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Nonlinear Dynamical Systems and Quantum-Entropy theory in Psychology and Medicine

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Abstract
Introduction: Nonlinear dynamical systems (NDS) have proven to be valuable tools in various disciplines, such as psychology, medicine, and biology, where they offer insights into complex, non-linear behaviors. These systems often complement the Theory of Quantum Entropy Logic (TQEL), a framework used to model complex systems and predict the behavior of biological systems. NDS and TQEL are particularly effective in understanding the underlying mechanisms of psychological disorders and optimizing medical treatment protocols.
Methodology: This article examines the application of NDS in psychology and medicine, focusing on key concepts such as attractors, bifurcations, chaos theory, fractals, and self-organization. These concepts are utilized to explain complex psychological phenomena, including human behavior, emotions, and cognition. Additionally, the article explores the role of brainwave entrainment and Quantum-Entropy theory in influencing specific cognitive and consciousness states.
Results: The integration of NDS with psychological and medical research has led to novel insights into human behavior and the mechanisms underlying psychological disorders. Concepts like attractors, bifurcations, and chaos theory have been used to model human emotions, cognition, and mental states. The application of brainwave entrainment and Quantum-Entropy theory has demonstrated the potential for inducing specific cognitive states, which could have therapeutic applications.
Conclusion: Nonlinear dynamical systems, in conjunction with quantum-entropy theory, offer a promising framework for advancing the understanding of human psychology and medicine. By elucidating the complex behaviors of the mind and body, these systems provide new opportunities for developing diagnostic tools, therapeutic interventions, and personalized medicine.

Keywords: Nonlinear dynamical systems, Psychology, Brainwave entrainment, Quantum-Entropy theory, Metatron bio feed-back system

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1. Introduction

The early years of nonlinear dynamical systems (NDS) in psychology can be traced back to the influence of catastrophe theory, which was first introduced by mathematician René Thom in the 1970s. Catastrophe theory is a branch of mathematics that describes how sudden, drastic changes can occur in complex systems, often due to small perturbations or changes in initial conditions. This concept has been applied widely across various fields, including psychology, biology, physics, and economics, and its widespread conceptual applications have been documented. In the context of psychology, catastrophe theory has been used to describe how small changes in cognitive or emotional states can lead to sudden shifts in behavior or mood (Chaperon and Laudenbach,2020). A special issue of Behavioral Science published in 1978, edited by Cobb and Ragade, was dedicated to the application of nonlinear dynamical systems and catastrophe theory to psychological phenomena. This issue sparked a wave of interest and research in NDS and catastrophe theory in psychology, with many subsequent articles appearing in Behavioral Science and other journals. The subsequent articles explored the applications of these theories to various psychological phenomena, further solidifying the foundations of NDS in psychology (Cobb and Ragade, 1978; Guastello, 2017; Katerndahl,2010).

In 1990, a trio of experts from diverse disciplines - F. Abraham, a psychologist, R. Abraham, a mathematician, and Shaw, a graphic artist - came together to explore the potential applications of Nonlinear Dynamical Systems (NDS) to the realm of human psychology. This interdisciplinary team harmonized their distinct expertise to delve into the intricate and captivating world of human behavior, weaving together insights from psychology, mathematics, and art to unravel the complexities of human thought, behavior, and emotions. The parameters that define human psychology are characterized by the dynamics of attractors, bifurcations, chaos theory, fractals, and self-organization. These parameters exhibit nonlinear behavior, meaning they do not conform to predictable, linear patterns or relationships.

1.1 Dynamics of Attractors

“The team's work focused on the dynamics of attractors, which are points in a system where the motion or behavior tends to converge or a region or shape to which points are “pulled” as the result of a process that displays sensitive dependence on initial conditions”. In psychology, attractors refer to the hypothetical entities that shape an individual's behavior, emotions, and thoughts. They explored how these attractors can be stable, unstable, or even chaotic, and how these patterns can be observed in various aspects of human behavior. The concept of attractors is borrowed from chaos theory, which studies the behavior of complex systems that exhibit unpredictable patterns. In psychology, attractors are thought to be stable points or patterns that attract and maintain a system's behavior, making it more likely to converge towards those patterns. Attraction in this context means the process by which things come together or settle into a stable pattern. Imagine you're playing with a bunch of balls on a trampoline. As they bounce around, they'll eventually start to settle into a specific pattern, like a spiral or a circle. That's kind of like attraction. Attractors are components of nonlinear dynamic systems, with each attractor state representing a specific cell type. Transitions between these states reflect changes in cellular phenotypes over time, including healthy, cancerous, metastatic, or drug-resistant states (Abraham, 2022; Guastello, 2001; Boyatzis et al. 2015; Boyatzis & Dhar,2023; Nuri, 2024).

