Article

A Novel Approach to Understanding the Conscious Self, Will, Behavior, and Psychopathology and Its Treatment

Fredric Schiffer [1,*]

[1]Developmental Biopsychiatry Research Program, McLean Hospital, Department of Psychiatry, Harvard Medical School, Belmont, Massachusetts, USA; fschiffer@mclean.harvard.edu

*Correspondence: fschiffer@mclean.harvard.edu, Tel: 01-617-969-1188

Abstract: In this paper I will address Dr. Sonne's questions about will, agency, choice, consciousness, relevant brain regions, impacts of disorders and their therapeutics, and I will do this by referring to my theory, Dual-brain Psychology, which posits that within most of us there exist two mental agencies with different experiences, wills, choices, and behaviors. Each of these agencies is associated as a trait with one brain hemisphere (either left or right) and its composite regions. One of these agencies is more adversely affected by past traumas and is more immature and more symptomatic while the other is more mature and healthier. The theory has extensive experimental support through 17 peer-reviewed publications with clinical and non-clinical research. I will discuss how this theory relates to the questions that Dr. Sonne presented and will discuss also my published theory on the physical nature of subjective experience and its relation to the brain and how that theory interacts with DBP, and how the 2 theories relate to subjective experience, will, behavior, psychopathology and its treatment.

Keywords: consciousness 1; subjective experience 2; will 3; agency 4; self 5; psychopathology 6; treatment 7; transcranial near infrared light 8; biophotomodulation 9

1. Introduction

Dual-brain Psychology comes out of my early clinical experiences in which I observed that my patients seemed to have two and only two personalities [1]. One that was quite symptomatic and affected by past traumas [2]. As the person progressed there often was a shift to a more mature, healthier personality. A regression led to the immature personality. Later I reread the split-brain studies and had the hypothesis that these 2 personalities I was observing related to the 2 cerebral hemispheres [3; 4]. The studies by Sperry and his associates essentially showed that after callosotomy, patients had two minds [5; 6]. For example, by showing a photograph to the left lateral visual field the image would be seen only by the right hemisphere because of the neural connections between the medial retina, which received the image, and the contralateral hemisphere. All but one of these patients had speech in the left brain and each reported that they could not see the image and were not able to pick the item from a group of items with their right hand, controlled by the left brain. The right hemisphere is mute, but with the left hand can easily pick out the item shown as instructed. This demonstrates that the mute right hemisphere understands the English language and is able to perform the task. Because of the corpus callosum in ordinary people the image is transferred to the opposite hemisphere and either hemisphere can perform the task.

Werner Wittling and his associates reported that by tracking eye movements and masking a computer screen they were able to show an upsetting movie to one hemisphere or the other in intact people [7; 8]. The participants' responses were different depending on which side the movie was shown, and in patient from a clinic, the side which was more troubled by the film was not the right hemisphere as expected from the common wisdom but could be either left or right in a given person [9]. I realized that I might be able to accomplish the same effect by simply blocking a person's vision so that he could see out only one of the lateral visual fields. I did not notice a difference but that day when I went to my private practice, I asked a Viet Nam veteran who had reenlisted 3 times for frontline combat and suffered severe PTSD for which he was being treated. When I asked him to look out of his left lateral visual field, he appeared quite stressed and said, "That plant behind you looks like the jungle!" I asked him to look out the other side, and he said, "No, that's a nice-looking plant." Since then, I have found that over 80% of my patients have a noticeable difference between sides such as one side has an anxiety level of at least 2 of 10 points higher than the other side. Often there is a 5-point difference. My experiences with my patients were describe in my book, Of Two Minds [4]. This idea that people can have two very different

experiences depending on which lateral visual field they look out of has been difficult for the academy to find credible because it is so far from our unaided experience. But I found that my patients not only had more anxiety on one side, but also, I often looked critical (like the patient's critical mother) on one side and supportive on the other. Photographs of other people also looked critical on the same side as I did. On that side the patient's attitude about himself also was more negative and he would be prone to develop cravings for drugs or gambling if these were a problem for him. To make this everyday observation clearer, the I will present part of a published transcript [3] of a former patient who had a severe drug problem that was well treated. I asked the patient to return to my office to try the lateral visual field test (LVFT), which had not yet been discovered when the patient was in treatment.

