a memory of this type of symptom. This indicates that when epilepsy occurs, the information-package from the counterparts flows into the ex-memory area to be cloned, and then one of the information-packages flows into the ex-display area to release part of the information. However, epileptics have no memory of other symptoms, e.g., simple staring spells, violent shaking, and loss of alertness. People in the state of epilepsy cannot perceive these symptoms of ex-self, so discrete events about these symptoms cannot form information-units to store in the ex-memory area, let alone release the information in the ex-display area.

4. Conclusion

Consciousness may be regarded as a phenomenon of complex quantum entanglement. Brain neurons, microtubules, and energy are the material prerequisites for quantum entanglement. Through the analysis of sleepwalking and epilepsy, we can understand self and consciousness more deeply. Which part of the brain corresponds to different areas of the self needs to be further explored. The fundamental reason for sleepwalking and epilepsy is the information cycle caused by quantum entanglement. This information cycle includes the large cycle between the individual and her counterparts, and the small cycle within the individual itself. The neurobiological feature of sleepwalking and epilepsy in information circulation is excessive electric discharges of the nerve cells or neurons in the brain.

The quantum entanglement satisfies the convergence and difference effect of the counterpart. An individual and all her counterparts form a set, namely, the whole-self (seen as one person). The characteristics and states of the whole-self that single-self must obey are determined by the majority of its members. If the state of the single-self is inconsistent with the whole-self, the information exchange caused by entanglement naturally forces the single-self to converge with the whole-self. When all the

valves in the in-self of the single-self are forced to open, it may lead to sleepwalking. When all the valves in the ex-self of the single-self are forced to close, it may lead to epilepsy.

Sleepwalking and epilepsy have some symmetries. The sleepwalker is naturally dormant in the outset, namely, all valves in her ex-self are naturally closing; the epileptic is naturally awake at first, namely, all valves in her ex-self are naturally opening. Most or all of the counterparts of a sleepwalker are naturally awake, while most or all of the counterparts of an epileptic are naturally dormant. Sleepwalkers are naturally dormant at first, but they are forced to wake up; epileptics are naturally awake, but they are forced to fall asleep. During sleepwalking, the information-package flows into the sleepwalker's in-sensation; during epilepsy, the information-package flows into epileptic's ex-sensation. These conditions mirror each other in their opposing transitions and sensory processing, highlighting an inverse relationship between the two states.

According to the counterpart theory, sleepwalking and epilepsy are both unconscious behaviors, because the information that leads to these behaviors comes from the patient's counterparts. We could slow down or prevent sleepwalking and seizures through conscious behavior. I would like to put forward a guiding evasion method. Based on the counterpart rules, a sleepwalker or epileptic should change up her daily routines, keeping pace with most of her counterparts, and making her surroundings different from her counterparts'. A sleepwalker should live or work active (stay awake) during the period that it is easy for him to sleepwalk, and sleep active during the period that it is not easy for him to night-walk; an epileptic should sleep active during the period that it is easy for him to suffer an epileptic fit and keep awake active during the period that it is not easy for him to have an epileptic seizure. Meanwhile, both sleepwalkers and epileptics should increase the difference between their surroundings and counterparts', e.g., adjusting the location of indoor furniture such as the bed and table, or even leaving their living environment, like moving, changing work units, and so forth.

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Notes

Note 1. Quantum cosmology holds that on a very small scale, quantum uncertainty not only makes matter and energy, but also makes space and time fluctuate between different states. These fluctuations in time and space produce wormholes, which connect one region of time and space with another remote region of time and space. It's almost impossible for us to move from one space-time region to another, because quantum effects can disrupt our constituent particles. In my opinion, although an individual can not pass through the wormhole, the quantum information of the individual and her counterparts may be transmitted through the wormhole. Focus on the connections between neurobiology and quantum mechanics, the quantum states inside one neuron could not extend to others across cellular boundaries, this leads to a speculation that there is a quantum tunneling through window-like gap junctions (which essentially fuse neurons into hyperneurons) to enable such extension.

Note 2. Most scientists in modern times are reductionists, explaining observable phenomena through invisible particles. At present, scientists' research on consciousness mainly focuses on the material characteristics of the human brain nervous system, and the most advanced research has introduced the concept of quantum. Because of the complexity of consciousness, the study of consciousness should be open to philosophy. We should make more philosophical analysis of quantum concept and introduce it into the study of consciousness.

