Article

Measuring Altered States of Consciousness in Transpersonal Psychotherapy with Gas Discharge Visualization Technology: A Systematic Review

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Abstract

Altered states of consciousness have been used as transpersonal psychotherapy to treat mental illnesses. ASC allows the patient to travel to the inner world; once the patient understands the source of their problems, they appear to find the solution to their anxieties and can self-heal with these transpersonal experiences. This article introduces the use of Gas Discharge Visualization to measure ASC for the transpersonal therapist that is interested in dealing with mental conditions that can benefit from self-exploration and self-realization of consciousness states that could be responsible for the patient's mental condition. The goal of this article was to open therapists' eyes to the potential of these technologies in the use of transpersonal therapies.

Keywords: Altered states of consciousness, quantum theory, neurotechnology, transpersonal psychology, GDV.

1. Introduction & Background

When practicing transpersonal psychotherapy, it is important to remember that the human mind is multidimensional, and that there are numerous "levels of awareness." Every one of these possesses unique qualities and is subject to a particular set of regulations. As psychoanalysis does not emerge as in opposition to other schools of thought, so too does transpersonal psychology that does not deny other schools of philosophy. The study of human nature and development that constitutes transpersonal psychology begins with the presumption that human beings can realize potentials that go beyond the confines of an ego that has been normally created. The spiritual experience needs to be incorporated into a more comprehensive knowledge of the human psyche for transpersonal theory to achieve its primary objective (Valverde 2015).

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Abraham H. Maslow provides a preliminary and informal description of "transhumanistic" psychology in his first public announcement of transpersonal psychology in a lecture at the First Unitarian Church in San Francisco in 1967 (later called transpersonal psychology). The field of 'transhumanistic psychology' is concerned with transcendent experiences and transcendent values. The fully developed (and very fortunate) human being working under the best conditions is motivated by values that transcend the self's geographical limitations. As a result, one can begin to discuss transhumanistic psychology (Maslow, 1969).

In the inaugural issue of The Journal of Transpersonal Psychology, transpersonal psychotherapist Anthony Sutich (founder and first editor of the Journal of Transpersonal Psychology) provides one of the first formal definitions of transpersonal psychology in 1969. (Vol. 1, No. 1, Spring 1969). Although a strong resistance to this movement was encountered at the beginning, the emerging Transpersonal Psychology ('fourth force') emerged as a psychology specifically concerned with the empirical, scientific study of, and responsible implementation of, findings relevant to becoming, individual and species-wide meta-needs, ultimate values, unitive consciousness, peak experiences, B-values, ecstasy, mystical experience, awe, being, self-actualization, essence, bliss, wonder, ultimate meaning (Sutich, 1969).

According to the work of Stanley Kripner (2000), an altered state of consciousness (ASC) is a mental state that can be subjectively recognized by an individual or by an objective observer than the individual who experiences it as different in cognitive functions, the normal state of the individual, the alertness, and the waking. ASC can also be recognized by an observer other than the individual who is having the altered state of consciousness.

The field of transpersonal psychology has incorporated for clinical psychotherapy purpose ASC. One of these methods is called holotropic breathwork and it is produced by using hyperventilation. This technique requires the individual to breathe quickly and deeply for a period of several minutes. Stanislov Grof (1998) developed the method that enables the investigation of an individual's consciousness while the person is in the ASC, he can cure his patients' mental conditions by utilizing this powerful experiential healing potential of the ASC.

In particular, the assertion that one's state of consciousness can be altered voluntarily by manipulating the sound pattern has been shown to be correct by research that was carried out using biofeedback. This work led to the discovery that different frequencies were linked to different psychological states (Kamiya, 1968) so does the discovery of Globalized Alpha of decreasing frequency for Transcendental States as in the early work referred to in Travis & Shear (2010); and finally, the result of Green et al. (1970) demonstrated that the brain is sensitive to different frequencies. Measurements of the electroencephalogram (EEG) are founded on the research and theories that were developed from the early work of Adrian and Matthews (1934). These two scientists discovered that electronic brain stimulation could cause the brain to go to specific

frequencies. Experiments like these were the first to show how the brain can start up, in a manner comparable to how a computer does when given the correct input frequency.

The general goal of this paper in GDV Consciousness research is to reveal many general correlates of the ASC with this technology. The paper starts with a review of Transpersonal psychotherapy and ASC for the reader to understand the potential use of ASC to treat mental illnesses. The review continues with an introducing brain waves and ASC, it covers how the frequency of brainwaves is related to different states of consciousness and how we can identify ASC by measuring the frequency of the brainwaves. It explains how to use ASC can be used for transpersonal therapy in the treatment of mental illness such as depression and final explains how the therapist can use GDV technology to identify ASC and how to use EEG metrics to validate ASC.

This paper provides a systematic review that summarizes the current state of understanding of the use of Gas Discharge Visualization (GDV) to measure altered states of consciousness for the transpersonal therapist by presenting the results that were part of research studies conducted for this purpose. The main goal is to present to therapist the benefits of GDV technology in the application of transpersonal therapy in order to help the patient to induce self-exploration and self-realization of consciousness states that could be responsible for the patient's mental condition.

2. Transpersonal psychotherapy and ASC

Transpersonal psychotherapy is a holistic therapy that encompasses the entire human experience. By focusing on the essential self, the therapy seeks to reveal the person beneath the mask of personality. For many decades, the majority of Western psychologists, social workers, and counsellors avoided direct introspective studies of consciousness in favor of the positivistic view that knowledge is limited to observable facts. Transpersonal counselling concepts are based on Abraham Maslow's works, who taught motivation and self-actualization theory. C.G. Jung's studies of Analytical psychology also bear similarities. Individualization, Jung's term for the process of personal development that involves establishing a connection between the ego and the self, is one of his central concepts (Valverde 2022).

Transpersonal ASC therapy is effective in the treatment of ADHD, depression, anxiety, addictions, posttraumatic stress disorder, grief work, and many biological health disorders (Mishara et. Al 2011) (Valverde 2016) (Miller 2013). There are many techniques used in transpersonal therapy, some of which are worth mentioning: Mindfulness and contemplation, clinical hypnotherapy, depth psychology, narrative approach, solution-focused brief therapy, cognitive behavioral therapy, existential psychotherapy, and transpersonal neuro and biofeedback (Valverde 2022) (Valverde 2016).