"Can you describe the difference between how you feel on this side versus the other side?"

"I'm more relaxed on this side. The other side I was a little more uptight." . . . .

"Let's put the other pair back on. . .. How do you feel?"

"Same as before. Not as comfortable as the other side. . .. Not a good sign here. I'm just thinking about things I did in the past and everything about me then. I don't really think about anybody but myself and the abuse, some of the things I've been through in life. This is not what I want to remember. Not good. Can I take them off now?"

"Now I just want to ask you one more question. Can you relate these uncomfortable feelings to your father?"

"I don't know. I was never comfortable around my father. With these glasses on it's sort of like dealing with him again because it's always the unknown, and it's always a pressure and a problem. . .. Yeah, you feel the unknown, you have the tension. . .."

"Let's put the other glasses on [right brain]."

"More relaxed. More focused. Clearer."

"Now if you think of your father on this side."

"I can deal with him on this side. I know how to handle him now, and I don't think he'd get me upset, and I wouldn't do the counterproductive things if I looked at him out of this side all the time. I'd feel more pity for him and for the relationship, and I don't think I'd want to abuse myself by using drugs."

"What would someone have to do to you to get you to use drugs, feeling the way you do on this side?"

"I don't think it's an option on this side."

"Would they have to have a gun on something?"

"Oh, yeah, they'd have to do some extreme things."

"On the other side?"

"Yeah, I could see myself doin' it on the other side."

What I found was that most of my patients, like the one in the transcript, clearly had two very different agencies or minds with very different experiences which led to very different choices and wills and behaviors. The patient described, who is typical of about 50% percent of his patients

in having such a robust response; another 30% have a clinically useful but not as robust a response, and about 10 to 20% have no response. Clearly, the patients with a robust response, like the patient presented, have two agencies.

The patient in the transcript was still suffering (on one side) his trauma from his difficult relationship with a father who was experienced as severely critical. If the patient's more childlike mind dominated, then he would return to his choice of using large amounts of cocaine, which is a choice, based on his experience of intolerable pain of disrespect and devaluation as well as his childlike agency's attempts to deal with his distress. His immature mind reasons, if I can't have Father's approval, I will act in a way that will get his disapproval and I will have control over his insults by provoking them. The cocaine high offered some relief from his pain, but the withdraw pain also motivated his use by attempting to control his pain and humiliation by inducing them [10]. These behaviors have rolling consequences since they lead to depression, disfunction and criminality, all intensifying his sense of defectiveness.

This patient and I worked weekly on this for about 3 years, and he was able to discover his mature mind. He stopped using cocaine early on, and his mature mind came to dominate, and he never used cocaine again in the time that I knew him and in the 2-years since his termination when he came in for the lateral vision test. As is clear in the transcript, his mature side has an entirely different experience from his immature side: "I can deal with him on this side. I know how to handle him now, and I don't think he'd get me upset, and I wouldn't do the counterproductive things if I looked at him out of this side all the time. I'd feel more pity for him and for the relationship, and I don't think I'd want to abuse myself by using drugs." Looking out the right visual field (left brain activation) he says, "Yeah, I could see myself doin' it on the other side."

Before we discuss the relation of these clinical observations to Dr. Sonne's questions, we must first establish further that these observations are reproduceable and supported by controlled experiments, because these observations are ignored by most philosophers, with a few exceptions [11; 12], and by most clinicians and academic psychologists with some exceptions [13].