1.2 Concept of Bifurcations

This group also delved into the concept of bifurcations, which occur when a parameter is varied and changes the behavior of a system. Scientists examined how these changes can manifest in human behavior, cognition, and emotions, and how they can be used to understand complex psychological phenomena. Bifurcation refers to a sudden, dramatic change in the behavior of a system (Physical, Biological and Psychological) when a small change is made to its conditions or parameters. In the context of chaos theory, bifurcations occur when a system's parameters are tweaked, and the system's behavior changes drastically. In biological systems, bifurcations can occur in response to changes in environment, diet, or other factors. In psychological systems bifurcations can manifest as sudden changes in mood, behavior, or cognitive patterns. For instance: A person might experience a sudden mood shift from calm to anxious after receiving bad news or a person might suddenly develop a new habit or obsession after experiencing a significant event (Guastello,2001; Kostromina and Grishina, 2023; Boyatzis & Dhar,2023).

1.3 Concept of Chaos

Beyond attractors and bifurcations, researchers delved into the concept of chaos, which is marked by unpredictable behavior and complex patterns. Chaos theory offers insights into human behavior, particularly in situations where uncertainty and randomness prevail. Chaos theory categorizes humans as complex, adaptive, and non-isolated systems and therefore can explain how humans grow and change in a non-linear fashion. Chaos is characterized by three key features: unpredictability, sensitivity to initial conditions, and complexity. Unpredictability is a hallmark of chaos: the outcome is difficult or impossible to predict, even with complete knowledge of the initial conditions. Additionally, chaos exhibits sensitivity to initial conditions, meaning that small changes in the starting point can lead to drastically different outcomes. Optimal cellular homeostasis is critical for maintaining health and avoiding diseases influenced by initial statue of different intrinsic factors (sex, age, genetic makeup, metabolites, hormones, mediators),

extrinsic factors (nutrition, environment agents), as well as host/environment interaction, that together modify the risk for developing various somatic and psychological diseases. Furthermore, complexity arises from the interplay of many interacting variables, which contribute to the chaotic behavior (Guastello,2001; Kincanon and Powel, 1995; Galatzer-Levy, 2016; Yiheng et al.,2018; Vincenzina et al.,2015).

1.4 Fractals

Building on this foundation, researchers drew on the concept of fractals, geometric shapes that exhibit self-similarity at different scales. Fractals are ubiquitous in both microscopic and global structures found in natural environments, featuring self-similar components that repeat at varying size scales. This repetition of patterns within patterns is a hallmark of fractals, which can be observed at the quantum level, in natural landscapes like coastlines and fault lines, and even in intricate structures like snowflakes. The self-similarity of fractals means that the pattern of the whole is reflected in the pattern of its parts. In fact, our brains are themselves fractal systems, with our minds serving as the complex, non-linear branches of these systems. Despite being exposed to various challenges, these systems maintain their coherence and coherence, striking a balance between order and chaos. The concept of fractal dimension applies to cognition, suggesting that the human brain's cognitive processes exhibit fractal properties. This means that certain patterns of cognitive activity, such as visual perception, memory, language, or problem-solving, can be described using mathematical concepts like fractal dimension. By modeling complex psychological phenomena like human development and cognition using fractals, researchers demonstrated the potential for fractals to illuminate these processes. Fractals are robust indicators of complexity and chaos, as systems with fractal architecture can withstand environmental changes. Many physiological and pathological processes follow nonlinear power laws, though they differ in their order parameters and fractal characteristics (Guastello,2001; Cerasa, 2024; Díaz et al, 2024; Nuri, 2024).