Abraham Maslow (1969) concluded that what is called the climax experience involves an individual merging of facts and values in conflict resolution, loss of anxiety, the discovery of the true self, a sense of unit, detachment, generosity, happiness, and love. He came to this conclusion after observing that the climax experience involves an individual merging of facts and values in conflict resolution.

Grof (1994) and his wife Cristina engaged in holotropic therapy to induce ASC without the consumption of any drugs. As discussed previously, to achieve this result, one must engage in hyperventilation. To induce pulmonary hyperventilation, Grof utilized this method, which includes listening to music and receiving some verbal direction from the person in charge of the session. The subject is required to remain in a supine position with his or her eyes closed throughout the duration of the consciousness shift. This method results in a decrease in the levels of carbon dioxide in the blood, which must be maintained at a level that is neither too high nor too low. This precipitous drop in carbon dioxide levels, in turn, causes a neurological crisis and acts in the brain in a manner that is comparable to that of a drug. The individual experiences a crisis as a direct result of this, which leads to ASC. The psychologist is then able to study the individual's consciousness in this newly acquired state. Stanislav Grof (1994) makes use of the potential for experiential healing that this new state of consciousness possesses.

ASC is used often in transpersonal psychotherapy (Valverde 2015), but a definition is required for us to understand what exactly ASC is. Ludwig (1966) defines ASC as any mental states for various physiological, psychological, or pharmacological agents that can be recognized subjectively by the same (or an objective observer of the individual person induced) as representing a sufficient deviation in the subjective experience or psychological functioning of certain general rules. In other words, ASC are any mental state(s) for various physiological, psychological, or pharmacological agents that can cause ASC. This deviation can be adequately described as a significantly increased preoccupation than is typical with one's own internal sensations or mental processes, alterations in the formal characteristics of thought, and varying degrees of deterioration in one's ability to distinguish between fantasy and reality.

Grof (1988) proposed that ASC encompasses all types of transpersonal experiences; however, there are some types of ASC that do not meet the criteria for being considered transpersonal (involving an expansion or extension of consciousness beyond the limits of the usual and limitations of time and space). Even though it takes place during ASC (like hypnosis, for instance), a living and complex childhood memory does not qualify as being transpersonal.

Since the 1970s, the field of transpersonal psychology has been divided into three distinct subfields. The ideas presented by Grof (1988), which maintains that transcendence (non-yoga) can only take place in the presence of ASC, served as the motivation for the first group of researchers. Grof's followers believed that transcendence can only take place when ASC are present. This

organization creates conceptual models of non-ordinary states of consciousness to study and obtain a better understanding of them. Another group was established by Wilber (1975) and is comprised of people who are interested in attempting to label the internal states of consciousness. Wilber is of the opinion that all manifestations of the highest state of consciousness in each tradition are the same as psychopathic conditions, which are located at the bottom of the hierarchy, normal waking reality, which is in the middle, and meditative states of higher consciousness, which are located at the top of the hierarchy.

Normal waking reality is located at the bottom of the hierarchy. Normal waking reality is in the middle. It sees the self-getting up and going to work in the morning, while the higher consciousness rakes leaves, sweeps the floor, and washes the dishes. It also sees the higher consciousness raking leaves. This is the third and largest subset of the transpersonal movement, which does not have a bearer that can be specifically identified. This includes everything that we ought to be paying attention to right now (Taylor, 1999).

No matter what criteria is applied, there is more to consciousness than just the brain and the activities that occur within it on their own. In addition, the interaction of each individual with the collective human informational field also contributed to the formation of this result. It is impossible for human consciousness to develop and continue to exist in isolation, without the presence of society or a continuous exchange of information with the surrounding environment. Because consciousness is a systemic phenomenon, the functioning of the entire outer world (which extends beyond the self) needs to be considered to conduct an accurate investigation into it. Contemporary models of consciousness try to take this reality into account, and a number of brilliant researchers have contributed to this field (Valverde 2016).

Transpersonal experiences, which include an expansion of consciousness beyond the limits of time and space, are included under the umbrella term of ASC. We can find possible answers to who we truly are and why we are here by entering into ASC.

In the ASC the effects beyond the usual level of human capability are notably and repeatedly reproduced and registered. Among these effects, the following are observed: demonstration of high learning abilities and sports achievement; deep actor transformation, being in the zone, mental influencing of physical sensors, water, and other individuals (healing); distant transfer of emotional states (telepathy) and remove vision (Korotkov *et al.* 2010).

3. Brain Waves

Even though the electrical power that controls our neurons is relatively low (measured in microwatts), this power is necessary to process, manage, distribute, and use vast amounts of

information as well as generate multiple possible answers (almost infinite in possibilities). With the help of micro electricity, we can reach the conclusion that a brain is a low-frequency system that In addition to processing information received through the senses, is also capable of emitting extrasensory information that is received through "electromagnetic waves" of a similar nature but at a lower intensity. These frequencies are analogous to those of a radio transmitter-receiver. The pituitary gland, which is in the human body, contains a real receiver of terrestrial magnetism. This allows the pituitary gland to play the role of a radio station for many bird species, guiding them on their annual migrations. Because of this receiver, they are aware of the location at which they must fly as well as the direction in which they must fly. It's almost like your brain has a physical compass built right into it. It's possible to think of the mind as the "sense" of the brain (like sight is the sense of the eye).

The activity of the cerebral cortex that the EEG picks up is made up of a series of solitary waves or in groups setting a rhythm, and which differ from each other in terms of their frequency, amplitude, spatial distribution, shape, duration, and reactivity (Talamillo 2011) (Hämäläinen et. al 1993).

Conscious thought that is always thinking, even when there appears to be no activity is a normal state or level, of untrained consciousness. Trivial ideas pass through the conscious mind all the time, except when it enters States of Transcendence described in the literature of Yoga. This type of conscious thought is known as continuous thinking. According to Signer and Streiner (1966), the average person has approximately 200 different daydreams throughout the course of a single day. When our minds are not occupied with conscious thought, we are most likely dreaming. As a direct consequence of this, consciousness is the aggregate of all our internal as well as external perceptions.