From McLean Hospital and the Harvard Medical School, my colleagues and I performed several studies to attempt to confirm that patients have different experiences out of the different lateral visual fields and that these different experiences have to do with the activations of one cerebral hemisphere or the other. First came the clinical observations [14] such as I describe with the two patients I have mentioned. Next came studies with lateralized taped safety goggles and taped safety goggles that were not lateralized as a sham control. We measured the emotional responses and EEG and ear temperature changes and reported that the lateralized goggles but not the control goggles induced significant lateralized emotional, EEG, and ear temperature changes [15; 16]. We believe that the ear temperature changes were due to changes in hemispheric blood flow around the ear related to hemispheric activation. Later we performed a brain imaging study [17], an fMRI study, which showed changes in hemispheric blood flow that occurred when the subjects looked out of one visual field and then the other for 30 seconds each and then repeated that. The results are shown in Figure 1.

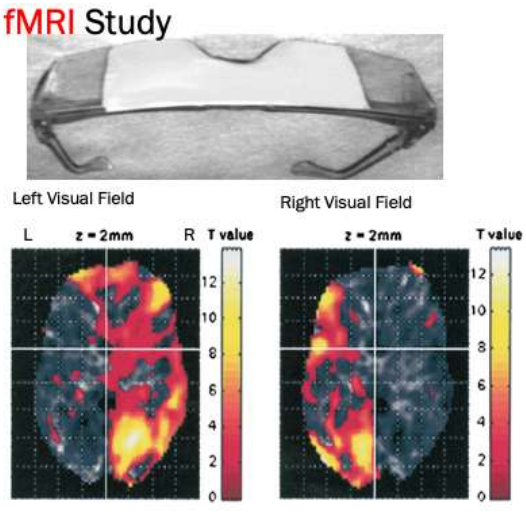

Figure 1 shows the mean fMRI results of 7 healthy subjects as they look out of each lateral visual field. Looking out of each visual field activated relatively the contralateral hemisphere [17].

A second study was designed to test whether the observed or reported changes in a person's experience with lateral vision were related to lateralized hemispheric stimulation. We did this by offering the taped lateralized goggles to 37 patients who were to undergo a 2-week course of rapid transcranial magnetic stimulation (rTMS) for depression [18]. Prior to the magnet treatment, which is a very widely used treatment for depression, each patient

was asked to rate how depressed he felt out of each lateral visual field. Thirty-five of the 37 patients felt more depressed on one side than the other. For unknow reasons, rTMS is only applied to the left side of the head at 10 hz, which is stimulatory. We reasoned that if the rTMS was stimulating a healthier hemisphere, then the stimulation should be beneficial, but if the vision test indicated that they felt more depression when looking out the right visual field suggesting that the left hemisphere was more depressed, then the patients would not be expected to do well. That is, we predicted that the 20 patients, who at baseline felt less depressed when looking out the right visual field than the left, would do well because the treatment was stimulating a less depressed cerebral hemisphere. We predicted that the 15 patients who felt more depressed when looking out the right visual field than the left would not do well because the treatment was stimulating a more depressed hemisphere. Two weeks after the 2-week course of rTMS the group that we predicted to do well had a 42% decrease on their Hamilton Depression Rating Scores, while the group that we predicted to do poorly had an 11% decrease, and the difference was highly significant statistically and clinically. A few years we replicated the study with a Canadian rTMS clinic and obtained almost identical results [19].

I made many attempts to convince rTMS clinics to stimulate according to the LVFT, but none would agree to do it. Therefore, I looked for a more portable method of stimulating a particular cerebral hemisphere and after a successful pilot study [20], I tried unilateral transcranial photobiomodulation, near infrared mode, over the positive hemisphere in my private practice as an off-label intervention and he found that 81% had positive clinical responses of which 62% had very remarkable responses to the treatment as illustrated in the following published transcript [21].

Before utPBM treatment
Dr.: So, looking at this angry man, tell me what you're feeling.
Pt.: Feel scared.
Dr.: How scared, say from 0 to 10?
Pt.: I'd say 8 or 9.
Dr.: Now, I notice you seem to be shaking.
Pt.: Yeah, I know. It's not because I'm trying to do it on purpose.
Dr.: I know, but that's an example of how stressed you feel.
Pt.: Yeah, extremely stressed.
Dr.: Let's try to treat you.