1.5 Self-organization

Finally, scientists also explored the concept of self-organization, which refers to the ability of systems to adapt and change without external direction or control. They investigated how self-organization can be applied to understand human behavior and development, particularly in situations where individuals must adapt to changing environments. Human nature can change significantly over time. Change is essential for adaptation and sustainability. Desired structural and functional changes can occur at any level of the human organism, from atoms to organs. Living systems are complex, open, self-organizing entities that interact with their environment, maintained by the flow of information, energy, and matter. This fascinating phenomenon is a fundamental concept in psychology, describing the inherent ability of complex systems, such as the human mind, to spontaneously reorganize and arrange themselves without conscious control. Self-organization is not limited to internal psychological processes, but also engages with larger social systems to establish a new homeostatic balance in response to changing circumstances. This process involves complex systems comprising numerous living and non-living entities, which operate within a larger meta-system and, in turn, are part of an even larger meta-meta system. This hierarchical structure can be extended indefinitely. When systems encounter contaminants or interference, they respond through feedback loops that signal disruptions and motivate changes within the system to adapt and integrate. Self-organization plays a crucial role in complex systems by creating a sense of order, cohesion, and stability over time. In complex biological systems, internal relationships foster self-organization, while external relationships permit self-adaptation (Guastello,2001; Goldstein, 1997; Kaplan and Kaplan, 1991; Janecka, 2007; Boyatzis and Dhar, 2023).

2. The Complexity of Perception

A prevalent view holds that perception begins with sensory input to the sensory cortex, followed by processing in the visual association cortex to ultimately achieve a complete understanding. However, psychological studies on perception have revealed that memory plays a significant role in the perceptual process, influencing both current expectations and past perceptual experiences to organize sensory data into meaningful percepts. The process of perception is not fully conscious. The scientific community's efforts were ultimately rewarded with conclusive evidence for the existence of supersensory, or intuitive perception, which revealed that all individuals have the potential to possess such abilities. Extrasensory perception (ESP), also known as a sixth sense, or cryptaesthesia, is a claimed paranormal ability pertaining to reception of information not gained through the recognized physical senses, but sensed with the mind. Furthermore, these abilities can be enhanced through training, and more recently, significant advancements have been made possible through the use of specialized electronic equipment. It was found that the phenomenon of intuitive perception can be explained by materialistic concepts, remaining within the framework of established scientific laws. However, understanding this ability to perceive distant or hidden stimuli without relying on normal sensory processes required expertise in disciplines such as neurophysiology, information theory, and quantum theory (Luu et al., 2010; Shepard, 1984; Bowers et al., 1990; Aerts,2014). A major challenge in utilizing parapsychological phenomena in widespread practice is the low sensitivity associated with them. To overcome this limitation, various methods are employed to

induce a specific bioelectrical activity in the brain, thereby enabling individuals to successfully manifest their paranormal abilities related to intuitive perception (Escolà-Gascón, 2020).

3. Binaural Beats

In 1975, R. Monroe patented a method for inducing a paranormal state in the human brain through the use of stereo sounds, which were played simultaneously in the right and left ears of the subject with a frequency difference of 4-7 Hz. Robert Monroe, founder of the Monroe Institute of Applied Sciences, also explored binaural beats. Through thousands of experiments using an electroencephalography (EEG) machine to monitor subjects' brain wave patterns, Monroe found that he could effectively entrain brain wave patterns using binaural beats. Notably, he observed that the response did not occur solely in the auditory region of the brain, nor did it occur in one hemisphere or the other exclusively. Instead, the entire brain resonated, with both hemispheres exhibiting identical frequencies, amplitude, phase, and coherence in their waveforms. According to some researchers, when you listen to certain binaural beats, they can increase the strength of certain brain waves. This can increase or hold back different brain functions that control thinking and feeling. Specifically, studies have consistently demonstrated that listening to binaural beats can increase alpha brain wave activity (8-12 Hz), which is associated with relaxation, reduced cortical activity, and increased feelings of calmness and focus. Binaural beats have also been shown to induce theta brain wave activity (4-8 Hz), which is linked to states of deep relaxation, meditation, and increased creativity. Research has further found that binaural beats can affect beta brain wave activity (13-30 Hz), which is associated with attention, concentration, and mental processing. By increasing or decreasing these brain waves, binaural beats can potentially influence various aspects of cognition and behavior, including mood, attention, emotional processing, and cognitive processing. It is essential to note that individual results may vary depending on factors such as the specific type of binaural beats used, individual differences in brain function and response to auditory stimulation, and the context in which the binaural beats are listened to. Nevertheless, the existing evidence suggests that binaural beats can be a valuable tool for promoting relaxation, improving cognitive function, and enhancing overall well-being (Zainul Abadin et al., 2021; Corona-González et al.,2021).