Wakefulness and sleep are the two states of consciousness that are most common; however, changes in expressing both cerebral and psycho states can be distinguished according to a person's conscious or subconscious feelings. These alterations are inextricably linked to the electrical activity of the brain. The number of oscillations per second (Hz) and the various states of consciousness in the brain can be used to measure this activity: our brain only perceives a limited range of frequencies that are required to operate comfortably in the space-time universe. This activity can be measured. Our eyes perceive colors ranging from red to violet (though extending beyond, up, and down), all possible smells and tastes, and the infinite textures that we can distinguish with our skin.

Our ears can detect between 20 and 20 KHz. However, in addition to receiving vibrations, the brain is also capable of producing them. The electroencephalogram (EEG) has revealed that the brain, depending on the person's state of mind, emits waves with varying intensities and frequencies.

- ALPHA WAVES: are the waves that Bergen found to be emitted at a frequency of 10 waves per second over wide regions of the brain when the subject was awake, but physically relaxed, in an environment free from sudden stimuli. Alpha waves can be recorded in adults and young adults (Millet 2001). The size or amplitude of an alpha wave can range from a few microvolts to a few hundred microvolts. The more relaxed a subject is, the larger and more prominent his alpha waves are. Interestingly, some people do not have clearly defined alpha waves. If a subject with normal alpha waves is suddenly startled or awakened, they stop, and this is called alpha wave blockage. As well, by projecting a spotlight into a subject's eyes, the alpha waves will stop immediately. In summary, alpha waves appear to be inversely related to arousal. A subject, when not active, tends to produce alpha waves.

- BETA AND GAMMA WAVES: Berger originally defined beta waves as fast, rhythmic, low-voltage waves that occur at the frequency of 20 to 50 waves per second. Jasper divided this class of waves into beta waves, from 18 to 30 waves per second, and gamma waves, from 31 to 50 waves per second. Beta and gamma waves are in higher arousal or alert states than alpha waves, and they correspond to the usual states of attention and wakefulness in the daily activity of the human being.

- DELTA WAVES: A fourth type of wave, the delta wave, is a very slow wave, of great amplitude, that is produced at the approximate frequency of 2 or 3 waves per second. Delta extends up to the beginning of Theta. Delta waves characterizes different stages of Deep Sleep, where the EEG shows very large, slowly synchronized waves.

- THETA WAVES: The frequency components ranging from 4 to 7 Hz are referred to as theta, regardless of where those frequencies originate. In young children, theta activity in the cortex is frequently observed. In older children and adults, it has a greater propensity to manifest itself during meditative, drowsy, hypnotic, or sleeping states; however, it does not manifest itself during the deepest stages of sleep. Alterations in these theta signals are found in a variety of psychiatric disorders as well as neurodevelopmental conditions. Theta originates from the midfrontal cortex, which is specifically related to a manifestation of Mindfulness Meditation. There is a strong connection between theta and the function of sleep, as well as the necessary restoration of the body. When the body is in a theta state, it is actively repairing damage that was done while it was awake. When theta is active (at certain times of day or night) the immune system is brought to balanced function. Theta states are beneficial because they help to restore and rebalance the autonomic nervous system. This state is linked to the occurrence of ASC.

Brainwave frequencies measurements can be used as indicators of our psychological states and correspond to the various ways in which we produce. ASC of consciousness are linked to theta waves, but it is necessary to measure the transition from a beta to alpha, and to alpha to theta for us to understand the process of going into ASC (Valverde 2015).

4. Methodology and instrumental components for the investigation of ASC

The induction of ASC is a critical part for transpersonal therapy before it can be measured with GDV. Bundzen studied ASC using a variety of methodologies (Bundzen, 2000, 2002). From 1996 to 1999, the experiments were carried out in Sweden and Russia. Researchers employed audio files from the Swedish mental training program (Unestal 1997) to conduct this research, including the relaxation phases for the body and mental relaxation stages 1 and 2. During a particular session, the participants engaged in active mental imagination while listening to an audio program. Visualizations were used to connect with nature. A stereo recording of ocean waves was played for those in the control group. Sixty-one healthy individuals, ranging in age from 17 to 23, took part in the research. Fifty-six people in the control group weren't doing any mental training. There was around a 7-to-2-week period needed to complete the ASC self-induction process. The length of time and intensity of the trance was proportional to the subject's hypnotism. The Stanford scale was used to gauge a person's hypnotisability. ASC can be quickly acquired and sustained by healthy people who have been practicing mental training for at least two years.

For ASC formation, the Quasi-DC Potential (QDCP) registration approach can be employed. QDCP values below 20 mV can be used as the ASC depth criterion, whereas the ASC formation criterion was the absence of bilateral asymmetry in the QDCP (Iluchina, 1993). In Bundzen et. al (2002), a study was performed with two disposable silver-chloride electrodes from "Medico Teknik" (Denmark) and were placed four centimeters apart in the upper region of the forehead to register QDCP in the millivolt range digitally. Both the right and left forehead had frontal leads, and the hand tenor corresponded to them. NIIF's "Omega-tester" two-channel microcontroller was used in the experiment performed by Bundzen et. al (2002). The constant current amplifier's input resistance was 100 Mega Ohms, and the registered potential range was 100 mV. Each recording channel took three seconds to quantify using QDCP recordings. The electrodes' polarization was limited to 2.2 mV each hour.

The use of EEG can be used to detect ASC. In Bundzen et. al (2002), an analysis of the EEG spectrum and the local activation coefficients (LCA) were carried out on 29 subjects to understand the brain's electrical activity better. The EEG was recorded using 16 cup electrodes coupled to loop electrodes and set up carefully according to the 10/20 scheme (Computerized encephalograph "Nixon Coden" and magnetograph EAM-500 Tesla). The eyelids of each individual were closed as they sat in a comfy chair. Before processing the EEG fragments, artifacts were removed visually

on a television monitor. A 12-channel digital EEG recording with 256/s digitalization was employed. Both hetero- and self-inductions in ASC were monitored with EEG.

