Once Upon a Time There Was The Traditional Psychotherapy And Now Our New Look On Neuroscience Oriented Psychotherapy

The Psychosocial Genomic Stress Related Cancer Connection

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Editorial

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ONCE UPON A TIME THERE WAS
THE TRADITIONAL PSYCHOTHERAPY
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ON NEUROSCIENCE ORIENTED
PSYCHOTHERAPY

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Traditional psychotherapy deals primarily with Observing Consciousness. The domain of “Traditional Psychotherapy,” the way we were taught in psychotherapy schools, is to dialogue with patients where we discuss their “problems” and world view with human language. We talk with words, sentences, figures of speech, case histories, narratives, stories, myths, psychological and spiritual metaphors etc. And then again we analyze, advise, create strategies for better living etc. Even the good Ericksonian psychotherapist, like most other schools of psychotherapy, talks to patients in their own language to optimize rapport and understanding. Next to what is done by other approaches more a good Ericksonian therapist follows Milton Erickson’s advice by immediately picking up and utilizing the patient’s actual words, points of view, figures of speech, attitudes, etc. However, from our current neuroscience perspective, there are limitations to these early paradigms of “Traditional or Narrative Psychology.” Some of the major limitations of traditional psychology is that our psychotherapy teachers knew nothing of Neuroscience in facilitating mind-body healing via so-called, “psychotherapy.” The discovery and research in these area has taken place only within the past 10 or 20 years! That is the reason because we need to update most traditional schools of psychotherapy by introducing a new concept of Psychotherapy taking into consideration the Neuroscience, the Epigenetics and Psychosocial and Cultural Genomics (Rossi, 2002). A new way to understand the psychotherapy expands the parameters of “traditional psychotherapy” improving the power of our clinical interventions.

In the last years, epigenetics and functional genomics methods to evaluate the genomic effects and mechanisms of mind-body therapies have increasingly grown. DNA microarray technology has been used to show the involvement of the stress response pathways both in the case of disease and stress and as an effect of mind-body therapies. For example, in our research, the DNA samples obtained from 20 individuals who experienced a mind-body therapeutic protocol (MBT-T), were analyzed from the bio-molecular point of view by means of an epigenetic marker (MSAP molecular tool), in order to estimate the different status of methylation. The subjects were compared at 3 different times: prior to, 1 hour after, and 24 hours after the treatment. The Mind-Body Transformations Therapy-MBT-T is an evidence-based method for the treatment of mind-body illnesses and a therapeutic approach for facilitating human resilience and resourcefulness for health and rehabilitation characterized by a structured protocol based on the four-stage creative process, the ultradian rhythms, the basic rest-activity cycle (BRAC), and the neuronal and biological plasticity (Rossi et al. 2006).

MBT-T protocol can be used in a group setting or in individual sessions, it is included among mind-body therapies and uses in a new way the last epigenetic and neuroscientific findings in order to modulate the expression of genes related to an overall improvement of quality of life promoting resilience, reducing symptoms of the stress related disorders, and facilitating mind-body healing (Rossi et al., 2008; Atkinson et al., 2010; Cozzolino et al., 2015). The mechanisms of this method is based on the use of the natural Activity-Rest physiologic cycle (BRAC); the ultradian biological rhythms; the biological plasticity showed by our genes expression and the relaxation response (RR). In sum the Mind-Body Transformations Therapy (MBT-T) is a therapeutic protocol which makes use of our natural biological
rhythms to set the best conditions to activate inner mind-body healing processes treating the stress related dysfunctions in psychiatry, psychology and rehabilitation (Cozzolino et al. 2015). The molecular data were processed through different biostatistics approaches: the Bayesian statistics approach, in order to estimate the clustering membership of the subjects (Structure), and the statistical estimation of the DNA methylation level (MSAP statistical tool). The structure analysis revealed that the clusters and their membership changed among the three time points moving from higher heterogeneous distribution to higher homogeneous clusters. Before the treatment, the subjects’ epigenetic profiles were heterogeneous; after the mind-body treatment we found that epigenetic profiles converged to homogeneous DNA methylation status. The structure analysis revealed that the clusters and their membership changed among the three time points moving from a higher heterogeneous distribution to a higher homogeneous cluster. The results showed that 1 hour after and 24 hours after the MBT-T treatment the number of meta-populations decreased from three to two. Moreover, the membership was more homogeneous at time C than at time B. In fact, before the treatment the subjects’ epigenetic profiles were heterogeneous whereas after the mind-body treatment we found that the epigenetic profiles converged toward a homogeneous DNA methylation status. These results suggest that the DNA epigenetic status of the subjects was affected by the MBT-T treatment. This study represents a preliminary research in the field of the relationship between mind-body therapeutic treatments and epigenetic responses. In our opinion this kind of research constitutes an innovative approach to genomic aspects of mind-body therapies. It represents a new to mean the psychotherapeutic intervention opening for the future many innovative develops in the field of health.
References


Abstract

Current research in the psychosocial genomics of stress is achieving a quiet but significant breakthrough in understanding the fundamentals of the etiology and proliferation of a variety of human cancers. This research is a profound breakthrough in the theoretical and practical advances for the amelioration and cure of cancer. It is now evident that prostate, lung, and breast cancer have a common source in the stress-related cancer connection via angiogenic metabolism nerve-endothelium interactions within the molecular tumor microenvironment. Recent reports have emphasized that medical treatment with nonselective β-blockers could inhibit this tumor-associated angiogenesis that fuels such cancer growth. Several studies have elucidated the role of neuroendocrine regulation of downstream physiological and biological pathways relevant to cancer development, also demonstrating how subjective stressful experiences, defined by literature bio-behavioral factors (Antoni et al., 2012), may influence tumor growth and progression, via sympathetic nervous system (SNS) and hypothalamic-pituitary-adrenal axis (HPA) activation. Otherwise, the inflammatory process was recently associated to neoplasm transformation and tumor growth (Mantovani et al., 2008; Costantini et al., 2009; Allavena e al., 2008). When the inflammatory stimulus persists, the inflammation becomes chronic, and chronic inflammation has been shown to be involved in all the three phases of tumor development: initiation, progression and metastasis. Functional genomics studies show interesting connections between mind-body therapies and immune system. In particular, recent studies have shown that mind-body therapies are able to generate an overall reduction of the expression of genes related to inflammatory response, such as NF-κB, and to regulate numerous pathways involved in apoptosis and cell proliferation (Antoni, 2013; Dusek e al., 2008). So these research have documented how the implementation of specific protocols of psychosocial intervention and mind-body therapies are able to modify leucocyte transcriptional dynamics in the terms of reducing the inflammation and increasing the cell immunity, counteracting tumor growth-promoting processes (increased angiogenesis, migration and invasion, and inflammation) and tumor defense processes (decreased cellular immunity) relevant for cancer progression, improving quality of life (Antoni et al. 2013) and survival in cancer patients. This paper seeks to answer the question: Could we use psychological and behavioral methods of stress reduction as well as the medically recommended β-blockers to reduce chronic stress and therefore ameliorate recovery from such cancers? Our answer to this fundamental question is to introduce Feynman’s Path Integral approach to an integrated quantum field theory of physics, math, biology and psychological model of therapeutic consciousness, and cognition as well as Erickson’s Burden of Effective Psychotherapy. Our paper proposes that mind-body treatment may achieve similar therapeutic effects in cancer by reducing psychosocial genomic and cultural stress at their daily and hourly source in the 90–120-minute Basic Rest-Activity Cycle (BRAC) and the 4-Stage Creative Cycle.

Introduction

Therapeutic Consciousness and Cognition for the Amelioration and Cure of Stress-Related Cancer

It’s been almost two generations since present Richard Nixon declared in 1971 “The “War on Cancer.” Nevertheless, the International Agency for Research on Cancer’s online database, GLOBOCAN, estimates a substantive increase to 19.3 million new cancer cases per year by 2025, due to multiple factors. So while we certainly have not yet won the war, the research cited herein is at least the beginning of a new theory and methodology for curing cancer. In fact, the cancer represents a great challenge to the scientific community and we can only fight using all our capacity of manage the complexity of it. For two generations it has seemed to be an impossible to win a war within our own genes – It would seem that everyone who had cancer had a unique disease. The current breakthrough now appears to imply that while each cancer may in fact have unique genomic sources, they may all have a simmer etiology in the psychosocial genomic origin of chronic stress that fuels the growth and progression of cancer. If current and future research continues to document the
psychosocial and cultural origin of chronic stress as major source of cancer, we must change our strategy for winning this war. For this reason, in literature, we note the beginning of many research projects oriented toward an integration of care based on psychological and medical aspects simultaneously (Antoni, 2013; Antoni et al. 2012). Furthermore, recent innovative epistemological proposals bring to the scientific community the translation of a mind-body approach to the concept of human health that takes into account physical, psychological and genomic aspects of health and disease. Within this epistemological framework, some studies have developed innovative genomic analysis studying how gene expression can be modulated in relation to mind-gene communication and which genes are involved in the therapeutic success. Moving in this epistemological perspective we are implementing the Psychosocial Genomics Research Program in Oncology (Cozzolino et al. 2015; Cozzolino, 2016). Our principal expectation is related to the possibility this proposal offers to provide an innovative, more efficient, effective, sustainable and personalized therapeutic strategy for treating cancer that takes into account differences on psychosocial and biological/genomic level both. This is also related to the fact that our mind-gene therapy addresses the co-morbidity between cancer and mental disorders, such as depression and anxiety, that often result in the practice of poly-pharmacy especially frequent in older patients. Despite the great efforts of biomedical research, the mortality rate is still too high and so are the related costs. This PSGPO program has several objectives:

• to translate the most recent findings in the field of neuroscience, genomic research and mind-body medicine into cancer clinical practice through the conduct of randomized clinical trials aimed at demonstrating the greater effectiveness and sustainability of mind-body approach compared to traditional approaches;
• to understand the determinants of the therapeutic outcome through the study of the genome that could clarify the molecular mechanisms underlying the clinical efficacy of a mind-body approach on cancer patients;
• to identify and validate genomic-based classifiers that act as potential predictors of the clinical benefit in order to promote the personalization and optimization of treatment;
• to define guidelines and develop an effective protocol of intervention shared between different countries to be used in clinical practice for treating cancer patients;
• to exploit a great amount of genomic and research data generated by the projects in order to maximize their access and facilitate the dialogue between researchers and clinicians.

The translation of research findings into clinics and in general into public healthcare settings improving health outcomes would mean also to reduce health inequalities and promote active and healthy ageing that is closely related to chronic diseases burden. Such an ambitious objective would be granted through the cooperation of interdisciplinary research teams and the integration of different approaches (biological, psychological, medical, genomic, bioinformatics) realizing in this way a truly transdisciplinary approach to cancer treatment.

We know that the chronic diseases, such as cancer, are complex conditions determined by a multiplicity of factors and so rarely can be treated by only surgical and/or pharmacological approaches. Treating cancer effectively means also taking into account the psychological and emotional challenges patients cope with. In particular when emotional distress becomes a mental disorder (e.g. depression, anxiety acc.) a comprehensive and cost-effective approach to treat co-morbidity is required also to avoid polypharmacy that is a frequent practice especially in older patients. To date, several studies have elucidated the role of neuroendocrine regulation of downstream physiological and biological pathways relevant to cancer development, also demonstrating how subjective stressful experiences, defined by literature bio-behavioral factors (Antoni et al., 2012), may influence tumor growth and progression, via sympathetic nervous system (SNS) and hypothalamic-pituitary-adrenal axis (HPA) activation. Based on these findings, some international groups tested another hypothesis too, demonstrating that the application of specific psychosocial intervention protocols and Mind-Body practices were able to modify leucocyte transcriptional dynamics in cancer patients (Antoni, 2013; Dusek, 2008), counteract tumor growth-promoting processes (increased angiogenesis, migration and invasion, and inflammation) and tumor defense processes (decreased cellular immunity) relevant for cancer progression, improving quality of life (Antoni et al. 2013) and survival in cancer patients.

For this evidences we need to heal the chronic sources of stress, conflict, corruption and war within our own psychological nature. It will require a revolutionary shift in our social and spiritual values. We must cultivate empathy, compassion and peace as our most valued virtues for the pursuit of health and wellbeing for all.

Psychosocial Genomics Research Program in Oncology (PSGPO) aims to integrate psychological and biomedical knowledge on the base of neuroscientific findings, genomic research and mind-body medicine. This is the reason because it is so important reflecting on following new important findings in the oncological field. These questions could open new way to understand the meaning of human cancer.