After 4-Minute utPBM treatment
Dr.: You're not shaking now.
Pt.: No.
Dr.: What your stress level?
Pt.: I would say 4, less than when I walked in the door. I would say less than half of what it was before the treatment, then it was a 10.

My results from my practice led me to initiate 2 double-blinded, randomized controlled trials (RCT), both of which showed highly significant positive results in participants who had a past or present history of opioid use disorder (OUD) and had on entry, a opioid craving level of at least 4 of 10 on an opioid craving scale [22]. Both studies recruited the majority of participants from Craigslist.com. None were known to the researchers. The first study was a within subject trial in which participants came for 3 sessions. The first was a treatment with either an active 4-minute, near infrared LED at 250 mW/cm^2 treatment or a sham device which was identical to the active but had foil over the LED so that the participants could feel warmth but receive no photons. The participants were tested with the LVFT as in the rTMS studies to determine which hemisphere had the more positive hemispheric emotional valence (HEV). They also used a computer test that was designed to measure their HEVs. All the treatments active and sham were given on the forehead over the cerebral hemisphere with the more positive HEV. In the first study, about half the participants received the active treatment and about half the sham at the first treatment. The second week they received the opposite treatment from that which they received at week one. The third weekly visit was a follow-up of the second week's treatment. The results show that a week

after the active treatment there was 51% decrease in OCS but only a 16% decrease after the sham treatments, and the differences were highly significant statistically with a high effect size of 0.73.

In the second study, which was funded by the National Institute on Drug Abuse and the HEAL Initiative, a group of 20 participants received the active treatment twice a week for 4-weeks with 3 follow-ups and 19 received the sham treatments. From baseline to the 3rd follow-up the active treatment group had a mean decrease in opioid cravings of 72% and the sham group had a decrease of 30% and the differences were highly significant statistically. There were also highly significant decreases in opioid use and in anxiety levels in the active group compared to sham.

In my practice, as a part of the patient's psychotherapy, the LED is placed over the negative hemisphere and this causes the same kind of negative qualitative change as the lateral vision, only larger. As with the LVFT, placing the LED over the negative hemisphere alters the patients experiences but does not cause any harm or adverse reactions and the patient is always treated on the positive side as his last treatment. The positive hemispheric changes are also much greater with the LED than with the lateralized goggles. In the first RCT, we treated the negative hemisphere before the positive hemisphere and there was a significant reduction in cravings when the positive hemisphere was stimulated compared to the negative when the participants were given the active treatment. There was no difference when the treatments to the 2 sides was with the sham treatment. In both RCTs we had no side-effects at all and in the extensive literature there have been no significant adverse reactions [23; 24]

All of the preceding discussion is to assert that in healthy controls and in patients and in study participants, people are usually of 2 minds or agencies, one associated with one brain hemisphere and one with the other. The discussion that follows will address how the findings of Dual-brain Psychology related to Dr. Sonne's questions about agency, will, consciousness, brain regions, psychopathologies, and their treatments.

2. Discussion

If the Introduction robustly supports my assertion that we are of 2 minds, each associated with one brain hemisphere, then what meaning does this have for the investigation of consciousness? The most obvious implication is that a cerebral hemisphere is capable of generating a mind. We know that patients who underwent a hemispherectomy retain their human personality [25; 26]. Wada studies in which one hemisphere at a time is anesthetized prior to brain surgery to locate language sites, often show very different personalities when one hemisphere is anesthetized and the other awake [27; 28]. Since these minds are often very different in terms of experience, will, and behavior, we need to look at the hemisphere and not the whole brain when thinking about consciousness. Each hemisphere has component parts but taken together, each is capable of a distinct self (each with the same birth date, address, and social security number). Radden [11] defines each of 2 minds within a person as each mind's having a separate, distinguishable pattern of motivation and behavior. Each would have a different pattern of physical and emotional characteristics and moral dispositions. This is exactly what I have observed in my practice and research as I described above. To this I add that each such "self" is related to one hemisphere, and I think that assertion is well supported as described above.