In the experiment of Bundzen et. al (2002), EEG recordings of at least 15 non-artifact, two-second duration were selected for spectrum analysis. The experts-neurophysiologists used the absence of artifacts and the relative stationarity of biorhythmic as criteria for choosing the examined epochs. The typical EEG frequency bands: delta, theta, alpha, beta-1, and beta-2, were used in this study. Based on two-second recordings, averaged power matrices according to EEG frequency components were constructed after Fourier-processing. There were 15 epochs in each matrix, which contained data on the intensity variations of EEG frequency components. Background, physical relaxation, mental relaxation (ASC-Rx), activity (ASC-Act), and post-action were analyzed for each individual. The experimental (15 participants) and control (14 subjects) groups' average data were analyzed. The following parameters were subjected to statistical analysis of the averaged power matrices based on the EEG frequency components.

When a person's mental state changes, the EEG spectrum components' average power fluctuates. Local activation spectral coefficients alter in absolute value during changes in mental state. A method described in (Pavlova et al., 1988) to compute spectral activation coefficients can be used for this purpose. In the study of Bundzen et. al (2002), the distribution and interactions between local activation coefficients in the examined brain areas reflected cortical activation patterns (Bundzen et al., 1996). Third, the fractality attractors in the EEG power spectrum (D-mode and A-mode) serve as a punctuation of the mental state (Yoshida, 1991).

4. GDV and ASC

The glow of different kinds of things in high-intensity electromagnetic fields was observed more than 200 years ago, and since then, it has drawn the attention of a research group in the field of psychology (Korotkov, 1985). However, it wasn't until 1995 that technology called gas discharge visualisation (GDV) was developed, which catapulted this kind of research into the realm of science. Since that time, an extensive amount of research has been conducted on the physical principles that are responsible for the glow (Korotkov et al. 2010), serial production of the devices has been established, and a set of software programs for the research of medical, biological, and material topics has been developed (Korotkov 2018). It has been proven that the activity of a person's autonomic nervous system is mostly responsible for determining the features of the glow that emanates from their cutaneous covering. In the presence of ASC, electro photonic imaging (EPI) and gas discharge visualization (GDV) bio electrographic devices have been shown to be of practical use. The investigation of various aspects of awareness is a fascinating component of EPI applications. Research conducted over the course of several decades has made it possible to establish a connection between bio electrographic imaging and ASC (Bundzen et al., 2000).

The electrical current used in EPI is extremely low-voltage and painless; it is only applied to the fingertips for a fraction of a millisecond. As a reaction to this stimulus, the body creates something resembling an "electron cloud," which then releases photons of light energy. The body releases electrons from points ionizing the surrounding air. Recombination of the ions and the electrons then creates the light photographed by the GDV. The electrical "glow" that is produced by this discharge is not strong enough to be visible to the naked eye, but it can be captured by an optical CCD camera system and then converted into a digital computer file.

Each test produces a one-of-a-kind "Photonic Profile," which is then compared to a database containing hundreds of thousands of data records utilising 55 distinct parametric discriminates and charted for further discussion and analysis (Korotkov 2018).

The Human Energy Field is the most sensitive indicator of the current state of a person's body and mind. The purpose of the Energy Field programme is to process GDV photographs and to build a model of the human energy field by making use of the data from ten GDV photographs of human fingers. A diagnostic map is used in the process of producing the energy field. The Energy Field presents a numerical representation of the human electromagnetic energy field in the form of tables and diagrams, as well as a visual representation of the human energy field as an image centred on the human contour. These samples show that ASC images have a significant amount of distortion, that both the left and right sides are out of balance with each other, and that the overall appearance is noticeably different from what it would be under normal settings (Korotkov 2018).

The St. Petersburg Federal Medical University conducted a study to verify the validity and reliability of the EPI method. This study involved both healthy individuals and patients with bronchial asthma (BA) in order to create a baseline. The trials yielded results indicating that the average amplitude of fluctuation in the GDV-gram parameters for individuals without health issues is approximately 4.1% in the daily average, while the 10-minute average amount is approximately 6.6%. The values for patients with BA were found to be 8.6% and 7.7%.

In the case of the titanium calibration cylinder, the degree of fluctuation is found to be less than 1% during nighttime and greater than 3% during daylight, under conditions of a tranquil atmosphere. When evaluating individuals that have a consistent psycho-physiological condition, the parameters of the GDV-gram were replicated with a precision ranging from 5% to 10% (Korotkov, 2002).

It has been clearly proved, through the use of the GDV bioelectrography technology, that the activity of consciousness has an effect upon the emission characteristics of several organs of the human body. These parts include the brain, the heart, and the lungs (Bundzen, Korotkov, & Unestahl 2002). Gas Discharge Visualization technology (GDV Camera, KTI, Russia) was

employed to measure ASC in several studies that were performed over six years: from 2012 to 2018 (Bundzen et. al 2002).

5. Brain Bioelectricity activity measurement and ASC

EEG power can be used to measure the brain's bioelectricity that can be used to identify ASC by identifying harmonic resonance. An example of this is the study of Bundzen et. al (2002) that performed an experiment with a statistically significant differences between EEG data of experimental subjects in an ASC and a control group with the following EEG spectral component averaged power values:

1. Theta and alpha activity increased during mental relaxation (ASC-Rx) in the following regions: F3, F4, C3, C4, T6, O1 ($p < 0.05$).

2. During active imagination (ASC-Act), the power of alpha activity decreased in the retro central zones of the cortex: T5, T6, P3, P4, O1, O2 ($p < 0.05$-0.01). Right lobe zones F4 and F8 showed a significant increase in beta-1 activity ($p < 0.05$). As a result of these adjustments, there is a frontal-occipital decline in alpha activity. In addition, the majority of the patients had their main alpha-rhythm frequency in P3, P4, O1, O2 divided into two peaks: one at low frequency (6.80±3 Hz) and the other at high frequency (11.00±4 Hz) as a result of the abovementioned modifications. The most common frequency ratio was 1.61±0.16.

ASC-Act EEG's power spectrum profile, both anti-central and retro-central, statistically followed l/f when participants engaged in active imagination. The subdominant frequency attractor (Delta, Theta, Alpha, and Beta-1) ratio was 1.61±10% (fig.3). The "golden mean" is a well-known literary term for this ratio. EEG fractals were earlier observed during the modelling of positive mental states (Yoshida et al., 1991). The EEG spectrum was assumed to reflect the general biological integration and harmony mechanism of the functioning of the brain system (Korotkov, 2000).