1. Could we use psychotherapy and stress reduction as well as the medically recommended β-blockers to reduce chronic stress to ameliorate recovery for a variety of human cancers?
2. How important is the tumor environment?
3. How much is the transduction of NFkB mediated
signal involved in the regulation of viral replication, autoimmune diseases, inflammatory response, tumorigenesis and apoptosis?

4. The key role of the stress like neuro-epigenetic regulator.

Regarding the first question, Current research reports published in high impact scientific and medical journals affirm that it may be possible as the following quotes indicate.


“Common wisdom holds that stress is not good for cancer patients. However, stress can be difficult to avoid, considering that both the diagnosis of cancer and the associated treatments are quite challenging for the mind and body. Nilsson et al. (2017) investigated the effects of stress hormones during the treatment of non-small lung cancer. This phenomenon in non–small cell lung cancer, providing insights into the underlying mechanism and a potential intervention. Stress hormones activate β2-adrenergic receptors on cancer cells, triggering a signaling cascade that promotes tumor resistance to EGFR (epidermal growth factor receptor) inhibitors, a key therapy for this disease. Conversely, β-blockers, a common class of drugs used in humans, blocked this mechanism of resistance and may become a useful adjunct to lung cancer therapy regimens. (Italics added here.)


Epidermal growth factor receptor (EGFR) tyrosine kinase inhibitor (TKI) resistance mediated by T790M-independent mechanisms remains a major challenge in the treatment of non-small cell lung cancer (NSCLC). We identified a targetable mechanism of EGFR inhibitor resistance whereby stress hormones activate β2-adrenergic receptors (β2-Ars) on NSCLC cells, which cooperatively signal with mutant EGFR, resulting in the inactivation of the tumor suppressor, liver kinase B1 (LKB1), and subsequently induce interleukin-6 (IL-6) expression. We show that stress and β2-AR activation promote tumor growth and EGFR inhibitor resistance, which can be abrogated with β-blockers or IL-6 inhibition. IL-6 was associated with a worse outcome in EGFR TKI-treated NSCLC patients, and β-blocker use was associated with lower IL-6 concentrations and improved benefit from EGFR inhibitors. These findings provide evidence that chronic stress hormones promote EGFR TKI resistance via β2-AR signaling by an LKB1/CREB (cyclic adenosine 3′,5′-monophosphate response element-binding protein/IL-6-dependent mechanism and suggest that combinations of β-blockers with EGFR TKIs merit further investigation as a strategy to abrogate resistance. (Italics added here.)

(3) Nerves switch on angiogenic metabolism: Adrenergized blood vessels contribute to prostate cancer progression (Hayakawa & Wang 2017).

Nerves release neurotransmitters to regulate most physiologic functions in the body. Recently, it has been recognized that nerves play dominant roles in organogenesis and tissue regeneration. In addition, growing evidence suggests that cancer development in a variety of tissues is controlled by an assortment of nerve-mediated signals, including neurotransmitters and other molecules. The key molecules depend on the organ and the context, but the targets of neurotransmission appear to include both stem cells and the surrounding stromal cells. Both adrenergic and cholinergic nerves promote prostate cancer development, at least in part, by activating stromal cells ... Zahalka, et al. (2017) expand on their previous findings by elucidating the molecular mechanism of neurotransmission in prostate cancer, revealing that noradrenaline released from cancer-associated nerves triggers angiogenesis and thus cancer progression. (See Figure 1. Italics added here.)

(4) Zahalka, et al. (2017) announce their breakthrough in title of their Science paper as “Adrenergic nerves activate an angio-metabolic switch in prostate cancer,” which they summarize in their abstract and first paragraph as follows.

“Nerves closely associate with blood vessels and help to pattern the vasculature during development. Recent work suggests that newly formed nerve fibers may regulate the tumor microenvironment, but their exact functions are unclear. Studying mouse models of prostate cancer, we show that endothelial β-adrenergic receptor signaling via adrenergic nerve–derived noradrenaline in the prostate stroma is critical for activation of an angiogenic switch that fuels exponential tumor growth. Mechanistically, this occurs through alteration of endothelial cell metabolism. Endothelial cells typically rely on aerobic glycolysis for angiogenesis. We found that the loss of endothelial Adrb2, the gene encoding the β2-adrenergic receptor, leads to inhibition of angiogenesis through enhancement of endothelial oxidative phosphorylation. Codeletion of Adrb2 and Cox10, a gene encoding a cytochrome IV oxidase assembly factor, prevented the metabolic shift induced by Adrb2 deletion and rescued prostate cancer progression. This cross-talk between nerves and endothelial metabolism could potentially be targeted as an anticancer therapy.” (p. 321, italics added here.)
Nerve–endothelium interaction in the tumor microenvironment

Nerves control the multistep endothelial cell metabolic pathway in cancer through $\text{ADR} \beta_2$, NADH, nicotinamide adenine dinucleotide reduced form; NAD, nicotinamide adenine dinucleotide; ADP, adenosine 5'-diphosphate; ATP, adenosine triphosphate.

1. Nerves produce noradrenaline in the tumor microenvironment.

2. Endothelial cells express $\text{ADR} \beta_2$.


4. Up-regulation of Coa6 biases endothelial cell metabolism toward oxidative phosphorylation in the mitochondria in a COX10-dependent manner.

5. This metabolic switch in endothelial cells triggers angiogenesis and promotes tumor progression.

Figure 1: A research breakthrough that identifies a new psychophysiological/psychosomatic paradigm of mind/body communication at the cellular and epigenetics level of the etiology, progression, amelioration and cure of varieties of cancers (with permission Hayakawa & Wang, 2017, p. 306).
The second question is: how important is the tumor environment?

The acquisition of new knowledge regarding molecular characteristics of the tumor and the peritumoral microenvironment could significantly impact the development of new therapeutic strategies (Andreopoulou E, 2008; Guarneri V, 2009). In fact, the tumor and the surrounding microenvironment are closely interconnected and interact constantly: on the one side the tumor has an influence on the microenvironment by releasing extracellular signals, on the other side cells of the microenvironment affect the growth and evolution of cancerous cells.

In this scenario, where cancerous cells and microenvironment are co-protagonists, the inflammatory process was recently associated to neoplasm transformation and tumor growth (Mantovani A, 2008; Costantini S, 2009, Allavena P, 2008). Inflammation is a physiological process in response to acute tissue damage resulting from multiple causes such as ischemic damages, infections, exposure to toxins, chemical irritation and/or different types of trauma (Lu H, 2006; Bondar T, 2013). It represents a protection mechanism of the organism intended to removing the noxious stimuli and starting the tissue healing process. When the inflammatory stimulus persists, the inflammation becomes chronic. In the inflamed site a complex signaling network is realized, involving a large number of growth factors, cytokines, different types of leukocytes, lymphocytes, other inflammatory cells and chemokines.

Chronic inflammation has been shown to be involved in all the three phases of tumor development: initiation, progression and metastasis. Initially, the inflammation plays a role in tumor suppression, stimulating an antitumor immune response, afterwards it seems to stimulate tumor growth (Mantovani A, 2008; Abjo A, 2012). The intensity, duration and nature of the inflammation may explain this apparent contradiction. An important aspect of tumor microenvironment is the cytokine-mediated communication between tumor and peritumoral cells, in fact cytokines and chemokines show many activities that allow cell-cell communication (Szlosarek P, 2006). One of the main differences between normal cells and tumor cells is represented by the continuous proliferation of the latter, which soon determines a deficiency of nutrients and oxygen; the state of hypoxia created during tumor growth induces many cytokines and chemokines (Mancino A, 2008; Germano G, 2008). The control of cytokines production is a highly complex and multifactorial mechanism; therefore, it is difficult to identify the role of a single cytokine in the pathogenesis of the disease.

The complexity of cytokines system can be clarified by analyzing cytokines panels, that is studying the cytokinome which represents the complex network of interactions utilized to regulate both the cytokines synthesis and the similar receptors. The cytokinome provides an overview of the antagonistic and synergistic interactions among different cytokines, which involve many and often redundant pathways (Costantini S, 2010).

The third question is how much is the transduction of NFkB mediated signal involved in the inflammatory response, tumorigenesis and apoptosis?

The transduction of NFkB mediated signal is involved the regulation of viral replication, autoimmune diseases, inflammatory response, tumorigenesis and apoptosis. Also, in our previous paper, NFkB pathway was one of the most enriched by differentially expressed genes. Given its involvement in numerous other pathways and taking into account the scientific literature and the previous data, it represents the optimal candidate for our experiments. In this context it is important to highlight that, being NFkB a transcription factor which plays a central role in the induction of pro-inflammatory genes expression, also cytokines are included in its mechanism of action. They are a family of small molecules which are implicated in the chronic inflammatory process that leads to cancer. In fact, neutrophils which represent the main leukocyte type present in the inflammatory site during the initial phases, take an active part both in the phase of activation and in the resolution of inflammatory process thanks to the ability of synthesizing and releasing both pro-inflammatory (TNF-alfa, IL-1beta, CXCL8) and anti-inflammatory (IL-1ra, sTNFRs) cytokines and chemokines. It follows that the complexity of the role played by cytokines can be studied only analyzing large panels of them, where the “cytokinome” represents the totality of this wide protein family with their complex network of intra and extra-cellular interactions.

4) The key role of the stress like neuro-epigenetic regulator.

In an important review on this focus the Hunter and McEwen says:

“The brain is the central organ of the body’s response to and perception of stress. Both the juvenile and the adult brain show a significant capacity for lasting physiological, structural and behavioral plasticity as a consequence of stress exposure. The hypothesis that epigenetic mechanisms might lie behind the lasting effects of stress upon the brain has proven a fruitful one. In this review, we examine the growing literature showing that stress has a direct impact on epigenetic marks at all life history stages thus far examined and how, in turn, epigenetic mechanisms play a role in altering stress responsiveness, anxiety and brain plasticity across the lifespan and beyond to succeeding generations. In addition, we will examine our own recent findings that stress interacts with the epigenome to regulate the expression of transposable elements in a regionally specific fashion, a finding with significant implications for a portion of the genome which is tenfold larger than that occupied by the genes themselves” (Hunter & McEwen, 2013)
How can we as researchers and clinicians use all this findings?

Only in these last years we have glimpsed the strategies of stress reduction that could win the war against cancer and we can state it thanks to the following knowledges and findings.

**The importance of stress reduction through mind-body therapeutic approach**

Recent research carried out by internationally renowned scientists on patients with breast cancer highlight the importance of juxtaposing next to the already established oncology procedures, also integrated mind-body clinical protocols which take into account at the same time physical, psychological and genomic aspects of oncologic disease.

Functional genomics studies show interesting connections between mind-body therapies and immune system. In particular, recent studies have shown that mind-body therapies are able to generate an overall reduction of the expression of genes related to inflammatory response, such as NFκB, and to regulate numerous pathways involved in apoptosis and cell proliferation (Antoni, 2013; Dusek, 2008). The transduction of NFκB mediated signal is implicated in the regulation of viral replication, autoimmune diseases, inflammatory response, tumorigenesis and apoptosis.

Recent studies show how genes interact with environment to modulate behavior and cognition of health and illness. These interactions involve a particular class of genes usually described as activity or experience dependent genes, which can be activated by signals coming from physical and...
psychosocial environment modulating our complex physiological and psychological functions (Rossi, 2002; Lloyd & Rossi, 1992, 2008). An innovative area of research studies how psychosocial stressors can influence gene expression. This kind of research takes advantages of innovative molecular biology procedures such as DNA microarrays and RT-PCR analysis. In this branch of studies chronic diseases and tumors are always more understood as the pathologic result of multifactorial interactions between genes and environment.

Transcriptional genomic research on leucocytes has allowed to identify a common pattern which increases the expression of pro-inflammatory genes in the case of diseases and/or stress. Consistent with other studies, we propose that just as stress is able to activate a specific inflammatory pattern, in the opposite direction positive psychosocial experiences as well as relaxation response and mind-body balance oriented therapies can affect the same pattern reducing the level of expression of pro-inflammatory genes related to stress. In fact, recent research (Antoni, 2013, Dusek 2008; 2013) have documented how the implementation of specific protocols of psychosocial intervention and mind-body therapies are able to modify the transcriptional dynamic in leucocytes in the terms of reducing the inflammation and increasing the cell immunity, counteracting relevant processes for the tumor growth and progression. These processes in turn lead to a better quality of life (Antoni et al. 2013) and a greater survival in cancer patients (Andersen, 2008). Recent studies show how a certain number of mind-body therapies are able to reduce stress eliciting the relaxation response (RR) which in turn modulates genes expression. Other studies show a reduced expression of genes associated with the inflammatory response and the pathways related to stress (Dusek, 2008), as well as they demonstrate that a good Stress Management is able to reduce the expression of genes related to the biochemical inflammatory response in women with breast cancer (Antoni, 2012).