If we see that activating one hemisphere with lateral visual field stimulation or with UtPBM induces a dramatic change as described in the person's experience, will, choice and behavior, then how would this change in experience, will, choice, and behavior be explained? Each hemisphere resides in the same skull. The person goes through life seeing the same events, has the same blood trans versing its arteries and veins, the same parents and yet each has its own agency.

I suggest that the best way to understand this is to consider that the two hemispheres have different neural connections, electrical fields, biophoton emissions, cellular metabolism, extracellular chemicals (hormones, synaptic chemicals, growth factors), and different extra-neuronal components (glia, brain immune cells), epigenetic factors, genetic expression and regulation. All of these components interact within each hemisphere and no single factor leads to a self, but we can say that together all of these constantly changing components are together: brain information. That is the brain produces information and each mind associated with each hemisphere is the momentary outcome of its brain information. What we see is that each hemisphere has different information.

Brain information acts on different levels. Much of brain information never reaches to the level of subjective experience such as most cranial nerves and their ganglia. When we speak of agency a necessary component is subjective experience. Obviously, conscious experience is a form

of subjective experience and the concept of agency suggests that the agent has conscious experience, but we need to appreciate that subjective experience can also be beyond consciousness. Non-conscious experiences long known as the unconscious in psychiatry are experiences of which we are not conscious, but which can deeply affect us. An example would be the music score of a movie. We are often not consciously aware of the music, but it affects us. Another example would be a hypnotic suggestion [29]. In one experiment, a group of men were told under hypnosis that they were woman and that they would not remember being given the suggestion [30]. When the men came out of the trance, they all argued that they were women. Of course, psychoanalysis made famous unconscious motivations that could be uncovered but were completely unappreciated by the analysand's conscious mind. I am arguing that these unconscious motivations exist as experiences that can compel behaviors related to those experiences. The movie soundtrack is more obviously an experience that adds covertly to our experience of the movie. Of course, we are familiar with conscious experience, but as Freud and Jung and Janet pointed out [31], conscious experience sits upon non-conscious experiences.

So, when we are considering "will," each agent in each hemisphere has non-conscious experiences as well as conscious motivations that affect choice. The dual-brain model suggests that each agent has different conscious and non-conscious motivations that affect its choices and behaviors. In all cases the choice chosen will be that option, which in the view of the agent will best reduce toxic pain and enhance wellbeing. All living beings also have a tendency to choose options that enhance the prolongation of their lives, with the exception of human suicide, which can have complex motivations.

In the Dual-brain model, one hemisphere has a mind that consciously and non-consciously is more childlike and more affected by past maltreatments or traumas. So, the choices of the agent in the more immature hemisphere will tend to make choices that may create more pain. The person may choose gambling or aggressive, destructive behaviors or substance abuse. Each of these choices might seem to an outside observer to indicate a will to induce pain, but from psychiatry we see that a more childlike mind with a history of trauma may make choices that lead to destructive behavior such as heroin addiction which is destructive and painful and not life sustaining. But a child's mind thinks differently from an adult's mind. It tends to over generalize, to urgently anticipate a return of the trauma even when its source has been removed. It tends to see few constructive options and often seeks solutions that are not intelligent. A more mature mind is able to bear and process past traumas and can envision a life without the past traumas and can see many constructive options that can effectively enhance wellbeing and the sustenance of its life.