4. Brainwave Entrainment

Brainwave Entrainment is a method based on the discovery that brainwaves vibrate at different speeds depending on the state of consciousness and the brain capacity to adapt to given frequencies. Brainwave entrainment is a technique that involves using rhythmic stimuli to induce a frequency-following response in brainwaves, which means that the brain's electrical activity patterns (brainwaves) synchronize with the frequency of the stimulus. This can be achieved through various sensory modalities such as visual (flashing lights), auditory (pulsating tones), tactile (vibrating subwoofers) electromagnetic fields or music (Tang et al., 2014; Teplan et al., 2006; Siever, 2015).

Brainwaves are categorized into frequency bands, each linked to specific states of consciousness: Beta (13-30 Hz, associated with attention/concentration and mental activity), Alpha (8-12 Hz, relaxation/reduced cortical activity), Theta (4-8 Hz, light sleep/ increased creativity and memory storage), Delta (0.5-4 Hz, deep sleep/unconsciousness), and Gamma (30-100 Hz, higher-level cognitive processing/attention). By using external stimuli such as light impulses, electromagnetic fields, or music, brainwave entrainment aims to influence the frequency and amplitude of brainwaves to achieve specific states of consciousness or cognitive states. For example, alpha waves (8-12 Hz) induce relaxation and reduce stress, beta waves (13-30 Hz) increase focus and concentration, and theta waves (4-8 Hz) promote a meditative state. The idea is that by exposing the brain to these specific frequencies, one can manipulate the brain's natural electrical activity to achieve specific states of consciousness or cognitive states (Attar, 2022; Kumar and Bhuvaneswari, 2012; Posada-Quintero et al., 2019).

Some scientists proposed the use of a weak alternating magnetic field resonant with the theta rhythm of the brain, in combination with light and sound stimuli, to enhance suprasensory perception. Research has demonstrated that when the cerebral hemispheres are stimulated by a magneto-light-sound impulse, they can become a source of new thinking and knowledge. Interestingly, studies have shown that various animals, including humans, possess the ability to perceive and respond to magnetic fields, suggesting a potential connection between the brain's internal states and the external environment (Hosseini, 2021; Achterberg et al., 2005; Agnati et al., 2018; Cashmore et al., 1999; Faisal et al., 2008).

5. Extra-sensory Perception

Many people believe in the existence of extra-sensory perception (ESP), which refers to the ability to perceive or experience things that are not detectable by the five traditional senses. Examples of ESP include mind reading, sensing trouble from a distant friend, predicting the future, and other phenomena that have been described in various forms of entertainment and folklore. ESP can take many forms, such as telepathy (reading minds), psychokinesis (moving objects without touching them), precognition (predicting future events), psychometry (reading past events from an object), or dowsing (locating hidden objects or water using a special rod). However, these phenomena do not conform to established scientific principles and have been met with skepticism by the scientific

community. Despite attempts to study and verify ESP, most attempts have been unsuccessful. In fact, a recent study by Daryl Bem was met with criticism and failure to replicate his findings. As a result, ESP is often considered pseudoscientific. However, research has shown that people's beliefs about ESP can be measured and conceptualized as a distinct set of paranormal beliefs (Branković, 2019; Tobacyk, 2004; Bem, 2011).

6. Quantum-Entropy theory

The Theory of Quantum Entropy Logic (TQEL) is a theoretical framework that attempts to explain the fundamental nature of information processing and exchange in the human brain, particularly in the context of consciousness and cognition. TQEL is a mathematical framework that describes the behavior of information in a system based on the principles of quantum mechanics. In classical systems, information is treated as a discrete quantity, whereas in TQEL, information is viewed as a continuous, entropy-based process. This process is thought to be mediated by microtubules, which are structural components of neurons that are also capable of quantum computing. According to TQEL, the brain's information processing is based on a continuous flow of quantum entanglements between neurons. This entanglement gives rise to the emergence of consciousness, which is seen as a fundamental aspect of the human experience.