A set of figures and concepts outline a 100-year journey to understand the psychosomatics of stress, creativity and mind/body healing.

The ultradian stress response VS the ultradian healing response
As we always have a good reason to be happy or to be unhappy in the life so we always have a good reason to respond in a stressed way or in a healthy way to life. Following we can understand the important difference of this choice on health and in the life.

Table One: A summary of the contrast between the qualia experienced during the Ultradian Healing Response, when people take appropriate 20-minute breaks through the day, versus the Ultradian Stress Response leading to the psychosomatics of stress-related cancer as documented by current research cited in this paper.

<table>
<thead>
<tr>
<th>THE ULTRADIAN HEALING RESPONSE</th>
<th>THE ULTRADIAN STRESS RESPONSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognition Signals</td>
<td>1. Take-a-Break Signals</td>
</tr>
<tr>
<td>An acceptance of nature’s call for your need to rest and recover your strength and well-being leads you into an experience of comfort and thankfulness.</td>
<td>A rejection of nature’s call for your need to rest and recover your strength and well-being leads you into an experience of stress and fatigue.</td>
</tr>
<tr>
<td>2. Accessing the Deeper Breath</td>
<td>2. High on Your Hormones</td>
</tr>
<tr>
<td>A spontaneous deeper breath comes all by itself after a few moments of rest as a signal that you are slipping into a deeper state of relaxation and healing. Explore the deepening feeling of comfort that comes spontaneously. Wonder about the possibilities of mind-gene communications and healing with an attitude of “dispassionate compassion.”</td>
<td>Continuing effort in the face of fatigue leads to the release of stress hormones that short-circuit the need for ultradian rest. Performance goes up briefly at the expense of hidden wear and tear so that you fall into further stress and a need for artificial stimulants (caffeine, nicotine, alcohol, cocaine, etc.), which can lead to Addictions.</td>
</tr>
<tr>
<td>Spontaneous fantasy, memory, feeling-toned complexes, active imagination, and ruminous states of being are orchestrated for healing and life reframing. Some people take a “nap.”</td>
<td>Many mistakes creep into your performance, memory, and learning; emotional problems become manifest. You may become depressed or irritable and abusive to yourself and others.</td>
</tr>
<tr>
<td>4. Rejuvenation and Awakening</td>
<td>4. The Rebellious Body</td>
</tr>
<tr>
<td>A natural awakening with feelings of serenity, clarity, and healing together with a sense of how you will enhance your performance and well-being in the world.</td>
<td>Classical psychosomatic symptoms now intrude so that you finally have to stop and rest. You are left with a nagging sense of failure, depression, and illness.</td>
</tr>
</tbody>
</table>
The four stage creative process like method for stress reduction and problems coping and solving

4-Stage BRAC of Creative Consciousness & Cognition

Stage one illustrated by a student getting a new idea and starting to work on a problem (first two panels on the left). Stage two is the typically difficult experience of incubation, struggle, stress and emotional conflict trying to solve a problem. This stage two of stress is when most people consult a psychotherapist; so intense is this inner creative work that that it is humorously portrayed as smoke rising from the student's head (the middle panel). Stage three is the creative moment of getting a flash of insight: this is the famous 'Aha!' or 'Eureka!' moment. Stage four is the happy verification of the problem solution in the real world (with permission, Tomlin, 2005, Dramatizing Maths: What's the Plot?). Leonardo da Vinci (1452-1519) originally outlined creativity as a seven-stage process: Curiosità, Dimostrazione, Sensazione, Sfumato, Arte/Scienza, Corporalità, Connessione. Rossi re-conceptualized this previous research as a 4-stage creative process of psychotherapy in two papers published in the Journal of Humanistic Psychology (1967, 1968) which are updated with detailed contributions on deep psychobiological levels in the two Lloyd & Rossi (1992, 2008) volumes. This is the daily process we ideally experience every hour and a half or two on all levels from mind to gene while awake, sleeping, and dreaming as manifestations of the Basic Rest-Activity Cycle (BRAC), which are reviewed as supplementary material to this paper.

The 4-Stage Creative Cycle mapped on to the 90-120 minute 4-Stage Basic/Rest Cycle(BRAC). Ideally Stage-2 of creative incubation wherein we replay whatever is new and interesting. This creative replaying of whatever is novel, interesting, wondrous, fascinating, tremendous, and numinous for us is what turns on activity-dependent gene expression & brain plasticity to generate the new connections and neural networks that are the basis of new consciousness, problem solving and mind-body healing. Unfortunately, we are not taught to respect and fully appreciate the significance of this creative replaying that takes place while we are awake as well as during REM state dreaming while we are asleep. This is the source of many psychosocial ills of humankind. We do not pay attention to the new consciousness that is being daily & hourly created within us. We are taught to respect the old “traditions” of the past generation. But life is ever new! While it is appropriate to check out the past for solutions to current issues – it is even more necessary to recognize what is new every day and allow of consciousness and behavior to adapt in appropriate way. The tragedies of trying to follow human traditions and values of the past frequently are the source of conflict and discord that leads to power plays and war. When will we ever learn? The recognition of the values of diversity here and now both within each of us and in our relations with others is a source of creativity on all levels from mind to gene expression, brain plasticity, and new consciousness. To explore and embrace new consciousness is the path of creative wellbeing, health, healing within each of us and loving relationships between people.

The relationship between Neuroscience research, Spiritual research, Therapeutic Hypnosis, Art, Beauty and Truth
We have hypothesized (Rossi, 2002) there is an equivalence between (1) current neuroscience research on how Activity, Novelty, and Enrichment turns on Activity-Dependent Gene Expression and Brain Plasticity to enhance the growth of the mind/brain, (2) theological research on how “Numinous Experience” (Fascination, Mysterious, Tremendous), (3) Therapeutic Hypnosis, and (4) Art, Beauty & Truth. All these classes of human experience turn on Activity-Dependent Gene Expression and Brain Plasticity to enhance the growth of the mind/brain.

| TRANSPERSONAL EXPERIENCES: THE NOVELTY-NUMINOSUM-NEUROGENESIS EFFECT |
|-----------------------------|-----------------|
| **NEUROSCIENCE**           | **NUMINOSUM**   |
| Activity                   | Fascination     |
| Novelty                    | Mysterious      |
| Enrichment                 | Tremendous      |


Figure 3: This is the basic idea about the relationship between neuroscience findings and Psycho-Spiritual practices from new psychotherapeutic point of view.
The relationship between neuroscience findings, Art, Beauty and Truth from our new psychotherapeutic point of view.

From this new perspective of human functioning all they facilitate the positive development of the mind/brain by turning on activity-dependent gene expression and brain plasticity. In the current secular/political realm this is the ethos of president Obama’s credo, “Yes, we can!” Yes, We Can, what? Yes, we can turn on “Activity-Dependent Gene Expression and Brain Plasticity to grow our own mind/brain!” This is the essence of our New Neuroscience of Creative Consciousness, Cognition and Psychotherapy that is supported and can support the current breakthrough in cancer research.

Beyond traditional psychotherapy and medicine towards the future of psychotherapy

Notice how these equations use the concept of Energy as the common coin of exchange at the fundamental level of Quantum Dynamics in psychotherapy. We intuit an integrated quantum theory is evident with the names of physicists and leaders of psychotherapy at each of the four stages of the creative cycle in figure 5.

We propose using the observer/operator within quantum field theory, Fredkin’s 3-way logical gate (2016) and Feynman’s Path Integrals (emended edition with Hibbs and Stryer (2005) to model the transmission/information/energy dynamics of psychotherapy at the Planck scale $10^{-33}$. At this tiny quantum scale the random movements of particle/waves quantum reality apparently can take all paths in Einstein’s relativist space-time to reach a goal, which is not possible in Newton’s classical orthogonal space and time.

Figure 4: This is the basic idea about the relationship between neuroscience findings, Art, Beauty and Truth from our new psychotherapeutic point of view.
Figure 5: The quantum evolution of our scientific (STEM) understanding of the cosmos, life, consciousness, cognition began about 100 years ago with the equations of Albert Einstein \((E = MC^2)\), Max Planck \((E = h\nu)\) and Edwin Schrödinger \((\text{E} \gamma = \text{H} \gamma)\) as they explored the ultra-small world of how atoms and light interacted to formulate the everyday world as we experience it.

Figure 6: Feynman’s Quantum Path Integral Equation (Image with permission, Muon Ray 2017) where all possible paths are consistent with Erickson’s Approaches to therapeutic hypnosis and psychotherapy (Rossi, Erickson-Klein & Rossi (2008-2014) in the supplementary material included at the end of this paper.)
Summary
The quiet but revolutionary current research in the medically recommended β-blockers to reduce chronic stress and ameliorate the recovery and cure of cancers is supplemented by psychotherapy to reduce chronic stress via Mind-Brain-Gene communication and the 4-Stage Creative consciousness and cognition.

Our New World of neuroscience and quantum perspectives helps us recognize limitations to early paradigms of “Folk or Narrative Psychology.

Our teachers knew nothing of Mirror Neurons, Activity-Dependent Gene Expression, and Brain Plasticity in facilitating mind-body healing via psychotherapy. Research in these areas has taken place only within the past 10 or 20 years!

This paper updates most traditional schools of psychotherapy by introducing the novel and well researched neuroscience research on mirror neurons, activity-dependent gene expression and brain plasticity in the creation of new consciousness and cognition.

This paper explores of how to expand the parameters of “folk psychotherapy” to include the modern neuroscience of creative psychotherapy! Modern cognitive/behavioral therapy usually deals with stage one & two in this map of the mind/brain. Neuroscience adds the 3rd and 4th stages so that we have the complete 4-stage cycle of creative psychotherapy.

Classical and Ericksonian therapeutic hypnosis has presumed to embrace all four stages, but it is only with the advent of current neuroscience in our generation that we are beginning to understand the operations in stages 3 and 4.
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RESOLVING EMOTION: THE GOLDFINGER APPROACH

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The author presents a structured protocol for resolving accumulated emotion using ideomotor questioning. A progressive ratification series essential to this model addresses affect, imagery, cognition, and behavior. A method for developing ideomotor finger signals is defined and a questioning tree illustrating the method of emotional inquiry is posed. This non-invasive, brief procedure is a useful adjunct to other treatment modalities and instrumental in clarifying the focus of treatment.

[1]There are many different approaches therapists employ to help a client heal psychological wounds and resolve emotions. Described here is a relatively non-invasive method for unloading the emotional past, first described in 1997 (Walsh, 1997) with a recent elaboration (Walsh, 2016). This process engages direct communication with the unconscious mind through a simple, predetermined form of body language known as ideomotor (ideo= idea, motor= movement) signaling (Rossi & Cheek, 1988; Cheek, 1994; Cheek & LeCron, 1968; Walsh 1997,2005,2016; Ewing & Eimer, 2006). The unconscious develops yes and no signals in fingers and this allows the operator to receive ideomotor responses to questions posed to the unconscious.

[2]Ideomotor questioning provides great facility with which to navigate the emotional terrain and resolve emotional themes. Resolution of these emotional states may happen very quickly, as the unconscious functions outside the limits of clock time, such as we experience in dreams. Ideomotor signaling bypasses cognition and conscious volition to secure useful information and helpful resources. Because this method employs finger movements and can potentially, and idiosyncratically, yield great value, I chose to call it Goldfinger.

The Goldfinger Method

[3]The Goldfinger process solicits help from the unconscious to release and resolve various accumulated emotions. This procedure then reduces the adverse influence of past emotion on present experience. We humans have a tendency to accumulate emotion as we go through life, and most of us are carrying emotional burdens for which we may have no conscious awareness.

[4]The emotional resolution portion of this procedure is a variation on methods developed by Cheek and LeCron (1968). Because our functioning involves more than emotion, and because emotion influences thought, perception and behavior, efforts to make change as comprehensive as possible are important. Some effort, therefore, to integrate the dimensions of thought, perception and behavior into the emotional change is addressed with a ratification sequence. Ratification is simply an observable sensory verification of change.