This shows that psychopathology comes out of the traumatized, immature mind. There are always compelling (childlike) reasons for the destructive choices and therefore the resultant psychopathology, but the reasons are the reasons of a traumatized (defined broadly as any harmful experience that the child encounters) childlike mind which knows that the harm will be repeated and is unavoidable. When the immature hemisphere dominates, such a person will experience depression (feelings of being stuck in hopeless traumatic pain). Depression will induce choices that are different from a mind in a state of maturity and wellbeing. All affective state are motivational states, and all have a logic. For example, anxiety always results from an anticipated danger. An immature mind will anticipate danger differently from a mature mind and often the anticipated danger is not consciously apparent but relates to a very negative experience that has not been processed and persists in the immature hemisphere. The treatment then is to uncover the perspective of the immature mind and help it to realize that it is safer and more valuable than it believed. In Dual-brain Psychology, the healthy side is enlisted to aid the more troubled side. The relevant brain areas are the collective parts of the two hemispheres which then compete for dominance or find a constructive way to cooperate.

Still, this does not yet address the physical nature of subjective experience. I believe that the brain processed information is in itself is no more conscious than a bacterium or a plant. I assert that the complex brain information from each hemisphere does not possess subjective experience any more than the New York Times. I believe that brain information must interact with a fundamental quantum field that I have called the "subjective field" in order for its information to achieve experience, either non-consciously or consciously. I have discussed this in greater detail in an earlier paper [32], but to summarize, I suggest that possibly brain information gets translated into codes expressed ultimately in biophotons which interact through quantum superpositions and reductions with the quantum subjective field and that that interaction confers subjectivity upon the

specific brain information that is related to the biophoton emissions. The resulting subjective experiences of the brain information impacts the brain. We know that experiences impact the brain. The same event, however, will impact the 2 hemispheres, with their different sets of brain information and processing apparatuses will experience the event very differently and have different impacts on the brain. utPBM sends photons into the brain and induces significant changes subjective experiences as described in the introduction. Do the irradiated photons, from UtPBM, affect or amplify a biophoton code from the irradiated hemisphere, stimulating an enhancement of the dominance of that hemisphere and its associated subjective experiences and behaviors?

I have not yet addressed conscious subjective experiences and the self, which always is conscious. I believe that non-conscious experiences come out of an interaction between certain brain information and the subjective field. Conscious experiences are a step further than non-conscious experiences, and I feel that it must entail a similar but additional quantum field which I call the "quantum awareness field"[32]. The self (one in each hemisphere) is a complex area or construct of fields and neural connections, that emits biophoton codes [33] and is non-conscious until it interacts with the quantum awareness field to achieve consciousness. The conscious experiences of the self effect the brain. All consciousness goes through the self (which is the agency) and each hemisphere has its own self. The experiences of the conscious self are the enlivenment of each self's brain information. The selves can struggle for dominance or can cooperate. Usually one self is more in control and present but is always influenced by the other to a greater or lesser degree. A more mature self may dominate until the more childlike self is stimulated and empowered by some events and the person can quickly shift from a mature personality to one that is immature and that on a compelling impulse (first a non-conscious experience) may decide to gamble or use illicit substances that its mature side knows from experience, will not end well.

All things being equal, the more mature self is generally more moral in so far as it is more likely to choose behaviors and dispositions that lead its and its group's wellbeing. So, morality has to do with one's efforts to promote his mature mind's dominance [34].

3. **Conclusions**

I have discussed Dr. Sonne's questions from the perspective of Dual-Brain Psychology and believe that each brain hemisphere relates to a different agent, and because this occurs within one head, it offers insights into subjective experience (conscious and non-conscious), brain information, agency, will and behavior. I discussed briefly how this relates to psychopathology and its treatment.

Author Contributions: FS conceived of and wrote the paper and has agreed to publish this version of the paper.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Written informed consent has been obtained from the patients to publish this paper

Acknowledgments: The author acknowledges the advice and suggestions of William P. Seltzer.