Professor T. Van Hoven of Amsterdam has proposed a theory of Quantum Entropy Logic, which mathematically demonstrates that the destruction of material structures can lead to a significant expansion of information channels between systems. This, in turn, can increase the effect of supersensible perception. According to Van Hoven's theory, the destruction of material structures allows for a fundamental shift in how information is exchanged between systems. He has formulated this idea as the principle of his theory: "By knowing, I destroy; and by destroying, I know. "In essence, Van Hoven's theory suggests that the act of gaining knowledge is closely tied to the destruction of physical structures, and that this process can lead to a deeper understanding of the world around us. Theodore van Hoven proposed a hypothesis that initiated a true revolution in natural science. The essence of his hypothesis lies in the following: a magnitude of organization loss in a material system interacting with electromagnetic radiation cannot take on arbitrary or zero values. Instead, the density of entropy field for elementary systems must be equal to an integer multiple of the system's energy. By doing so, van Hoven established a connection between the degree of system destruction and the maximum amount of energy that can be radiated or absorbed by the system (Hoven, 1972; Hoven and Bars, 1988; Lazarev et al., 2023). The theory of entropic logic is founded upon a diverse range of knowledge, principles, axioms, and postulates from various modern scientific disciplines, including information theory, quantum mechanics, thermodynamics, relativity theory, philosophy, psychology, sociology, ecology, catastrophe theory, and other fields.

Since 1988, Theodore van Hoven, a scientist known for his development of the physical theory of psychointeractions, has led a program at the National Aeronautics and Space Administration (NASA) and the Pentagon to develop electronic devices capable of intentionally altering consciousness and producing reproducible psychophysical effects, including the contactless acquisition of information from distant objects. The majority of these experiments took place at the Stanford Research Institute (SRI), a leading laboratory focused on studying paranormal phenomena. The experiments resulted in the creation of equipment that functions on the principle of initiating signal multiplication upon breaking up metastable states. This technology, along with similar designs, came to be known as "brain machines". Interestingly, a similar device or “metatrons” was developed independently by Soviet scientists Svyatoslav Nesterov, Vladimir Igorevich Nesterov and A. Akimov around the same time, without knowledge of Van Hoven's work. In quantum entropic logic, information plays a special role. At the quantum level, systems can exist in a nonlinear state, where an object can be considered virtual, meaning it lacks matter, physical fields, and cannot be described using classical physics' quantitative values. However, this object can be described using quantum entropic logic. The measurement of information (entropy) in entropic logic is based on the concept of entropic potential. For a detailed explanation of how to do this, see T. Van Hoven's article published in Physics Today magazine in 1972. The Quantum Entropic Logic theory does not distinguish between information and entropy, instead linking them directly to energy. Changes in information (entropy) are accompanied by changes in energy, and information exchange is directly related to energy exchange (Nesterov, 2011; Nesterov,2012; Ebrahimi et al., 2017). According to the Theory of Quantum Entropy Logic, information exchange in any system occurs distantly, associatively, and selectively due to quanta of electromagnetic radiation that have energy equivalent to the energy required to break down the bonds of the system's elementary structure. Specifically, certain types of electromagnetic radiation (like light or radio waves) have a specific amount of energy that is strong enough to break apart the tiny building blocks of a system. Think of it like a lock and key. The "system's elementary structure" is like a lock, and the "quanta of electromagnetic radiation" is like a key. The energy of the radiation is like the strength needed to turn the key and open the lock. For instance, a double bond typically consists of both a sigma (σ) bond and a pi (π) bond. When a photon is absorbed, promoting an electron from a π bonding orbital to a π^* anti-bonding orbital, it leads to the disruption of the original pi bond (Ashfold et al., 2009; Galue et al., 2016).

7. Non-linear Methods in Medicine

Studies in the field of psychotronics, including these and others, have enabled the development of devices that can switch a person's normal perception of sensory, interpersonal, and psychological reactions. With the aid of this equipment, researchers are able to intentionally expand the realm of the subconscious, allowing for controlled access to the vast repository of information stored there, which contains a wealth of knowledge about the surrounding world. The barrier between the conscious mind and the subconscious sphere, previously thought to be impermeable, is effectively breached.

Our subconscious mind is constantly receiving information from the surrounding world, often without our conscious awareness, including details from people and objects whose current location we are interested in knowing, as well as physical objects whose potential for destruction we are attempting to assess. Nonlinear analysis systems (NLS) are founded on the study of the magnetic fields that surround living organisms. The magnetic field has a crucial role in facilitating information transfer and enabling the interaction of biological systems with their external environment. When developing this equipment, one exploited the fact that biological systems possess an electromagnetic information framework that can respond to the influence of extremely weak external fields.