The above-mentioned, as well as the fact that the EEG spectrum in ASC-Act was characterised by the polyharmony of frequency components, contribute to the hypothesis of a possible increase in "harmonic resonance" in the process of activity in ASC (Oschman, 2000). Most probably decrease of alpha-activity is directly connected with active mental activity under ASC-Act in contrast to ASC-Rx. This fact brings together EEG of ASC-Act correlates and EEG of the so called Shamanic-ASC correlates (Wright, 1995).

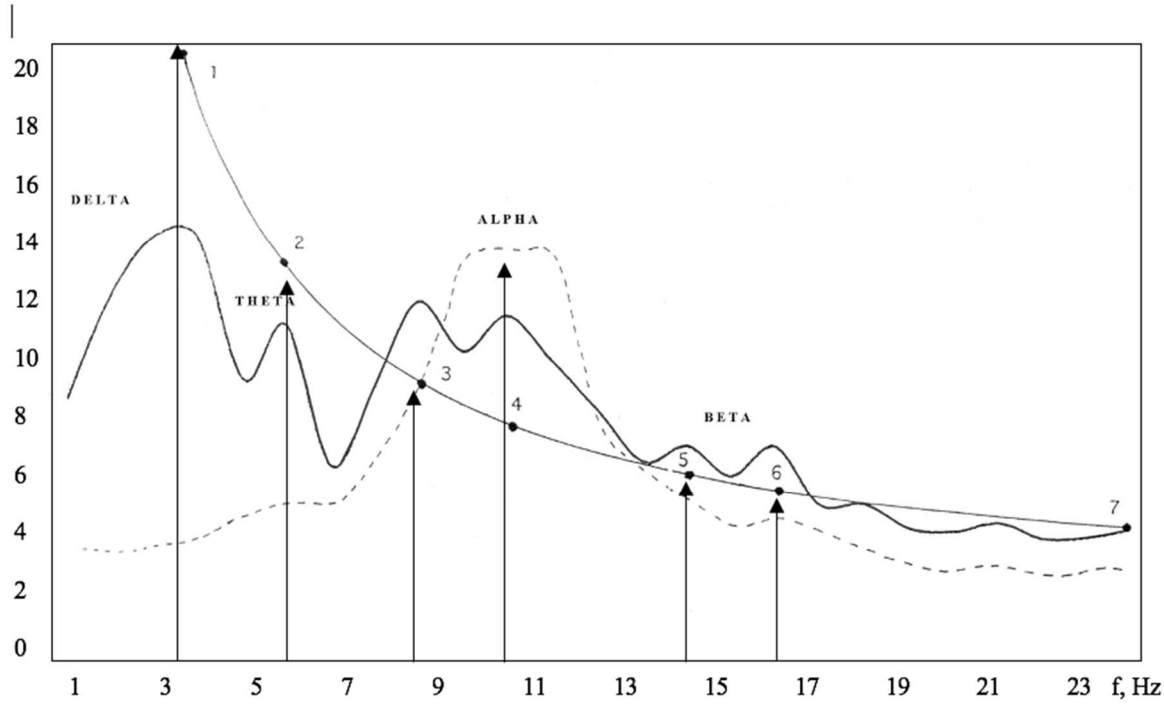

Figure 1. Averaged EEG spectrum profiles for the rest state (closed eyes) during the 10 minutes of mental relaxation (dotted line) and ASC-Act (firm line).

Fig. 1 shows the X axis that represents the frequency in Hz, while the Y axis represents the relative power of spectrum components. N=11 participants (only 11 out 15 participants were used for the data analysis due to problems with data collection and interpretation). Reliability of frequency difference: delta $p < 0.001$; theta $p < 0.001$; alpha $p < 0.05$; beta $p < 0.05$.

The smooth declining slope corresponds to the flicker noise's 1/f dependency. The arrows depict the projection of the ASC-Act spectrum peaks to the function 1/f. The relationship between function values at points 1,2,3,4,5 and 6 supports the hypothesis of polymodal EEG spectrum harmonization in ASC. This hypothesis proposes that the human brain has the sensory system (ecoceptive sensory system) which responds to changes of the Earth electromagnetic fields (EEFs) (Limanski 1980).

6. EEG Spectral activation coefficients metrics for the identification ASC

Spectral activation coefficients are metrics that can be used to identify ASC. In the study of Bundzen et. al (2002), neurodynamic correlates of system-structural changes in cortical activation were analysed in the second stage of the study using the spectral activation coefficients (SAC) (Fig.2).

Cortical activation dynamics were shown using the SAC values. The ASC-Act procedure statistically impacted front-occipital and bilateral brain asymmetry transformations (fig.2, fragment 3).

In the study of study of Bundzen et. al (2002), researchers discovered that the duration and methodical nature of mental training were the primary determinants of the stability of the given processes rather than the subject's hypnotisability. To put it another way, ASC is a process of shifting the brain's dominant system-structural organization from its regular "dominant activation" state to its "non-dominant activation" (ASC-mode) state. Yet, the central system-structural organization was re-established after exiting ASC; however, it had its maximal activation shift to the right lobe's anti-central and central structures (fig.2, fragment 4).

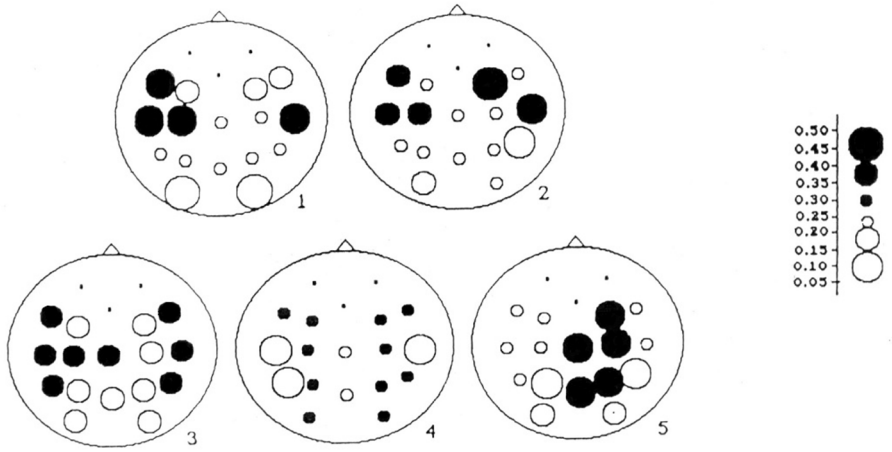

Figure 2. Averaged patterns of brain activity's spectral coefficients for the researched psychic states.