Conflicts of Interest: The author is the Founder of MindLight, LLC, which intends further research and commercialization of the methods and device described in the introduction of the paper. The author has been issued 2 US patents which cover the method of unilateral tPBM to a positive hemisphere as described in this study: U.S. Patent No. 8303636, Methods for treating psychiatric disorders using light energy. Issued 11/06/2012, and U.S. Patent No. 8574279, Methods for treating psychiatric disorders using light energy. Issued 11/05/2013. He has filed on December 5, 2019, a US patent application, #16/703,937, Method and Apparatus for Determining Hemispheric Emotional Valence, and on August 3, 2020, he filed a US provisional patent application #63060177, Enhanced Treatment of Brain Disorders Utilizing Coordinated Negative Suppressive Stimulation and Related Devices Designed to Achieve Treatment. The author has no other conflicts of interest.

References:

[1] F. Schiffer, Cognitive activity of the right hemisphere: possible contributions to psychological function. Harv Rev Psychiatry 4 (1996) 126-38.

[2] F. Schiffer, M. Teicher, and A. Papanicolaou, Evoked potential evidence for right brain activity during the recall of traumatic memories. J Neuropsychiatry Clin Neurosci 7 (1995) 169-175.

[3] F. Schiffer, Can the Different Cerebral Hemispheres Have Distinct Personalities? Evidence and Its Implications for Theory and Treatment of PTSD and Other Disorders. J Trauma Dissociation 1 (2000) 83-104.

[4] F. Schiffer, Of Two Minds: The Revolutionary Science of Dual-Brain Psychology, The Free Press, New York, 1998.

[5] R.W. Sperry, E. Zaidel, and D. Zaidel, Self recognition and social awareness in the deconnected minor hemisphere. Neuropsychologia 17 (1979).

[6] F. Schiffer, E. Zaidel, J. Bogen, and S. Chasan-Taber, Different psychological status in the two hemispheres of two split brain patients. Neuropsychiatry Neuropsychol Behav Neurol 11 (1998) 151-156.

[7] W. Wittling, and R. Roschmann, Emotion-related hemisphere asymmetry: Subjective emotional responses to laterally presented films. Cortex 29 (1993) 431-448.

[8] W. Wittling, and M. Pfluger, Neuroendocrine hemisphere asymmetries: salivary cortisol secretion during lateralized viewing of emotion-related and neutral films. Brain Cogn 14 (1990) 243-65.

[9] W. Wittling, and E. Schweiger, Neuroendocrine brain asymmetry and physical complaints. Neuropsychologia 31 (1993) 591-608.

[10] F. Schiffer, Psychotherapy of nine successfully treated cocaine abusers: techniques and dynamics. J Subst Abuse Treat 5 (1988) 131-7.

[11] J. Radden, Divided Minds and Successive Selves: Ethical Issues in Disorders of Identity and Personality Oxford University Press, Oxford, 1996.

[12] L. Schechter, Self-Consciousness and 'Split' Brains:
The Minds' I, Oxford University Press, Oxford, 2018.

[13] R. Schwartz, Internal Family Systems Therapy, Guliford, New York, 1995.

[14] F. Schiffer, Affect changes observed with right versus left lateral visual field stimulation in psychotherapy patients: possible physiological, psychological, and therapeutic implications. Compr Psychiatry 38 (1997) 289-295.

[15] F. Schiffer, C.M. Anderson, and M.H. Teicher, Electroencephalogram, bilateral ear temperature, and affect changes induced by lateral visual field stimulation. Compr Psychiatry 40 (1999) 221-5.

[16] F. Schiffer, C. Anderson, and M. Teicher, EEG, Bilateral Ear Temperature, and Affect Changes Induced by Lateral Visual Field Stimulation. Compr Psychiatry 40 (1999) 221-225.

[17] F. Schiffer, F. Mottaghy, R.P. Vimal, P.R. PF, R. Cowan, A. Pascual-Leone, M. Teicher, E. Valente, and M. Rohan, Lateral visual field stimulation reveals extrastriate cortical activation in the contralateral hemisphere: an fMRI study. Psychiatry Res 131 (2004) 1-9.