[5]When questioning the unconscious directly, we invite the unconscious to step forward and play a more dominant role in experience—often resulting in some level of trance. How this more overt unconscious participation plays out is really very different for everyone. Experiencing alterations in thought, emotion, imagery, sensation or motor activity while questioning the unconscious are common possibilities. Sometimes there is very little conscious awareness of change as the unconscious responds in helpful ways. We may receive a finger signal indicating a desirable change has taken place without initially noticing anything different. Some may feel emotion moving through them. Some may experience powerful sensory or kinesthetic dynamics while emotion is released. What sensory signals are produced and what information is conveyed during ideomotor questioning can vary significantly from one questioning period to the next in the same person.

[6]During this questioning phase, a resolution hierarchy for emotions may be defined. Emotional pain, for instance, may need to be resolved before anger can be released. Specific information, themes or associations may become apparent at this juncture. Some form of abreaction, a spontaneous felt emotional release, may take place. You may observe noticeable movement and physiological alterations like flushing, lacrimation (tearing), crying, breathing pattern shift or something else. Abreaction is commonly silent, but sometimes is quite vocal. If
the unconscious has agreed to release or resolve an emotion and abreaction occurs, be assured that the abreaction will quell as resolution occurs.

[7] Your patience is paramount in doing this work. The resolution interval before ideomotor confirmation of each emotional shift may be less than a minute or as long as 20 minutes. Sometimes a longer interval is needed to prepare for resolution. During a subsequent questioning period, consider posing the ideomotor question “Is there any other guilt (or other emotion previously addressed and resolved) from the past that has not been resolved at this time?” This is an attempt to be thorough and possibly access any ego states (Watkins, J., 1992) or internal parts not responsive to prior questioning and resolution. As some level of trance will likely occur in the person you are questioning, maintain focus, note idiosyncratic expression and sparsely validate all unconscious responses. The eight steps formally involved in the Goldfinger procedure are outlined in Box 1. Figure One is a questioning tree for identifying and resolving emotion.

[8] The naming of emotions sometimes requires adaptation to a person’s unique perspective. A young man whose presentation, in my estimation, clearly reflected anger and hostility said he wasn’t angry. He confided having much resentment. If he had anger, as he explained, something or somebody would have been hurt. This person appropriated specific language to various positions on the continuum of anger, based upon his behavior. Most of us do the same thing when considering the fear continuum. Fear may range from avoidance to nervousness to anxiety to panic and intense terror.

[9] For most people, the use of common emotional language with words like anger, fear, guilt, emotional pain or sadness will work fine. When in doubt because of evidence from a person’s presentation, use more inclusive groupings of emotional terms. An inquiry about anger then becomes, “Is there any anger or resentment or irritation or rage from the past that you continue to carry at this time?” Sometimes it is important to ask, “Is there any other emotion I have not named that is best to be resolved at this time?” With a yes response the emotion is called the other emotion.

Rapport

[10] Take some time to understand the expressive and perceptual scheme of the person with whom you are working. How is this person seeing their circumstances and how are they seeing themselves? How are they expressing this in words and gestures? Establishing a positive interaction, based upon this person’s frame of reference, provides a foundation for collaborative endeavor.

[11] As part of developing rapport, explore expectations and give information about the unconscious and the investigation process that will take place. Present the unconscious as a helping expert that knows more about this person than anyone else ever could. Affirm your intention regarding the release of accumulated emotion. Also affirm your willingness to let the unconscious help in ways that it is able. Be very clear about the focus and limitations of your work with this individual.

[12] Sometimes a person needs to tell their story, as only they know it, and know that it is heard before even considering the release of emotion. Once this happens, letting go of the burden they have been carrying may be possible. An added benefit comes from scripting the future story once desirable change is enacted (White & Epston, 1990). Some find great benefit from writing their story on paper and then releasing emotion. Sometimes a person needs to hear a story told by another (Lankton & Lankton, 1989), a story with interesting dynamics paralleling their own life. But, there are some interesting twists and turns in the story, and the ending is surprisingly different than their own. Consider any of this as a rapport intervention.

Develop ideomotor signals

[13] Because communication with the unconscious is known to access and alter deep

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Box 1.

1. Develop rapport with other. Affirm intention with self.
2. Develop ideomotor finger signals.
3. Establish comfort.
4. Question the unconscious about emotional content and its resolution.
5. Ratify immediate affective experience.
6. Ratify cognition.
7. Ratify imagery with future orientation.
8. Ratify behavior.
levels of functioning influenced by regions of the brain regulating both the physiological and the psychological (Uvnas-Moberg, Widstrom, Marchini, Winberg, 1987; O’Hanlon & Hexum, 1990; Erickson & Rossi, 1979; Rossi, 2002, Rossi, 1988; Saadat & Kain, 2007; Spiegel & Moore, 1997; Stewart & Thomas, 1995; Butler, Symons, Henderson, Shortliffe & Spiegel, 2005), I think of the entity we call the unconscious more as the body-unconscious.

[14] Unconscious communication is widely viewed as the focus of hypnosis, even though the unconscious is very involved in Jung’s active imagination (1973, 1933, in Stein, 1985), Gestalt therapy (Perls, 1976), Transactual analysis (Berne, 1961, 1964), Holotrophic breath work (Groff, 1985), applied kinesiology (Frost, 2002) and more. Science is catching up with what practitioners of hypnosis have witnessed for decades. How is it that unconscious communication, under the guise of hypnosis, causes warts to vanish, or allows painless dental work or surgery free of anesthetics, or causes hallucination through any sensory modality or brings about behavioral change? The unconscious is accessing some very deep levels of functioning in order to shift conscious, sensory-motor experience.

[15] A common consequence of communicating directly with the unconscious is the development of trance. Trance occurs when the unconscious mind assumes a dominant role and the conscious mind is moved into a secondary position. Imagine two people going for a drive. In our waking state, most of the time, the conscious mind has the steering wheel and the unconscious mind is in the passenger seat working on the laptop computer, getting all sorts of things done. In a trance state, or a sleep state, the unconscious has the steering wheel and the conscious mind is either in the passenger seat observing what is happening or asleep in the back seat- or alternating between those two positions. This is a very simple way of thinking about trance. Hypnosis is the utilization of trance in a goal directed manner.

[16] Communication with the unconscious is effectively facilitated by developing a specific, mutually agreed upon body language known as ideomotor or ideodynamic signaling or ideomotor questioning, (Cheek, 1994; Rossi & Cheek, 1988; Rossi, 1986; Ewing & Eimer, 2006; Walsh, 2016), originally derived from hypnotic protocol. No
hypnotic induction or expertise in hypnosis is required to conduct ideomotor questioning. Some understanding of hypnotic phenomena (i.e. hallucination, time distortion, amnesia, hypermnnesia, catalepsy, dissociation) and facility with hypnotic protocol is helpful and encouraged, but not essential for applying this method. One form of ideomotor signaling employs finger movements. Without conscious volition, the unconscious is invited to lift or move a finger in some fashion to signal “yes” and lift a different finger to signal “no”. Once this signaling system is operationalized, questions put to the unconscious can be directly answered by the unconscious. Erickson (Erickson et al, 1976) commonly worked with a client’s ideomotor expression and solicited responses via physical movement. Box two contains a three-step approach to developing ideomotor finger signals.

[17] Unconscious finger movements are typically a bit different than consciously directed movement. The unconscious signal may seem slow to develop or express itself more as a vibration or side to side movement. All that really matters is that there is a visible movement representing an unconscious response.

[18] Don’t hesitate to ask the unconscious to lift a signaling finger higher if you are having any difficulty discerning a finger response. If, for any reason, developing ideomotor finger signals is not possible because of amputation, injury or something else, consider the following. You can ask the unconscious to develop movement in some other part of the body that will be observable for you. There are many options—facial movement, toes and feet, chest muscles twitching, arm movement and more. Another option is developing ideosensory signals. Ask the unconscious: “Will the unconscious now deliver a yes signal that can really be felt very clearly somewhere in the body?” Implore your client to focus on yes, and tune into sensory experience, to the best of his or her ability. If something is reported to be felt with uncertainty about it being a yes signal, simply ask the unconscious to please intensify or amplify the signal for clarification. Once a yes signal is established, follow the same process developing a no signal. If a noticeable sensory signal, like pain, is already being experienced by a client, ask the unconscious if working with this signal to develop yes and no responses will be acceptable. A yes signal could be an increase in pain and a no signal could be a decrease in pain, or the reverse. You will need to be very clear about which intensity is yes and no. Another ideosensory option for those who are very visual involves the unconscious showing yes and no pictures. When you are very clear about the yes and no signals, proceed to the next step.

Developing Comfort

[19] The ideomotor finger signals are ratified by requesting comfort, as follows. “I would like the unconscious to please respond to all of my questions through those finger signals. This will be quite helpful. Is it alright for you to develop a very deep experience of comfort and calm for your benefit at this time?” A “yes” or “no” response will ratify the signals. A “yes” response may be followed with some encouragement to enjoy the process with the following. “So that can now happen. Enjoy the development of comfort and please touch the index finger and thumb together on the non-signaling hand and let those fingers continue touching. When the unconscious recognizes you are really experiencing a deeply felt comfort, the yes finger can lift up.” After receiving confirmation of comfort with the finger signal, ask the unconscious “Will it be alright for you to access this same or deeper level of comfort whenever you desire it by simply touching these two fingers together, as they are now, and presenting a request for comfort, so that whenever it is important for you to have this same or deeper comfort, you will be able to call it up by putting those fingers together and saying something like ‘I would like that comfort now, please? Will it be OK to have this signaling system for comfort?’ A yes response means the comfort experience is now anchored as a comfort tool. The comfort tool is a quick way to remedying stress, tension and anxiety, trusting the unconscious to adapt the tool to various needs and circumstances. An added benefit is how the comfort tool is a remarkable sleep aid, if this is ever needed. Developing the comfort tool is also a delightful means of developing rapport between the client’s conscious and unconscious mind, as well as between client and therapist.

[20] If there is a “no” response to the comfort request, address the unconscious with, “perhaps something else needs to be addressed first.” You can revisit developing a comfort tool later and proceed with questioning the unconscious about emotion. Most of the time, and with most people, engagement of comfort and development of the comfort tool are easily facilitated after emotions are cleared. The accumulated emotion is most commonly the obstacle to accessing comfort.

[21] A “no” response to the comfort request may reflect: 1) language incongruity—(i.e. comfort may not register as an experience or possibility) - 2) an affective or experiential hierarchy—(i.e. comfort cannot be experienced until anger is addressed) - 3) a reluctance to surrender conscious control or 4) a breach in rapport, or something else, that needs to be investigated and resolved.

[22] Sometimes comfort develops but the unconscious refuses to anchor the comfort in a comfort tool. After receiving a “no” reply to the request for anchoring comfort and developing the comfort tool, you may get a verbal explanation for that response and that will guide your next step. In the absence of a verbally expressed position, or inner awareness of the same, I encourage you to proceed to emotional questioning in the next section. In other words, don’t worry about developing the comfort tool at this time and go to the next step. You will likely be able to develop the comfort tool later.
Identification and Resolution of Emotion

[23] The following series of questions represent variations on the questioning tree shown in Figure One. Questions are labeled to simplify response options. The example of questioning that follows is what has worked well in my practice.

[24] Announce your intention to the unconscious by saying, “I would like to ask some questions of the unconscious and ask that it please respond to my questions through those finger signals. That would be very helpful. I am going to ask questions about the emotional past. When I use the term past, I am referring to any time in your life before today, trusting the unconscious to have great facility moving through time and space.” Be patient awaiting the first response from the unconscious on any given day. The first response is most often the slowest response, as if the fingers need a bit of time to warm up and start functioning. The questioning below will cover a full range of emotion including fear, guilt, shame, anger, emotional pain/hurt/sadness, depression and anxiety. I typically start the questioning with fear, guilt or shame, as these emotions often limit access to other emotions.

A1. “Is there any fear (shame, guilt, anger, emotional pain or…) from the past you continue to carry with you at this time?” A yes or no answer defines the field of emotions as yet unresolved. Once an emotion has been clearly identified, a person may or may not begin to talk about the context related to the emotional experience spontaneously. Proceed with the following after any disclosures.

A2. “Since you have already been through all the experience of the past and you have whatever learning from experience can serve you well in the present, will that fear (or other emotion) now be released and resolved in whatever way is truly best for you at this time?” Following a “yes” response, ask for a specific finger signal indicating completion of the resolution and freedom from that emotional load: “So that can happen. When all parts of you are free of fear, that yes finger can lift up.” Await the signal before proceeding. Be patient.