In Fig. 2, fragmentation 1 represents the condition of peaceful awakening (background); fragmentation 2 represents the state of muscle relaxation; fragmentation 3 represents the condition of mental relaxation (ASC-Rx); fragmentation 4 represents the state of active imagination (ASC-Act); and fragmentation 5 represents the state of calm awakening (10 min after submerging to ASC). The size of the dots corresponds to the activation coefficient values in EEG zones using the 10/20 approach. N=11 participants (only 11 out 15 participants were used for the data analysis due to problems with data collection and interpretation).

7. QDC Potentials for ASC identification

In the study of Bundzen et. al (2002), the analysis of quasi-DC potential (QDCP) during consciousness transformation in ASC-Act revealed the disappearance of bilateral asymmetry in the milli-Volt band. Thus, we may infer that a super-slow control system was responsible for helping to turn the brain's system structure into ASC as the bilateral asymmetry disappeared after 30 minutes (fig.3). In the control group not statistically, significant changes ($p>0.05$) in the spatial organisation patterns of spectral activation coefficients (SAC) and QDCP were observed. For some participants the decreases in SAC absolute values and levelling of QDCP bilateral asymmetry were observed within 7-10 minutes of listening to the ocean waves sound. However, these changes were not statistically significant.

It is noteworthy, that the disappearance of asymmetry between the brain lobes was also observed in ASC induced by drugs in other studies, in particular, in the case of "dissociative states of consciousness" provoked by ketamine, and in hypnotic states reported by Cherednechenko (1997) and Koekina (1997).

In addition to the findings presented above, the evidence supported the assertion that consciousness transformation into ASC was linked to a brain activity system change. The results showed that the thalamus-cortical and limbic-reticular systems' interactions have changed.

This conclusion was supported by the results of a study of the dynamics of amplitude-time dependences of middle-latent evoked responses under the influence of ketamine (phencyclidine) of Koekina (1997), as well as by the calculations of doublet sources of slow waves in C_Z and F_Z areas generated in ASC. With this, the fact that the subjects described their mental state in ASC-Act not only as the state of positive psycho-energy activation, but also as the state of "inner euphoria" allowed us to infer that in ASC activation of "self - rewarding" brain systems took place. The latter is likely due to phencyclidine brain receptors belonging to the positive self-reinforcement systems of the brain (Bundzen, 1984).

In general, we can infer that in ASC the measure of brain dissipative functions as an informational system changes considerably. In this case, the most favourable conditions for the reproduction of centrally determined reactions and memory activation can be formed (Terner 1995). In addition, inhibition of self-questioning results in vivid mental images in ASC.

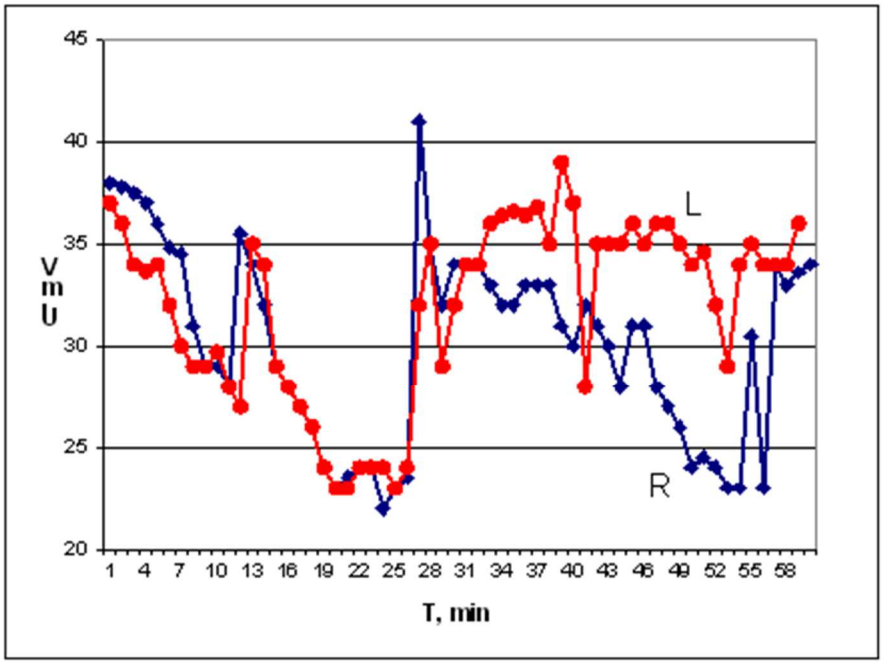

Figure 3. The averaged QDC potential's time dependency for four states of consciousness.

Fig.3 shows QDC for the following states of awareness: 1 – relaxation of the muscles; 2 – relaxation of the mind (ASC-Rx); 3 – active imagination (ASC-Act); 4 – after-state. R and L are the measures for the right and left sides, respectively. 15 participants were included in this study.

8. GDV analysis for ASC measurement

The GDV-grams for the experimental group participants in the ASC-Rx and ASC-Act showed a statistically significant difference in GDV parameters compared to the ordinary condition (Table.1). The following indices are used: total area, fractality and entropy.

Living systems are never in balance (as long as they are alive) and function at the expense of their free energy, continually working against the externally imposed equilibrium. This process generates entropy - the desire for balance. The driving force for entropy export originates within the organism's system. Entropy grows in a wave-like fashion or in increments during evolution. The growing interest in entropy can be explained by the crucial role it plays in the self-organization of biological systems, the development of biochemical metabolism, and the

asymmetric and speciation reactions, as well as by the potentially pivotal role it plays in the origin of life (Ebeling et al., 2001).

Diversification is quantified by entropy. High entropy indicates chaos, while low entropy indicates death. As with many other parameters of the body, entropy values must fall within a given range of norms. At the moment, the range's limitations are being defined using a newly expanded database. Entropy increases in all processes, whether physical, chemical, or biological. By utilising energy from their environment, living creatures minimise their own entropy. Living creatures are said to generate negative entropy, or 'neg-entropy.'