Note 3. The basic idea of quantum computer is this. Quantum computers represent quantum information as superpositions of both 1 and 0 (qubits). While isolated from environment (in superposition) qubits interact with other qubits by nonlocal entanglement, causing computation of enormous speed and near-infinite parallelism. After the computation/interaction is performed, qubits collapse to classical bit states by measurement, outputting the information. I think Penrose and hameroff use the term quantum computation as a metaphor for the complex computational functions of brain microtubules.

Note 4. Hameroff (2006) portrayed microtubule like this: Microtubule is a cylindrical polymer of subunit proteins known as tubulin arranged in a skewed hexagonal lattice. Each tubulin can exist in two or more conformational states, e. g. open (black) or closed (white). Each tubulin state is governed by quantum-mechanical London forces—collective positions of hundreds of electrons (represented here as two electrons) in nonpolar hydrophobic regions within the protein. Because of governance by quantum forces, it is proposed that tubulins can exist in quantum superposition of both conformations (black and

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white = gray). The actual displacement in the superposition separation need only be the diameter of a carbon atom nucleus, but is illustrated here as roughly 10% of the protein volume. (p. 218)

Note 5. Just as the concept of electric current is used in physics, the "flow" of information is also a metaphor, indicating a way of information transmission. A neuron theory says information flows from an incoming axon across a chemical synapse to a dendrite or cell body of another neuron. When a postsynaptic threshold is met from accumulation of excitations (offset by inhibitions), the second neuron's axon fires and an action potential or spike is triggered at the proximal axon hillock. Mediated by sodium ion fluxes across membrane channels, spikes propagate along the axon to reach another synapse where they influence release of neurotransmitters (Hameroff, 2006, pp. 208-209). As for the transmission of information on a large scale (among many-worlds), that is the subject of quantum cosmology.

Note 6. The word "clones" used in the paper is a metaphor, which means that an information-unit is completely copied. This is a theoretical conjecture and inference. The information-unit flows from one area to another. Once it releases its function in a certain area, it means that it disappears as a state, just like electric energy is converted into light energy. If the information-unit is not cloned, we cannot explain why the information-unit releases its function repeatedly in memory area after releasing its function in other area. From the perspective of quantum theory, once an information in superposition state interacts with the classical environment (e.g., brain neuron, cell, protein), quantum superpositions reduce, collapse or decohere to particular classical states. Thus superpositioned quantum information turns to classical information, which are copied and preserved by memory cells.

Note 7. The word "valves" used in this paper is also a metaphor. Understanding the word scientifically may lead to different theoretical models. According to the Orch OR theory, consciousness occurs in dendrites of cortical neurons interconnected by gap junctions, forming Hebbian "hyperneurons." Chemical synapses and axonal spikes convey inputs to, and outputs from, conscious processes in hyperneuron dendrites. The intradendritic cytoskeleton is responsible for information processing, triggering axonal spikes and regulates synapses. I suppose the chemical synapses and axonal spikes are the "valves" that control the input and output of the information, and the intradendritic cytoskeleton are the controllers of the valves. The opening and closing of valves are sometimes unconscious and sometimes conscious. For example, closing your eyes can prevent the entry of visual photons. This is the behavior of consciously preventing the formation of information from entering through the "eyelid" valve.

Note 8. People have memories of their own experiences, most of which are obtained in a sober state. It can be inferred that there is a mechanism to retain behavioral information in human body and brain, but how this mechanism works needs further study. Based on Orch OR theory, one action (e.g., wave one's hand) selected randomly from several possible actions (a superposition state) corresponds with instant one set of tubulin states, resulting in the appropriate set of axonal spikes to execute the choice. Evidence suggests memory is hard-wired in dendritic cytoskeletal structure. (see Hameroff, 2006, pp.

238-239). One action is recorded, which means it is transformed into a special material structure (an special organizational-unit, or a special information-unit). When this structure is transferred to another organizational-unit in the memory area, it means information replication. When the organizational-unit containing this structure releases information in the ex-display area, it means recall. Moreover, this kind of conscious action influences the counterparts of the actor through entanglement, which makes the counterparts tend to take the same action (an unconscious state).