B1. If you get a “no” response to A2, ask, “Is there some important information that needs to be clearly understood to allow the release of this fear (or other emotion)?”

B2. Follow a B1 “yes” response with, “Will that important information now come to conscious awareness so you can benefit from it at this time?”

B3. Follow a B2 “yes” with, “As you have that information in a way you can clearly understand it, that yes (or no) finger can lift up and you’ll be able to talk about it, if you choose.” Await that signal and whatever discourse may follow.

B4. A “no” response to B2 prompts, “Will that important information come to conscious awareness within the next twenty four hours (or two days, week etc.)?”

B5. You can sometimes shorten the process after a B1 “yes” by asking, “Will that important information become very clear to you as the fear (or other emotion) is resolved?” Ask for a specific finger signal when the information is secured and the emotion is resolved, if you get an affirmative response to this question.

B6. Follow a B1 “no” response with, “Is there some other emotion that needs to be addressed first before fear can be resolved?” A “yes” response brings you back to A1 to inquire about another emotion.

[25] Socratic questioning guides this investigation of the emotional past. Each ideomotor response leads to another question. The above series of questions illustrates the process and certainly does not represent an exhaustive list. I prefer to address fear, guilt, shame, anger, pain, depression and anxiety before moving to ratification procedures.

Ratification

[26] Emotional adjustments may extend to cognition, perception and behavior very consequentially and automatically following an emotional resolution. With no certainty that changes have extended in a comprehensive manner, enact the following measures to integrate emotional changes into thought, imagery and behavior that do no harm, and reinforce change. Think of ratification as an affirmation that facilitates incorporation, or integration, at various levels.

Ratifying immediate experience

[27] Various forms of ratification follow the release of whatever emotions are addressed. Ratifying the immediate resolution experience can provide a powerful grounding and affirmation of inner reality. One form suggests, “perhaps the unconscious will provide additional confirming signals the conscious mind can appreciate, which reflect the changes taking place.” As a resolution completion is signaled, consider a reflection like, “That’s right, free of that fear (or other emotion). Maybe you feel that change in some way, at some level.” Any acknowledgement of change helps ground and validate the experience.

Cognitive ratification

[28] This step seeks assurance that the cognitive process is aligned with emotional change. After confirmation of an emotional resolution, inquiries designed to reinforce a boundary between previously limiting cognitive constructs and contemporary adaptive options can help. A shift like this can, and does, often occur automatically. The questioning approach illustrated below can either confirm or prompt cognitive adjustments. After securing confirmation of an emotion being resolved, pose the
following questions, or variations of these questions. This step of ratification may be applied to a single emotion or collectively to a group of emotions that have been resolved.

C1. Solicit a specific ideomotor response (i.e. yes or no finger lifting) from the unconscious as you ask, “Since you are now free of that emotional burden of the past, is there a place in the past where all the thoughts, perceptions and learning no longer appropriate in the present can rest, out of the way of the present?... thoughts and perceptions previously tied to the emotional burdens that have been released?”

C2. Or ask, “Is there a place in history to put to rest all the thoughts, perceptions and learning that was somehow linked to the emotion that has been resolved?”

C3. Or ask, “Now that the _____ (emotion) has been resolved, will those thoughts, learning and perception previously linked to the past ______ (name of emotion) be positioned in the past where they will not interfere with present or future experience?”

C4. Or if guilt or shame was addressed, you might ask, “Given that you're now free of that guilt (shame), will you offer yourself forgiveness at the deepest level possible?” A “yes” response to C1, C2, C3 or C4 prompts,
“So that adjustment can now happen. When that adjustment is complete, the “yes” finger can lift up as a signal at that time.”

C5. A “no” response to C1, C2, C3 or C4 invites, “Given that you will still have an awareness of your past history after repositioning those thoughts, perceptions and learning no longer appropriate in the present, is there really any benefit to maintaining those things in the present?”

• A “no” response to C5 initiates a repeat of question similar to C3.
• A “yes” response to C5 suggests the cognitive ratification be postponed and may prompt a review of particular themes surfacing during ideomotor questioning.

C6. Or a “no” response to C1, C2, C3 or C4 can cause you to ask “Is there something important you need to understand very clearly before those adjustments can be made?”

• A “yes” response prompts a question like B2.

A “no” response to C6 may indicate the presence of another layer of emotion not yet resolved. There may be deeply entrenched belief, or learning requiring more focus. Negative or positive responses to these questions guide subsequent questioning and inform us about conditions possibly impeding progress.

Imagery ratification - future perspective

[29] If ideomotor responses reflect cognitive alignment with the affective resolution, another temporal shift helps reinforce these gains. How can emotional relief endure without some degree of cognitive congruence and grounding in the external world? A future picture can serve as a behavioral compass at times. Developing a clear picture, or sense, of how desirable change is experienced in the future will impede anxiety significantly, and also fuel hope. There are numerous ways to seed this experience. Consider how presenting the following speculations might guide experience:

D1. Suggest eye closure to the client and say, “Perhaps a picture is already forming which informs you of just how your experience can be, now that you are free of so much from the past… recognizing how your thoughts, emotions, perceptions and behavior can be with the freedom you now have.”

D2. Or I might suggest, “This may be just the right time to let the unconscious develop a picture, or sense, of how your experience can be, now that you are free of so much from the past. As you have that understanding very clearly, a “yes” finger can lift up as a signal at that time.”

D3. Or I might ask, “Now that these important adjustments have taken place, what is the first realistic step you see yourself taking to mark his occasion?” Allow plenty of time for a person to ruminate on this question. An answer to this question provides the raw material for the next step of behavioral ratification.

D4. When working with yourself, consider how your experience can be different now that you are free of those emotional burdens. Invite the unconscious to develop a picture so you can see how things can be. Also consider what you could really do to mark this occasion, whether it involves doing something in a different manner, or constructing a ritual or something else.

[30] Any of the above suggestions imply real change is happening and will be extended into the future. This implication, at the very least, seeds hope. Perhaps it also adds something new to the psychic landscape of the future.

Behavioral ratification

[31] This part of affect resolution is about what is done, and assumes the inevitability of action. Any of the following questions can be considered.

• How can you securely position this emotional resolution in day to day life?
• How will this change be acknowledged as a reality?
• What behavioral step or sequence of steps will be used to honor this personal change?
• Is there a ritual of any kind you can plan to mark this occasion, this experience of change?

[32] The person you are working with will likely need time to strategize this step. For some, the ratification of future imagery defines how change can be enacted or ratified. It is fairly common for fear to surface in anyone while planning an enactment, or just before taking the first steps of enactment. Fear may be experienced as nervousness, anxiety or panic. Fear may also come in a disguised form as it infiltrates thoughts in the form of procrastination and rationalization. In my experience fear almost always accompanies challenges to inner reality, or incongruity between behavior, foundation beliefs and learning. Fear has a wonderful way of preserving the status quo. It is important to understand the many ways fear can direct itself and how quickly fear dissipates after actually taking the steps associated with change. This allows one to take fear along as a traveling companion while enacting change. Fear, then, accompanies change and need not function as a braking system.

The behavioral ratification may be as simple as following through with a medical appointment or getting a massage. Of most importance here is that a plan for doing something to acknowledge desirable change taking place is developed, and then enacted. Some people will devise specific rituals relevant and meaningful to them. One gentleman constructed an elaborate ship from a milk carton and loaded it with items representing what he was purging from his life. He set the ship adrift on a local river.
Summary

[33] The steps outlined here rarely happen sequentially with a single affective state. Most often two, three or four states are identified and resolved before the ratification series is fully explored. Double checking resolution in a subsequent questioning series by politely inquiring about the presence of “any other ___ (name of emotion)” indirectly appeals to any ego-state involved with that emotion, and clarifies the appropriateness of further ratification. Although beneficial change may be realized in many without elaborating ratification procedures, some people are so entrenched in cognitive and behavioral patterns that affective alteration is imperceptible, or only minimally noticed. For others unconscious adjustments are quickly vetoed by familiar associational networks and environmental responses. Progress can be arrested easily without proper reinforcement. Affective containment may develop as a result of automatic, unconscious forgetting (Laughlin, 1983) or conscious attempts to bury undesirable emotion (suppression). Ideomotor questioning without inducing a deep trance facilitates search and adjustment potential at both conscious and unconscious levels simultaneously. Development of deeper trance states is then at the discretion of the unconscious, and based on the idiosyncratic needs of the individual.

[34] Questioning affective themes, as opposed to content laden information, leaves the option of releasing, or continuing to conceal, historical information to the unconscious. This avoids any unnecessary re-traumatization. The uncovering of historic artifacts is an option left completely to the unconscious.

[35] The ratification sequence can often prophylactically offset the resurgence of emotional states as it repositions triggering cognitions to the past. The cognitive orientation contributing to emotional distress then, ideally, becomes part of the past, part of personal history. In addition, establishing a new picture of the future through ratification of imagery and by doing something in a different way through behavioral ratification, change becomes more experientially grounded in the present.
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THE UTILIZATION OF MATHEMATICAL PATHWAYS IN THE TRANSFORMATION OF CONSCIOUSNESS

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Key words: implied directive, opposites, equivalence, correspondence, novelty, relationships, time, space.

Abstract
The role of mathematics in the transformation of consciousness and healing is discussed from the perspectives of the implied directive, opposites, novelty, multi-embedded metaphor, time, space, motion, and the creative focusing of attention. The concepts of sine, cosine, the exponential function, matrices, vectors, calculus, group theory and set theory are integrated in the context of yes sets with the effects of the variables of time and space on symptoms. The roles of correspondence, equivalence, and substitution are addressed in relation to the implied directive. The application of the principles of yes sets and truisms is integrated with mathematical concepts, mathematical thinking and mathematical processes in the transformation of consciousness. Poincare’s four stage creative process is used as a model for supporting unconscious searches and activity dependent gene expression in the facilitating of new, expanded, more harmonic consciousness. Parallels are drawn between mathematical concepts and processes with Erickson Mind-body hypnotherapy and Tibetan Buddhist meditation processes.

Introduction
The transformation of consciousness is often dependent on the focus of attention (Erickson and Rossi, 1979, Tulku, 1979, Wilbur, Engler and Brown, 1985). In mathematical terms this may correspond to vectors, which describe magnitude and direction, and infer the roles of space, time, and motion. As Goswamy has noted (Goswamy, 1999, 2015) regarding quantum consciousness, which reflects deep levels of interconnectivity, creativity plays a major role in the transformation of consciousness. This is consistent with the work of Erickson, who maintained that creativity was a primary variable in the transformation of consciousness (Erickson and Rossi, 1979, 1982, Rosen, 1982, Lankton and Lankton, 1983). From a set theory perspective, consistent with the inferences of Euclid, the consciousness of creativity can be considered as a subset of the set of all consciousness, which includes consciousness without an object, consciousness of the no-self, consciousness of the Empty Self, and, mathematical consciousness (Duham, 1991, Eves, 1985, Gregory, 2015, Merrill-Wolff, 1973, Surya das, 2011, Tulku, 1979).

Mathematics is considered the foundation of all the sciences. It is the study of topics that include; quantity (numbers), structure, space and change. (Kneebone, 1963, Ramana, 2007, Zeigler, 2011). Creativity has often played a significant role in mathematical discoveries as evidenced by the thought experiments of Galileo, Newton and Einstein, and in the work of Euler, Cantor, and others (Duham, 1991, Greene, 1999, Isaacson, 2006). Mathematics has been evolving over five thousand years. Prehistoric people began the study of counting and numbers by scratching lines on bones. The process of counting utilized the implied directive by reflecting the opposite on consensus and non-consensus reality (Erickson and Rossi, 1979, Mindell, 2000). Many advances in arithmetic, algebra, and geometry were made by the Babylonians and Egyptians starting in 3000 B.C. utilizing abstraction and logic. The study of mathematics as a discipline was begun by Greeks in the sixth century B.C. Greek mathematics introduced and emphasized the need for proofs, which were driven by deductive reasoning, and mathematical rigor, which depended on the appreciation of inference. Pythagoras offered the first proof of the Pythagorean theorem. Aristotle contributed the foundations of logic, which has continued to evolve through the work of Leibnitz, Russell, Hilbert and others. Euclid’s Elements became the primary mathematical text that has become the most influential textbook of all time. Archimedes developed the proofs for the area of a circle, the volume of a sphere, and an accurate approximation of pi, utilizing logic that was a precursor to calculus (Calinger, 1999, Hogkin, 2005, O’Connor and Robertson, 1996).
Galileo, considered by Hawking, Einstein and others to be the father of modern science, said; "The universe cannot be read until we have learned the language and become familiar with characters in which it is written. It is written in mathematical language, and the letters are triangles, circle and other geometrical figures, without which means it is humanly impossible to comprehend a single word. Without these, one is wandering about in a dark labyrinth." (du Sautoy, 2010)

Mathematics has also been called the formal study of the patterns of connectedness, which reflect the primary variables of nature with regard to structure, dependency relationships and rates of change, two fundamental aspects of the work of Milton Erickson, M.D., quantum physics and processes of Tibetan Buddhist meditation (Cox and Forshaw, 2011, Erickson and Rossi, 1979, 1982, Tullku, 1979). Mathematical proofs that express laws of nature are considered elegant and beautiful, in their presentation of hidden structures (du Sautoy, 2008, Frenkel, 2013).