Fractality is calculated using Mandelbrot's technique (Mandelbrot's et al 1988) as a ratio of the lengths of the picture glow's perimeters acquired at various BIO-gram scales. The form and fractality coefficients indicate the degree of irregularity in the exterior contour of the BIO-gram. The autocorrelation angle is the extent to which an organism is involved in a state of stress-adaptation. BIO-grams are the images generated by the GDV Express camera and normally taken from the 10 fingers of a person.

Table1. GDV parameters averaged for a group in different states of consciousness.

GDV parameter	States of Consciousness			Coincidence probability between ASC-Rx and ASC-Act
	Ordinary	ASC-Rx	ASC-Act	
Area (pixels)	13106 $\pm$ 436	9249 $\pm$ 429	8328 $\pm$ 346	< 0.05
Fractality	4.93 $\pm$ 0.11	9.94 $\pm$ 1.51	11.6 $\pm$ 0.97	< 0.07
Entropy	3.15 $\pm$ 0.09	3.15 $\pm$ 0.05	3.38 $\pm$ 0.03	< 0.001

ASC-Rx vs. ASC-Act states can be differentiated by GDV patterns parameters, which exhibit significant differences in energy processes in these states and connectivity with increased psycho-energetic personal potential under the impact of rigorous mental training.

As it turned out, in ASC-Act, the GDV parameters had the most significant modifications. They occurred at the same time as the brain's functional asymmetry began to level out. Short-term explosive activation of energy processes in the body occurred during strong mental engagement in ASC-Act (subject concentrating on mental imagery of physical activity). It is appropriate to explain this situation in terms of short-term explosive psycho-energy activation (EPEA). EPEA has the following functional characteristics:

1. The specific geometry of GDV patterns with separated fragments of concentrated emission (fig.4); in some cases, significant changes in GDV intensity within distinct topographic zones.
2. In 80% of the cases, specific to EPEA GDV patterns appeared only on the fourth fingers, which reflexogenic zones reflect the activity of the central nervous system (Korotkov, 2000).
3. In many cases of EPEA, GDV patterns have lost their distinctive features and have been transformed into very similar patterns with high fractality and "openness" (fig. 5). Beck (1986) discovered similar brain wave patterns for a large group of healers transformed into the "altered state" during healing.
4. Only those participants who completed all mental training sessions for seven weeks demonstrated EPEA regularly.
5. In EPEA, people had mental relaxation followed by active mental imagination, i.e., the transition from ASC-Rx to ASC-Act. Thus, in ASC-Act, EPEA was directly related to mental activity and presented for a short time. Parallel changes of the GDV patterns support the idea of "quasi–coherence behavior" of the whole organism (Korotkov, 1998; Oschman, 2000).

EPEA was statistically significant and was observed in a variety of experiments: in hypnotic states, in elite athletes engaged in competition imagining, in actors involved in theatrical performance, in people involved in mental training, and in healers engaged in healing mode (Korotkov 2005). We may conclude that transformation to ASC results in alterations in psychosomatic and psycho-energetic autoregulation with the harmonization of the brain's biopotential field, observed in both ASC-Rx and ASC-Act;

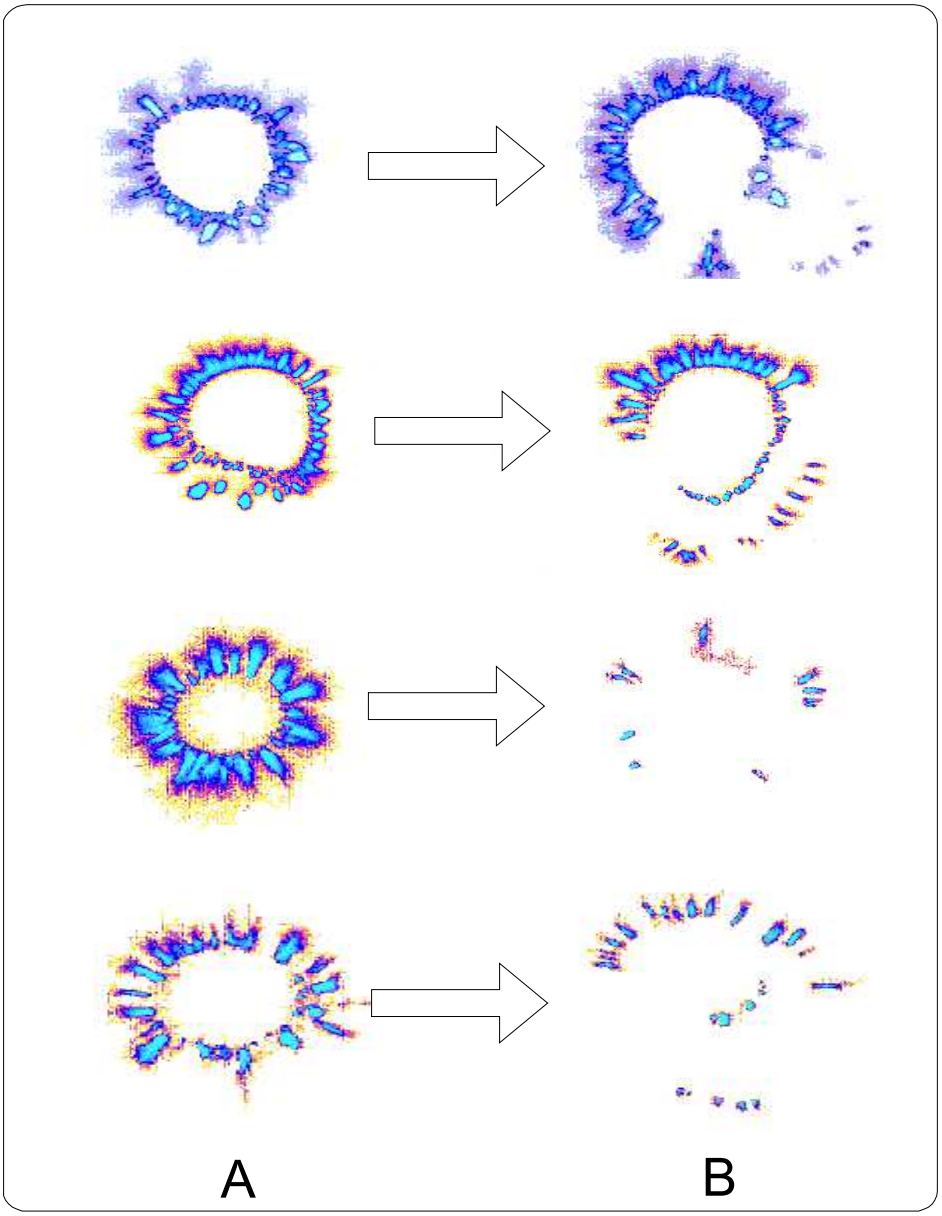

Figure 4. Modification of the GDV energy emission patterns of the left ring finger in four test subjects under conditions of mental work - active imagination during the metamorphosis to ASC-Act. A and B – patterns prior to and during immersion in the ASC-Act, respectively.