[18] F. Schiffer, Z. Stinchfield, and A. Pascual-Leone, Prediction of Clinical Response to Transcranial Magnetic Stimulation for Depression by Baseline Lateral Visual Stimulation. Neuropsychiatry, Neuropsychology, and Behavioral Neurology 15 (2002) 18-27.

[19] F. Schiffer, I. Glass, J. Lord, and M.H. Teicher, Prediction of clinical outcomes from rTMS in depressed patients with lateral visual field stimulation: a replication. J Neuropsychiatry Clin Neurosci 20 (2008) 194-200.

[20] F. Schiffer, A.L. Johnston, C. Ravichandran, A. Polcari, M.H. Teicher, R.H. Webb, and M.R. Hamblin, Psychological benefits 2 and 4 weeks after a single treatment with near infrared light to the forehead: a pilot study of 10 patients with major depression and anxiety. Behav Brain Funct 5 (2009) 46.

[21] F. Schiffer, Unilateral Transcranial Near Infrared Treatments for Opiate Addiction in a Clinical Practice. . Frontiers in Psychiatry: Addictions Section 11 (2020) 1-12.

[22] F. Schiffer, Reichmann, W., Flynn, E., Hamblin, M, Mccormack, H., A Novel Treatment of Opioid Cravings with an Effect Size of .73 for Unilateral Transcranial Photobiomodulation over Sham. Frontiers in Psychiatry, Addiction Section (2020).

[23] M.R. Hamblin, Shining light on the head: Photobiomodulation for brain disorders. BBA Clin 6 (2016) 113-124.

[24] P. Cassano, S.R. Petrie, M.R. Hamblin, T.A. Henderson, and D.V. Iosifescu, Review of transcranial photobiomodulation for major depressive disorder: targeting brain metabolism, inflammation, oxidative stress, and neurogenesis. Neurophotonics 3 (2016) 031404.

[25] A.S. Nahum, and F.J. Liegeois, Language after childhood hemispherectomy: A systematic review. Neurology 95 (2020) 1043-1056.

[26] R.A. McGovern, N.V.M. A, L. Jehi, R. Busch, L. Ferguson, A. Gupta, J. Gonzalez-Martinez, E. Wyllie, I. Najm, and W.E. Bingaman, Hemispherectomy in adults and adolescents: Seizure and functional outcomes in 47 patients. Epilepsia 60 (2019) 2416-2427.

[27] G.L. Ahern, A.M. Herring, J. Tackenberg, J.F. Seeger, K.J. Oommen, D.M. Labiner, and M.E. Weinand, The Association of Multiple Personality and Temporolimbic Epilepsy: Intracarotid Amobarbital Test Observations. Archives of Neurology 50 (1993) 1020-1025.
[28] K.E. Stabell, S. Andresen, S.J. Bakke, H. Bjornaes, H.M. Borchgrevink, E. Heminghyt, and G.K. Roste, Emotional responses during unilateral amobarbital anesthesia: differential hemispheric contributions? Acta Neurol Scand 110 (2004) 313-21.
[29] J.R. Martin, and E. Pacherie, Alterations of agency in hypnosis: A new predictive coding model. Psychol Rev 126 (2019) 133-152.
[30] K.M. McConkey, A. Szeps, and A.J. Barnier, Indexing the experience of sex change in hypnosis and imagination. Int J Clin Exp Hypn 49 (2001) 123-38.
[31] H.F. Ellenberger, The discovery of the unconscious : the history and evolution of dynamic psychiatry, Fontana, London, 1994.
[32] F. Schiffer, The physical nature of subjective experience and its interaction with the brain. Med Hypotheses 125 (2019) 57-69.
[33] V. Salari, H. Valian, H. Bassereh, I. Bokkon, and A. Barkhordari, Ultraweak photon emission in the brain. J Integr Neurosci 14 (2015) 419-29.
[34] F. Schiffer, Consciousness and Good and Evil, The Science of Consciousness 2020, Tuscion, AZ, 2020, pp. 251.