Mathematical progress was stagnant in the middle ages, while the progress made by the Greeks and other cultures prior was consolidated and expanded by the Islamic culture, with the work of Al-Khwarizmi being the most prominent. His primary works included; Calculation with Hindu Numerals, and The Compendious Book on Calculation by Completion and Balancing, which focused on algebra (Devlin, 1996).

Since the Renaissance, many stages in its evolution have been highlighted by profound discoveries that have included; Descartes’ development of analytic geometry, which uses algebra to describe geometry, Newton’s and Leibnitz’s discovery of calculus, Galois’ initiation of Group theory, Gauss’ differential geometry, Euler’s work with the exponential function, the standardizing of mathematical notation, and graph theory, Cantor’s work with set theory, which became the foundation for mathematics, and the Lorentz transformation which was a major component of Einstein’s special relativity (Duham, 1991, Livio, 2006, Grattan-Guinness, 1997).

These discoveries can be considered subsets of the larger set of all mathematics. From the perspectives of mind-body hypnotherapy, Poincare’s four stage creative process, and the psychobiology of gene expression, they can be understood metaphorically as vectors, and can be considered potential yes sets for the focusing of attention and the transformation of consciousness (Erickson and Rossi, 1979, Gregory, 2007, 2015, Poincare, 1905, Rossi, 1996, 2002).

The utilization of mathematical thinking, concepts and processes in the transformation of Consciousness

In terms of set theory, mathematical thinking can be understood as a subset of the Consciousness of Appreciation set, the set of all possible appreciations. Mathematical thinking appreciates deductive reasoning, inference, and the roles of space, time, permission, experimentation, and exploration. The inference rules, which can be considered subsets of the sources of comfort, have served as the foundations for the proofs developed over the course of over two millennia. These rules can also be recognized to be operating within the work of Merrill-Woff in his explorations of consciousness without an object, the precepts of Tibetan Buddhism with regard to dependent origination, and in the indirect suggestions of Milton Erickson (Erickson and Rossi, 1979, Merrill-Woff, 1973, Tullku, 1979).

The appreciation and trust of reasoning not only contains an implicit trust of the resources within the unconscious to facilitate creative problem solving, but implies and facilitates an opening of space that reduces pressure during the preparatory phase of creativity identified by Poincare (Poincare, 1905, Rossi, 1996). In addition, it implies that reasoning can and may function as a bridge to directly and indirectly support and sustain unconscious processes, which supports the development of a cooperative partnership between the conscious and unconscious minds. This further implies that the polarity between pressure and permission has value, can function as a portal, and can be utilized creatively to focus attention and activate the transcendent function, facilitating neurogenesis (Erickson and Rossi, 1979, Jung, 1916).

Erickson implicitly utilized this trust of the resources within the unconscious of the patient in the pacing of the exploration of the patient’s experience during the rapport building phase of treatment that facilitated and enhanced receptivity (Erickson and Rossi, 1979, Rosen, 1982, Lankton and Lankton, 1983). Primary processes employed by Erickson included yes sets and truisms, which correspond to the use of axioms in mathematical proofs. Receptivity functioned as a core aspect of the therapeutic foundations that facilitated gene expression and the accompanying transformation of consciousness. The transformation of consciousness reflects the capacity of resources within the hippocampus, culminating in the Kreb cycle, to function as the transcendent function, integrating the old and new, conscious and unconscious, and light and dark polarities (Duham, 1991, Gregory, 2015, Jung, 1916, Rossi, 2002, Squire and Kandel, 1999).

Poincare was a mathematician and physicist who was a contemporary of Einstein, and was responsible for the corrections to the Lorentz transformation that made Einstein’s discovery and formulation of special relativity possible. Poincare, appreciating the components of mathematical thinking, identified the four stage creative process. The four stages were: preparation /data collection, incubation, illumination and verification. Poincare implicitly and explicitly recognized the transcendent function and the unconscious resource network for integrating the conscious and unconscious minds (Goswamy, 2015, Isaacson, 2006, Poincare, 1905, Rossi, 1996).
Figure 1: below summarizes many of the core components that mathematics appreciates. Mathematical Consciousness of Appreciation © 2016 Bruce Gregory Ph.D.

Figure 2: below organizes core aspects of the fundamentals of mathematical thinking, which can be understood as a subset of the consciousness of appreciation. © 2016 Bruce Gregory Ph.D.
The preparatory phase incorporated a number of the components of mathematical thinking, and others not noted in Figure 1. The preparatory phase also includes the trust and utilization of axioms or truisms, intuition, creativity, organization, and permission, all of which contain the seeds of yes sets, which can be utilized to creatively focus attention and facilitate the transformation of consciousness.

Reason and its subsets, logic and inference, can be considered in a variety of ways. They can be explored in philosophical terms, which include cognitive-instrumental reason, moral-practical reason, and aesthetic reason (Habernas, 1995). When approached from a mathematical perspective, they can be considered resources/tools, in the context of the distinction between deductive and inductive reasoning (Vickers, 2009). Reason can also be viewed as the opposite side of the polarity with passion (Schafer, 2008). In the context of the role of mathematical pathways in the transformation of consciousness, the foundational process is reasoning, logic and inference being actualized into yes sets, so that they can be creatively utilized to focus attention. Yes sets were utilized by Erickson to contain resistance, establish rapport, and facilitate an active partnership between the conscious and unconscious. The primary yes set Erickson utilized was with the unconscious itself. This served as a foundation for focusing attention, the primary variable in the transformation of consciousness (Wilbur, Engler and Brown, 1985, Erickson and Rossi, 1979, and Tulku, 1979). This is consistent with Tibetan Buddhist meditation processes that explicitly utilize a yes set for the focusing of attention (Tulku, 1979).

To consider reasoning simply as an activity of the mind, or a mathematical resource, minimizes its value in the transformation of consciousness in ways similar to thinking that an elephant is primarily its tale and trunk, or that an iceberg is mostly what one observed over the surface of the water, or that the ripples extending over a lake compose the majority of a lake’s potential symbolic value. When a yes set has been established for reasoning and its subsets, logic and inference, they can be viewed and utilized as;

- Subsets as sources of comfort and creativity.
- Enzymes that facilitate neurogenesis and the transformation of consciousness (Rossi, 1986, 2002).
- Bridges to expand the experience of connection in the transformation of consciousness that parallel electron capacity for quantum entanglement in quantum physics (Cox and Forshaw, 2006, Greene, 1999).
- Vectors that support the focusing of attention.

The utilization of reasoning implies that thinking has value, leading to discoveries, learning and clarity. Further, it implies capacity and resources for the reasoning which is provided by the abundant resources of the unconscious coming from different areas of the brain (Joseph, 2011e, Dehaene, et. al, 1999). From a set theory perspective, reasoning contains both the subsets of healthy and unhealthy reasoning. Healthy reasoning can be understood as logical thinking, and unhealthy reasoning has been identified by cognitive behaviour therapy as either cognitive distortions or thinking errors (Beck, 1976).

In western culture, reasoning revealed some incompleteness in the foundations of calculus developed by Newton and Leibniz, who is also considered to be the originator of symbolic logic. (define) The incompleteness was focused around the concept of ‘limit,’ a core component of calculus, whose definition had been difficult to make logically precise. Newton and Leibnitz failed to adequately address this issue, and only in 1821 did Cauchy come close to a sufficient definition, after protracted struggles by groups of mathematicians had also failed. These failures pointed to the depth of the problem and a need for precision of thought, which would ultimately include an appreciation of the real number system. Unfortunately, Cauchy’s proposal also included references to motion, which were unsatisfying. The problem was finally solved by Weierstrass with symbolic logic.

The solution of the limit problem helped expose a problem with the limit’s opposite, the infinite. When distinctions between the rational and irrational numbers were explored, subtle reasoning exposed that these two groups were not equal with regard to the continuity of functions. This raised the question of the importance of sets with regard to calculus.

The evolution of reasoning from Newton and Leibniz through Cauchy, Weierstrass and others can be understood as an extended exploration of the ocean floor of nature’s patterns of design that led to shores of infinity. Cantor’s creativity attacked this problem with full force.

Cantor utilized the reasoning of correspondence, complemented by the consciousness of appreciation for the need for permission to slowly adhere to the steps necessary, to prove that the infinites of the rational and irrational numbers were not equal, and that there were different levels to infinity, identifying the distinction between denumerable and non-denumerable infinite sets ( Dunham, 1991). While doing this, Cantor, from a hypnotherapeutic perspective (Erickson and Rossi, 1979; Gregory, 2011, Rossi, 2002) was utilizing truisms and pacing to establish yes sets for exploring infinites, which could be applied in the treatment of the polarity between hopelessness and hope with indirect suggestions regarding possibilities. These distinctions within infinites may reflect the distinctions in Tibetan Buddhism drawn between lower time and Great Time, and lower space and Great Space (Tulku, 1979). In the process Cantor established set theory, which became the foundation of mathematics. Cantor went on to show through the utilization of the concept of power sets that there was a further distinction and hierarchy...
within the world of infinity, the never ending world of transfinitely large sets. Using the process of diagonals, Cantor showed that any set would be smaller than its power set.

In addition to showing that a yes set could be formed for infinities, as one way of applying mathematical thinking and principles, Cantor’s utilization of points in the interval \((0,1)\) for comparing the rational and real numbers implied that points had value, and could be understood and utilized as connective bridges, in set theory terms, subsets of comfort in the transformation of consciousness. This paralleled Abbott’s appreciation of points in his allegory about dimensions (Abbott, 1884, Gregory, 2015). It was also consistent with Tibetan Buddhist meditations utilizing points in dealing with transforming relationships and consciousness with regard to location in space, time and light (Tulku, 1979, Surya das, 2011). From a set theory perspective, points could be understood as subsets of space, which could be even further divided into subsets that included points on a line, vs. the point in the center of a circle that served as a reference for the radius. These subsets, once recognized and appreciated for their value in terms of space (Tulku, 1979), and the need to be centered and balanced, (Yang, 1996) could then be facilitated into yes sets for transforming consciousness.

Logic is a type of reasoning, and is considered a science that investigates principles governing inference. The appreciation of logic contains abundant opportunities for the facilitation of the transformation of consciousness. When appreciated, the implications of the unconscious network of resources within the hippocampus, culminating with the Kreb cycle can be explored, accessed and utilized from the perspectives of set theory and yes sets. For example, when logic is recognized to have value, that is, its utilization can lead to discovery and problem solving in the context of proofs, conversations can be approached more logically to support them remaining healthy and lead to mutually satisfying solutions. Logic can also be applied to internal processing in order to facilitate satisfying resolution, rather than circular motion, or spiralling, that only increases anxiety. A yes set can be established for logic through the utilization of truisms (axioms in the context of mathematical thinking), and basic accessing questions (Erickson and Rossi, 1979, Gregory, 2007, 2011, Rossi, 1986). With a yes set established attention can be focused creatively around logic to address such themes as the processing of anxiety or resistance, two primary components of experience interfering with the transformation of consciousness in meditation, or managing the course of one’s daily experience.

Continuing in the context of a set theory perspective, there are different subsets of logic, the primary ones being deductive and inductive logic. Mathematical thinking or reasoning utilizes deductive logic through the symbolic logic developed by Boole, who updated the system developed by Leibniz. Symbolic logic is a method of representing logic through the use and utilization of symbols and variables, instead of through ordinary language. Deductive reasoning, also called propositional logic, the kind that is utilized in proofs, uses inferences that follow from stated premises, leading to a conclusion. Inductive reasoning utilizes inferences based on observation.