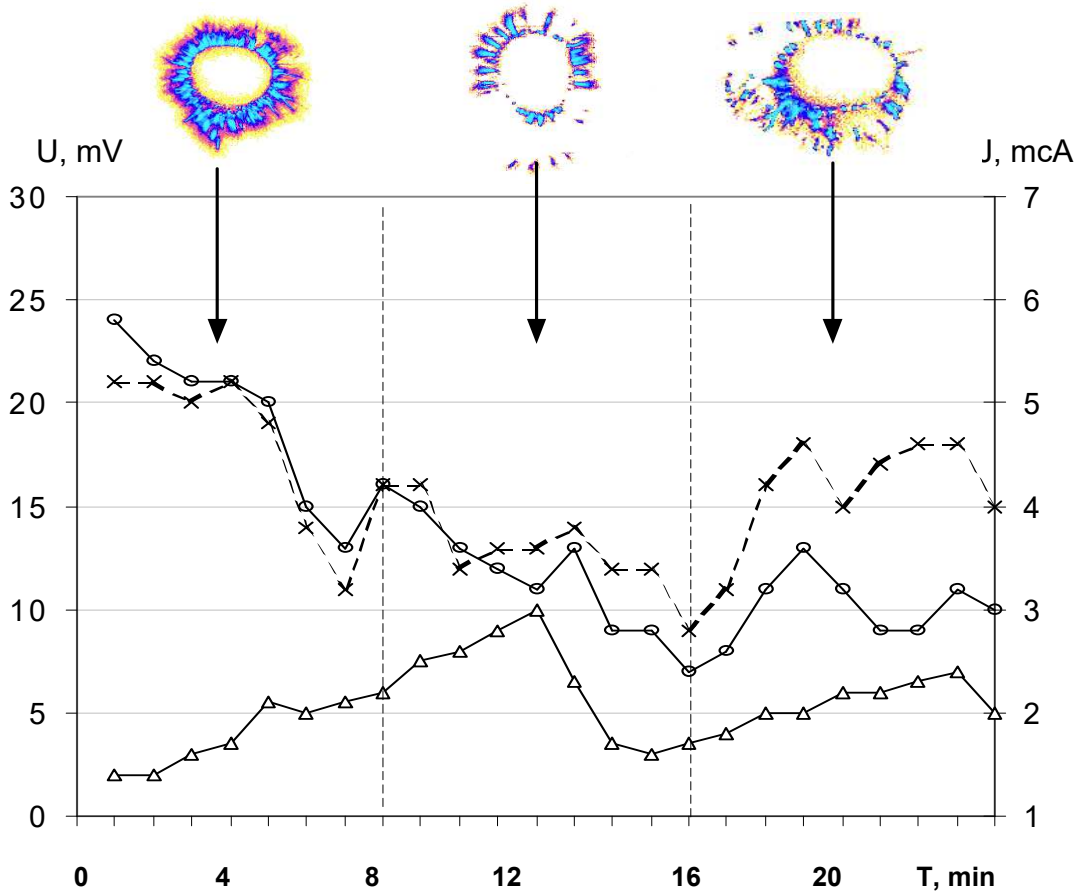

Figure 5. Time dependence of the averaged QDC potential and current of energy emission during immersion in ASC and active imagination in ASC-Act.

Figure 5 shows the respective QDC potentials of the left and right sides of the body; GDV current during the relaxation and imagining period (8-16 min). The images on top are examples of GDV patterns in various stages.

9. Discussions & Conclusions

The article discusses the concept of ASC and its relationship with brain waves patterns and energy states of a person. These states of consciousness are related to states of mind such as anxiety, stress, and fear, but it also relates to desirable conditions such as creativity, relaxation, and well-being.

This article introduced GDV and EEG measure, which has shown diagnostic value for specific diseases that appear to be psychosomatic and has also been shown to help measure individuals' states of consciousness. Transpersonal psychology has proposed ASC as a healing therapy. ASC enables the patient to travel to the inner world; once the patient understands the source of their problems, they appear to find the solution to their anxieties and can self-heal with these transpersonal experiences.

It is reasonable to assume that the psychodynamic changes that take place because of the influence of mental training are of a complex energy-informative nature. The interpretation of these changes could be of vital importance for the understanding of both mental practices and the "bio-energetic therapy" fundamentals of informational, complementary, no-chemical medicine.
Statistical studies have shown that in general, even mild ASC experiences are associated with higher-than-average levels of overall psychological and mental health. This is expressed in terms of better interpersonal relationships, higher levels of self-esteem, lower levels of stress and anxiety, a clearer sense of self-identity, an increased concern for others, and a more positive outlook on life in general.

However, there are several limitations to the use of GDV in transpersonal psychotherapy. First, the number of studies based on EPC=GDV technique in medicine and psychophysiology is relatively small. The number of all studies based on the GDV technique is not large, because this technique is comparatively young in the scientific world (Korotkov et al. 2010). Another limitation is the required knowledge to use this technology in the clinical setting, transpersonal psychotherapists would require a training in this technology that requires good background in imaging and computer technology, this can be a challenge in the clinical setting. The technology requires interpretation of images and statistical parameters, this might not be so evident for the traditional transpersonal psychotherapist.

The article introduced GDV technology as an alternative to EEG technology for the detection of ASC in transpersonal therapy. GDV technology is less intrusive and provides a viable solution for the transpersonal therapist that is interested in using ASC for transpersonal psychotherapy with the use of ASC.

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