According to the theory of quantum entropy logic, information exchange between systems occurs distally, associatively, and selectively because quanta of electromagnetic radiation possess sufficient energy to disrupt the connections between the elementary structures of the system. According to the principles of entropy logic, unstable (metastable) states arise in biological systems during information exchange. When molecular currents in the brain are exposed to an external magnetic field, their magnetic moments lose their original orientation, causing the spin structures of delocalized electrons at impurity centers in nerve cells to become disordered.

This disorder leads to the emergence of unstable metastable states in the nerve cells, which decay and amplify the initiating signal (Nesterov, 2011; Ebrahimi et al., 2017; Nakonecný and Rejdák, 1976; Kahuda, 1976; Woods, 1976; Perlovsky and Ilin, 2012; Perlovsky, 2009; Perlovsky, 2012; Vigani et al., 2021; Maffei, 2022; Zadeh-Haghighi and Simon, 2022). Nonlinear performance is frequently observed in human systems due to their inherently complex and dynamic nature, which cannot be accurately captured by linear models. Over the past century, non-linear thinking has gained increasing acceptance among physiologists and physicians, and non-linear system theories are now being applied to help interpret, explain, and predict biological phenomena.

Research on the application of non-linear methods in medicine is an active and rapidly evolving field, with new applications emerging regularly. For instance, techniques such as chaos theory-based analysis, fractal analysis of electrocardiogram signals, non-linear analysis of electroencephalogram signals, machine learning-based non-linear regression analysis, spectral entropy Analysis, non-linear filtering techniques for signal processing and non-linear dynamics-based predictive modeling of chronic diseases are just a few examples of the numerous medical diagnostic systems that utilize non-linear approaches to improve disease diagnosis and treatment (Nesterov,2011; Higginsa, 2002; Philippe and Mansi, 1998; Naghsh et al., 2020; Aboghazalah et al., 2024; Shekatkar et al., 2017; Wei et al., 2024; Onder and Adem, 2022; Helakari et al., 2019; Ebrahimi et al., 2017).

7.1 Three-dimensional (3D) NLS (Non-Linear System) Biofeedback System ‘Metatron’

A The three-dimensional (3D) NLS (Non-Linear System) biofeedback system, "Metatron", is a medical technology that utilizes the non-linear resonance principles of the NLS method, employing electronic oscillators that resonate at specific frequencies of electromagnetic radiation and spectral entropy analysis to enable the analysis of complex biological systems at various levels of structural organization.

Entropy is a fundamental concept that permeates various aspects of our daily lives, initially emerging in the realm of thermodynamics and later becoming a central idea in information theory. At its core, entropy measures the balance between order and disorder, specifically in relation to the quantity of usable information or energy. In physical systems, the distinction between order and disorder, or randomness, is crucial. As a system loses energy and information to its surroundings, it becomes less organized and more disordered. Scientists utilize the concept of entropy to quantify the level of randomness or disorder within a system, which is reflected in the disarray of molecules and the loss of energy and information.

Living systems, such as the human organism and its cellular machinery, are considered open and dynamic thermodynamic systems. In these systems, energy and information flow are not static, but rather dynamic and chaotic. Non-equilibrium biological or physical systems are driven by fluctuations in intensive thermodynamic variables, leading to the movement of matter, energy, and information throughout the system.

Given that entropy and entropy-related factors change with time, energy, and information, it is logical to apply the concept of entropy to developmental and physiological processes within the system, including cellular differentiation, cellular growth, morphogenesis, and aging.

Furthermore, the concept of psychological entropy has been used to describe the uncertainty and disorder in an individual's mental state. This idea highlights the intricate relationship between entropy and human experience, underscoring the complex interplay

between internal and external factors that shape our perceptions, emotions, and behaviors.

The Metatron bio feedback system is capable of examining both physical and biological properties of a system, identifying the essential factors necessary for maintaining stability and health. Moreover, the Metatron system can analyze biological systems at multiple levels (molecular, cellular, tissue, organ, etc.) and reveal the intricate relationships between these levels, providing a comprehensive understanding of the system's dynamics.