In the context of establishing and appreciating a yes set for reasoning, logic and inference, two examples of eastern thought that support reasoning, logic and inference functioning as both subsets for comfort and the transformation of consciousness, and working as vectors to focus attention are the work of Nagarjuna, the leading philosopher and proponent of Mahayana Tibetan Buddhism and Shankara, the primary thinker and philosopher who consolidated the Vedas. Nagarjuna developed his doctrine of emptiness, sunyata, around the concept of dependent origination. Nagarjuna’s logic pointed like a vector toward the exploration and appreciation of time and space as fundamental variables in the transformation of consciousness. This mirrored mathematics’ long standing exploration and appreciation of the complexities, depth and fundamental nature of time and space (Coitner, 2015, Tulku, 1979).

Nagarjuna utilized tetralemma, an Indian form of logic, which contained four possibilities, the logic of fourfold negation, which was called Catuskoti, and reduction ad absurdum. Included in the logic regarding negation, was the concept of non-affirming negation. An example of this would be that Buddhists shouldn’t drink, but did not suggest what a Buddhist should do instead, leaving the possible alternative choices simply open. This further implied the value of space and openness (Tulku, 1979). Shankara employed dialectical forms of logic that were similar to that of Nagarjuna in his work (Disgutpa, 1997, Garfeld, 1995, Kalapahana, 1995, Merrill-Wolff, 1973 Tulku, 1979).

These core principles of Nagarjuna implied the value and possibilities of utilizing dependencies as vectors, and appreciated dependencies in ways similar to mathematics’ use of dependencies in equations, Merrill-Wolff utilization of dependencies, and Erickson’s appreciation of dependencies in order to focus attention sufficiently enough to provide containment and transformation of resistance into receptivity, facilitate unconscious healing processes that led to activity dependent gene expression and the transformation of consciousness. From a set theory perspective, dependencies can be divided into the polarity of healthy and unhealthy dependencies. This division of the general set of all dependencies implies that healthy dependencies can be bridges to comfort, and can point like a vector, opening up the exploration of other possible areas of the value of dependencies.
In addition to the logic regarding negation, Nagarjuna identified and appreciated the relativity and implications of the polarities of light and dark, and self and no-self. This implicitly validated the value of opposites, while simultaneously implying the transcendent function, and the primary roles of time and space in the transformation of consciousness. This is consistent with, and corresponds to the appreciation of opposites by Taoism, Herodotus, Jung and classical music composition theory (Jung, 1916, Gregory, 2014, Levitin, 2006, Yang, 1996).

Examination and criticism of Nagarjuna’s logic (Cotnoir, 2015, Garfield and Priest, 2009, Vickers, 2009) have questioned Nagarjuna’s logic as being outside of the basic true/false options of western logic. Utilizing an appreciation of the implications of polarities, which is mathematically validated by the inverse component of group theory, and scale, which determines which laws of physics are operating, Tulku, a Tibetan lama from the Nyingma tradition (Tulku, 1979), demonstrated how the logic of negation could be applied to the polarity between lower and Great Time. Tulku extended this logic in a number of directions (vectors) with respect to;

- a direct relationship with time
- time’s position with respect to the position of the self
- capacity
- steps in the transformation process.

The utilization of logic is a way of slowing down an exploration, which validates the need for curiosity and time, and simultaneously acts like an enzyme sustaining the curiosity itself. It also implicitly accepts uncertainty, and facilitates space and time for further exploration and experimentation, which implicitly reduces pressure to be perfect.

Logic can be seen as a connective bridge, serving as metaphor itself, paralleling the connectivity represented by quantum entanglement in quantum physics (Goswamy, 2015), and the connectivity operating on multiple levels in Tibetan Buddhist meditation processes (Tulku, 1979).

The trusting and valuing of reasoning, logic and inference as connective bridges can continue to shift focus from objects or results to process variables, which is consistent with principles from Tai chi and Tibetan Buddhism meditation processes, and the
work of Merrill-Wolff. In addition, it may suggest that reasoning, logic and inference may be considered vectors themselves, as they support the focusing of attention in a different direction for accessing comfort and transforming consciousness.

A subset of mathematical thinking includes the appreciation of implications themselves; examples of this are demonstrated in the work of Euclid, Archimedes, Euler, Russell, Hilbert, and the implications set forth by Cantor in his proof regarding transfinite cardinals; the worlds of infinity. Cantor’s proof points like a vector toward the possibilities of consciousness, set forth in the logic of Tibetan Buddhism with regard to the possibilities of transformative and liberating relationships with time and space. These new relationships reflect the opposite of thinking errors made by the Self, which set in motion repetitive, compounding patterns of anxiety (Beck, 1976, Dunham, 1991, Masterson, 1976, Tulku, 1979).

A fundamental implication is that dependence can be positive, have value, and possess transformative potential. Functions deal with dependencies; equations and variables involve dependencies. Derivatives involve dependences. Vectors themselves contain dependency with respect to dimension. From a set theory perspective, dependency can be viewed as the set of all dependencies, and can be broken down into healthy and unhealthy dependences.

As stated above deductive reasoning is dependent on the utilization of rules of inference. The rules of inference incorporate connectives of language; and, or, and if, to link propositions. They are based on truth tables that evaluate propositions, and support the development of logical arguments to arrive at conclusions and solve equations. An example of this is:

- All men are mortal.
- Socrates is a man.
- Socrates is mortal.

Three basic forms of deductive logic and inference are; Modus ponens, Law of syllogism Modus Tollens. These and many of the primary ones are included in Figure 5 on the next page.

(https://en.wikipedia.org/wiki/Propositional calculus)

Figure 4: below illustrates a progression of implications regarding dependencies.

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<table>
<thead>
<tr>
<th>Name</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modus Ponens</td>
<td>If ( p ) then ( q; p ); therefore ( q )</td>
</tr>
<tr>
<td>Modus Tollens</td>
<td>If ( p ) then ( q; \neg q; ) therefore ( \neg p )</td>
</tr>
<tr>
<td>Hypothetical Syllogism</td>
<td>If ( p ) then ( q; ) if ( q ) then ( r; ) therefore, if ( p ) then ( r )</td>
</tr>
<tr>
<td>Disjunctive Syllogism</td>
<td>Either ( p ) or ( q ), or both; ( \neg p ); therefore, ( q )</td>
</tr>
<tr>
<td>Constructive Dilemma</td>
<td>If ( p ) then ( q; ) and if ( r ) then ( s; ) but ( p ) or ( r ); therefore ( q ) or ( s )</td>
</tr>
<tr>
<td>Destructive Dilemma</td>
<td>If ( p ) then ( q; ) and if ( r ) then ( s; ) but not ( q ) or ( s ); therefore ( \neg p ) or ( \neg r )</td>
</tr>
<tr>
<td>Bidirectional Dilemma</td>
<td>If ( p ) then ( q; ) and if ( r ) then ( s; ) but ( p ) or ( s ); therefore ( q ) or ( r )</td>
</tr>
<tr>
<td>Simplification</td>
<td>( p ) and ( q ) are true; therefore ( p ) is true</td>
</tr>
<tr>
<td>Conjunction</td>
<td>( p ) and ( q ) are true separately; therefore they are true conjointly</td>
</tr>
<tr>
<td>Addition</td>
<td>( p ) is true; therefore the disjunction ( (p ) or ( q ) ) is true</td>
</tr>
<tr>
<td>De Morgan’s Theorem (1)</td>
<td>The negation of ( (p ) and ( q ) ) is equiv. to ( (\neg p ) or ( \neg q ) )</td>
</tr>
<tr>
<td>De Morgan’s Theorem (2)</td>
<td>The negation of ( (p ) or ( q ) ) is equiv. to ( (\neg p ) and ( \neg q ) )</td>
</tr>
<tr>
<td>Commutation (1)</td>
<td>( (p ) or ( q ) ) is equiv. to ( (q ) or ( p ) )</td>
</tr>
<tr>
<td>Commutation (2)</td>
<td>( (p ) and ( q ) ) is equiv. to ( (q ) and ( p ) )</td>
</tr>
<tr>
<td>Commutation (3)</td>
<td>( (p ) is equiv. to ( q ) ) is equiv. to ( (q ) is equiv. to ( p ) )</td>
</tr>
<tr>
<td>Association (1)</td>
<td>( p ) or ( (q ) or ( r ) ) is equiv. to ( (p ) or ( q ) or ( r ) )</td>
</tr>
<tr>
<td>Association (2)</td>
<td>( p ) and ( (q ) and ( r ) ) is equiv. to ( (p ) and ( q ) and ( r ) )</td>
</tr>
<tr>
<td>Distribution (1)</td>
<td>( p ) and ( (q ) or ( r ) ) is equiv. to ( (p ) and ( q ) or ( p ) and ( r ) )</td>
</tr>
<tr>
<td>Distribution (2)</td>
<td>( p ) or ( (q ) and ( r ) ) is equiv. to ( (p ) or ( q ) and ( p ) or ( r ) )</td>
</tr>
<tr>
<td>Double Negation</td>
<td>( p ) is equivalent to the negation of ( \neg p )</td>
</tr>
<tr>
<td>Transposition</td>
<td>If ( p ) then ( q ) is equiv. to if ( \neg q ) then ( \neg p )</td>
</tr>
<tr>
<td>Material Implication</td>
<td>If ( p ) then ( q ) is equiv. to ( \neg p ) or ( q )</td>
</tr>
<tr>
<td>Material Equivalence (1)</td>
<td>( (p ) iff ( q ) ) is equiv. to ( (if ( p ) is true then ( q ) is true) ) and ( (if ( q ) is true then ( p ) is true) )</td>
</tr>
<tr>
<td>Material Equivalence (2)</td>
<td>( (p ) iff ( q ) ) is equiv. to either ( (p ) and ( q ) ) are true ) or ( (p ) and ( q ) are false)</td>
</tr>
<tr>
<td>Material Equivalence (3)</td>
<td>( (p ) iff ( q ) ) is equiv to., both ( (p ) or ( q ) is true ) and ( (p ) or ( q ) is true)</td>
</tr>
<tr>
<td>Exportation</td>
<td>from ( (p ) and ( q ) are true then ( r ) is true) ) we can prove ( (if ( q ) is true then ( r ) is true, if ( p ) is true) )</td>
</tr>
<tr>
<td>Importation</td>
<td>If ( p ) then ( (if ( q ) then ( r ) ) ) is equivalent to ( if ( p ) and ( q ) then ( r ) )</td>
</tr>
</tbody>
</table>
Mindell showed how a subset of mathematical thinking with respect to numbers could facilitate unconscious processes by setting up a polarity between consensus and non-consensus reality through reasoning and implication. Mindell identified how counting involves comparisons, choices, and implies opposites and the role of subjectivity. This kind of reasoning and its implications was consistent with the logic employed by Merrill-Wolff, who drew on the work of both Kant and Shankara, the Vedic scholar, regarding consciousness without an object (Merrill-Wolff, 1973). These examples of mathematical consciousness appreciating the seeds contained within reasoning and inference may correspond to the collapsing of the wave function as a result of the observation in quantum physics, and the role of consciousness in determining choices that focus attention (Erickson and Rossi, 1982, Goswamy, 2015, Mindell, 2000, Penrose and Hameroff, 2011). An example of this was Erickson’s personal consciousness that functioned as a vector, focusing attention in novel ways. This was reflected by Erickson’s mathematical treatment of the momentum of resistance through creative validation (Erickson, 1964, Gregory, 2011, 2015). Additional evidence of Erickson’s implicit utilization of mathematical thinking can be found in:

- The phantom limb case in his use of geometric progression
- His creative design of treatment plans which echoed Poincaré’s four stage creative process
- Utilization of learning sets (axioms/truisms, inference)

(Erickson and Rossi, 1976, 1979, Lankton and Lankton, 1983).

Poincaré’s four stage creative process can be considered in terms of its implications, and the resulting applications available in the context of yes sets, and the focusing of attention. (Poincare, 1905, Rossi, 1996)

Stage 1 carries a series of implications, relative to stage 2 and 3.

*These implications are summarized in Figure 6 below.*  
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• Permission to explore (value of space and need to open it up)
• Value of curiosity
• Capacity
• Need for time
• Curiosity about time
• Learning
• Gene expression
• Implication of structure and organization
• Hippocampus, electrons.
• Appreciation of structure and focus

Implied within mathematical thinking is that dependencies, vectors, rates of change and motion have value. When they are trusted and appreciated, they can be utilized to focus attention directly through truisms/axioms, or indirectly through metaphor, and the interspersal technique.