The Metatron system's advanced hardware and software capabilities enable researchers to induce specific brain activity patterns in neurons, amplify and extract signals that would otherwise be masked by background noise, and decipher the information encoded within them. By employing computer-based theoretical calculations, the Metatron system analyzes the complexity and disorder of biological systems (entropy potential) and the unique electromagnetic signals they emit (electromagnetic radiation spectra). This innovative approach has the potential to facilitate more accurate diagnoses and a deeper understanding of complex biological systems, as well as the development of novel treatments and therapies. The Metatron apparatus can direct electromagnetic radiation spectra back to their origin, allowing for:

• Signal deciphering: the Metatron system can interpret and decode the meaning of electromagnetic radiation signals, potentially identifying patterns, frequencies, and intensities that correspond to specific biological processes or functions.

• Real-time data recording and visualization: the decoded signals are then recorded and displayed on the computer screen in real-time, enabling researchers to visualize and analyze the data at their disposal.

The Metatron system's virtual model creates a detailed, comprehensive map of the electromagnetic activity within the human organism, providing a unique "electromagnetic fingerprint" or "biomarker" for each biological system. This biomarker can be used to detect changes or anomalies that may indicate disease or dysfunction. By analyzing these changes over time, researchers and physicians can monitor the progression of pathological processes and predict their outcome. To pinpoint the root cause of destruction with precision, operators navigate through fractal images on the screen, identifying the source with accuracy.

The Metatron's non-linear diagnostic method, implemented as a 3D NLS (Non-Linear System) biofeedback system, operates by transmitting non-invasive electromagnetic signals of varying wavelengths to facilitate biofeedback communication between the patient and the hardware computer module. This process enables the creation of a biofeedback loop, in which a highly sensitive receiver, equipped with a noise generator (trigger-receiver unit) based on a radio element, detects the patient's brain wave response to an external stimulus and transmits a digital signal back to the hardware computer module. The primary function of the trigger-receiver unit is to perceive the patient's reaction to vibrational codes supplied by the processor, convert it into a digital signal, and send it back to the processor for analysis. The received information is processed in a computer using programs developed on the basis of theoretical and experimental research conducted by. Prof Vladimir Nestrov and his team at Institute of Practical Psychophysics (IPP).

Metatron is a non-invasive safe, quick, personalized, and economical method of detecting various wave patterns in the human body. Chronic diseases can be screened along with their biochemical parameters & therapeutic effects of any treatments can be evaluated using the Metatron method. NLS biofeedback Metatron system saves both the patient's and the health care provider time and the cost of the diagnostic procedure and treatment. Furthermore, due to its fast and advantageous characteristics, it can streamline the workflow of hospitals and clinics.

The brain is a complex, dynamic system that exhibits non-linearity at multiple levels of analysis. Understanding its non-linear dynamics is crucial for grasping the intricacies of brain function. Dynamical neuroscience explores the non-linear dynamics of the brain at various scales, from individual neural cells to cognitive processes, sleep states, and the behavior of neurons in large-scale simulations and psychology. Recent advancements in the experimental physics of complex systems, such as chaos control, non-linear analysis, and spectral entropy analysis, can provide powerful new analytical tools and insights into the dynamics of neural systems (Nesterov,2012; Ebrahimi et al.,2017; McKenna et al., 1994; Nozari et al., 2024; Hirsh et al., 2012; Haozhe and Lei, 2024; Bienertová-Vašků et al., 2016).

8. Conclusion

In conclusion, the applications of Non-linear Dynamical Systems in psychology and medicine offer a new paradigm for understanding complex phenomena in both fields. By exploring the concepts of attractors, bifurcations, chaos theory, fractals, and self-organization, researchers can gain insight into human behavior, emotions, and cognition. The use of brainwave entrainment has shown promising results in inducing specific states of consciousness and cognitive states. Additionally, the study of nonlinear systems can provide a new perspective on extrasensory perception and other seemingly inexplicable phenomena. As research in this field continues to evolve, it is likely that we will see new breakthroughs in our understanding of human behavior and cognition. The potential applications of non-linear dynamical systems are vast and varied, from improved treatment of mental health disorders to enhanced cognitive performance. Furthermore, the interdisciplinary nature of this field has the potential to bring together experts from mathematics, psychology, medicine, and philosophy to tackle some of humanity's most complex questions.

As we continue to explore the mysteries of the human brain and behavior, we may uncover new ways to improve our understanding of ourselves and our place in the world. Ultimately, the study of nonlinear dynamical systems holds great promise for advancing our knowledge and improving human lives. By embracing the complexity and unpredictability of human behavior, we can unlock new doors to understanding and innovation.

Conflict of interests

The authors have no conflicts of interest to declare.

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