One application of Poincare's first stage of data collection can involve the exploration of a set of different experiences.

For example;
I wonder……

• Can you imagine a picture of the feeling?
• Where is it?
• How big is it?
• What color is it?
• What kind of shape does it have?
• What is its consistency?
• What is the source of the feeling?
• Can you imagine one molecule of the feeling?
• Can you imagine the feeling flowing from its source to a place in your body?

This type of exploration through basic accessing questions (Grove and Panzer, 1989, Rossi, 1986), can facilitate unconscious processes for learning, problem solving, and the transformation of consciousness. This template can be utilized to replace feeling with thought, experience, or need.

The exploration carries within it a series of implications that include;
• Curiosity/interest is valuable.
• The unconscious has resources to respond to curiosity.
• Time is needed for exploration and discovery.

This rotational transformational process is represented by Figure 7 below.
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By shifting the focus to the implications of an experience, the trusting and valuing of implications can act like a matrix, or a linear operator, rotating the temporal focal setting from the future toward and deeper into the present (Tulku, 1979).

**Substitution, Equivalence, Correspondence**

Substitution, equivalence, and correspondence are core processes in solving equations and proofs in mathematics. Employing logic, they support the steps necessary to identify the multilayers, the temporal, spacial and proportions of dependency relationships between variables. For example; \( F=ma \) can become \( F=m \frac{dv}{dt} \), since acceleration is the derivative of velocity over time. Correspondence was the primary process utilized by Cantor in his proof for countable and uncountable infinities. The equivalence principle was at the core of Einstein’s general relativity (Dunham, 1991, Greene, 1999, Isaacson, 2006).

The substitution of acceleration with the derivative of velocity over time can be particularly useful in that it is a creative way to address, validate and contain the momentum of the symptoms, while implicitly setting up an opposite with the rate of change for the transformation of consciousness.

In solving linear equations algebraically, substitution is a core method utilized. When experiences, feelings, or problems are considered as an equation with different variables, which is done implicitly in meditation, the utilization of substitution can act like a vector, redirecting the focus of attention toward waiting unconscious networks designed to facilitate the transformation of consciousness.

This can lead to the utilization of substitution in problem solving, that may correspond to substituting different dependencies in the context of treating imbalances in relationships, focus on objects, or substance abuse, through the utilization of basic accessing questions (Rossi, 1986), suggestions involving possibilities (Erickson and Rossi, 1979), and truisms/axioms (Erickson and Rossi, 1979, Struik, 1967).

Once yes sets can be established for their value, each of these three can be utilized to focus attention through the introduction of novelty. Once attention is focused, it can be sustained by creative focusing of attention around different aspects of the theme, whether it be substitution, correspondence or equivalence. This sustaining of attention is the foundation for setting up opposites, which can activate the transcendent function, activity dependent gene expression, and the transformation of consciousness (Engler, Wilbur and Brown, 1985, Jung, 1916, Rossi, 2002). This process was consistently utilized by Grove and Panzer (1989) in their treatment of trauma through visualization, and by Erickson in his February Man case (Erickson and Rossi, 1989).

Correspondence is a way of thinking that supports the opening of exploration for how different systems of thought parallel one another, which can facilitate the recognition of the areas where the systems overlap, and are using different words to address the same concept. A primary example of this is how different disciplines like tai chi, mathematics, mind-body hypnotherapy, meditation, and classical music composition theory all employ a fundamental appreciation of the role and value of opposites, implicitly and explicitly recognizing the resources for integrating opposites. Cantor’s utilization of correspondence demonstrated correspondence’s value as a subset, or connective bridge in transforming consciousness. Once a yes set for correspondence is established, it can raise the question of how correspondence might be applied as a vector, focusing attention in a different, new direction that would facilitate the activation of unconscious resource networks. An example of this can be when a person is having trouble managing an aspect of his experience like anxiety, uncertainty, anger, frustration, disappointment, hurt, etc. This may be the result of judging the experience, being afraid and avoiding the experience, or being impatient with processing the experience. This experience can be compared to, which is a form of correspondence, experiences with learning in general, learning a skill, conversations or meditation. The person’s receptivity to the comparison, and resulting unconscious searches reflect the value of the process of correspondence.

Two examples of the application of correspondence are Rossi and Rossi’s utilization of Dirac notation, linear operators, and Bayesian probability in dealing with expectancy components of transformation (Rossi & Rossi, 2016), and Erickson’s utilization of validation to transform resistance, which corresponded to Dirac’s creation and destruction operators (Erickson, 1964, Gregory, 2011, 2015). In addition, Rossi and Rossi’s utilization of expectancy theory reflected an appreciation of the polarity and the continuum between resistance and receptivity that could be utilized to focus attention creatively.

Equivalence is a concept that can be utilized in facilitating opposites in achieving the transformation of experience, and in doing so, facilitate the transformation of consciousness.

For example, in terms of conversations, it is possible to represent the result of dissatisfaction, tension, anxiety, frustration, etc. as a function of reactivity, lack of self-control, lack of preparation, and insensitivity. This implicitly raises the question of the variables and their accompanying magnitudes that would facilitate the opposite result. The above relates to an interpersonal context. In an intrapersonal context, which is represented by meditation, self-reflection or contemplation, the opposite results are represented by the polarity which includes frustration, anxiety, spiralling, circling, obsession on one side, and peace, and acceptance on the other. The peace and calm are often the consequence of time derivatives of permission, curiosity and acceptance, which are all implied by Poincare’s four stage creative process and integrated into many meditation processes (Wilbur, Engler and Brown, 1985, Rossi, 1996, Surya das, 2011).
Mathematical Concepts
The next section will discuss a number of mathematical concepts that can be utilized by professionals who have established internal yes sets for these concepts. The effectiveness is dependent on the degree of recognition, trust, and appreciation of the value these concepts can have both metaphorically and as doorways for the creative focusing of attention through the use of axioms, curiosity, and opposites to facilitate transformative unconscious processes.

Matrices/Vectors
Matrices and vectors are utilized in many mathematical processes, among them classical mechanics, quantum mechanics and quantum electrodynamics. A matrix is simply a collection of numbers that can be arranged in rows and columns. Matrices can be added, multiplied, or transposed, and can be used to represent vectors. A major application of matrices is in the context of representing linear transformations, especially in terms of rotating vectors. Vectors, which represent magnitude and direction, have a dimensional component, reflect a point in space, and an angle, which is basic to trigonometry. Vector spaces were an integral component in the development of quantum mechanics.

As such, matrices and vectors, when yes sets have been established for their value, can be utilized explicitly and implicitly to address the transformation of consciousness in a number of interpersonal and intrapersonal contexts. This can be done implicitly or explicitly. It is not necessary to specifically utilize matrices or vectors. Any word or concept that is relatively synonymous, or corresponds to matrices and vectors should be sufficient enough to facilitate getting the person to follow with his attention. This receptivity represents a connection with an unconscious resource network that recognizes the value and potential of a new direction of focus, from the perspective of transderivational searches and indirect associative focusing (Bandler and Grinder, 1975, Erickson and Rossi, 1979). Issues that can be addressed metaphorically include:

- Hopelessness
- Interruption of rigid patterns through introduction of new frame of reference
- Relationships with space
- Anxiety
- Focus

Figure 8: below reflects an appreciation of vectors/angles as a way of introducing novelty, interrupting chronic dysfunctional patterns of thinking and focusing, which can facilitate the establishment of a variety of pairs of opposites that can be utilized to activate unconscious transformational processes.
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Vectors for Focusing Attention/Facilitation of Novelty and Unconscious Searches

![Vectors Diagram](image)
The two most important issues are the capacity for transformation, which matrices represent, and the shifting of frame of reference, which has implications regarding the importance of one's position in space, and the value of space. This corresponds to the appreciation of space in classical music composition theory, tai chi, and Tibetan Buddhist meditation practices.

**Sine/Cosine**

Sine and Cosine are trigonometric functions that relate the angles of a triangle to the length of its sides. They symbolically reflect the appreciation of angles, and are very useful in modelling periodic functions, like light and sound waves. By implication, they can be considered subsets and connective bridges of time with reference to position. The sine of the angle gives the length of the y component, and starts its wave function at the position (0,0), and the cosine gives the length of x component at starts its wave function at the position (0,1). Their relevance to the position and velocity of harmonic oscillators gives them metaphorical value in terms of opening up one's consciousness in terms of motion, which can provide the opportunity to set up polarities with regard to motion.

These functions can also be defined in terms of the unit circle, the circle of radius one centered at the origin. This implies that sine and cosine are connected to the centering process and the point of the center metaphorically, and can be considered connective bridges to the centering process and the experience of wholeness. They can also be considered connective bridges to dependency issues in that the derivative of \( \sin x \) is \( \cos x \), and the derivative of \( \cos x \) is \( -\sin x \).

Sine and cosine are connected to imaginary numbers through Euler’s formula. This makes them connective bridges to these subsets of the behavior of the electron in quantum physics.

Figure 9 below is Euler’s formula.

**Euler’s formula**, named after Leonhard Euler, is a mathematical formula in complex analysis that establishes the fundamental relationship between the trigonometric functions and the complex exponential function. Euler’s formula states that, for any real number \( x \):

\[
E^{ix} = \cos x + i\sin x
\]

(https://en.wikipedia.org/wiki/Euler%27s_formula)

In terms of quantum entanglement, the need and capacity for connection, and the polarity between connection and disconnection/alienation, sine and cosine may be utilized metaphorically to focus attention with regards to frame of reference/direction of focus, relationships with space, and one's experience with motion. The steps for focusing attention, the logic within the steps, and the time needed to activate unconscious resources for the transformation of consciousness will be a function of the trust, creativity and appreciation of the professional facilitating the focus of attention, and the receptivity of the patient.

Sine and cosine's relevance and core participation with respect to the radius of the circle, the point of the center, vectors, harmonic motion, the exponential function, and complex numbers imply:

- the depth and complexity of the creative design and role of space
- symbolize the capacity of space to both allow (give permission) and contain
- a polarity between lower space and Great Space (Merrill-Wolff, 1973, Tulku, 1979)

From a set theory, they can be considered subsets of the sources of comfort and subsets for the appreciation of space itself. This can be considered a core component in the transformation of consciousness in that the self's position with respect to space can be so critical (Tulku, 1979) and that a professional's consciousness provides the space that contains the imbalances between the conscious and unconscious minds (Erickson and Rossi, 1979, Lankton and Lankton, 1983, Rosen, 1982).

**Group Theory**

Group theory was discovered by Galois, and advanced by the work of Lie, Klein and others (Ash and Gross, 2006, du Sautoy, 2008). Group theory involves hidden patterns of structure and an appreciation of the role of opposites. It is the language that describes the interactions of symmetries, actions between elements of a group that preserve its structure. Galois recognized that it was an active process, which altered and expanded its original understanding that viewed it only as static, reflecting a balance between sides, without an appreciation of the hidden patterns and structure within. Group theory was instrumental in the development of quantum physics, the solving of complex mathematical equations, and the Lorentz transformation which was an essential ingredient in the formulation of Einstein’s theory of special relativity (Ash and Gross, 2006, du Sautoy, 2005).

By thinking in terms of group theory, a subset of utilizing cognitive processes mathematically, Galois' core realization that the interactions between the symmetries of a group determines and reflects its essential structure can be creatively applied to orient consciousness toward the core of the healthy side of the polarity within the patient. This is done by an appreciation of the permutations which is what Erickson creatively utilized in his Resistance Protocol (Erickson, 1964, Gregory, 2015). Erickson utilized permutations with regard to the validation and transformation of resistance, and the utilization of time in his work with the polarities of not knowing and not doing. A similar, corresponding process...
is described by Tulku (1979) in Tibetan Buddhist meditation exercises involving the transformation of one’s experience with respect to time, the position of the self, and the distinctions between lower and Great Time.

Group theory emphasizes harmony and balance, fundamental components of classical music composition theory and tai chi, which both involve quantum processes. This is consistent with Tibetan Buddhist meditation practices that emphasize the transformation of the imbalance of the position of the self and the resulting consequences of disharmony (Tulku, 1979). By appreciating harmony and balance, group theory can be considered a subset of the Consciousness of Appreciation (Gregory, 2015). The above implies value and opportunities for exploring the following meta-subsets of consciousness;

- The Consciousness of Symmetry
- The Symmetry of Consciousness
- The Mathematics of Consciousness
- The Consciousness of Mathematics
- The Harmony of Consciousness
- The Consciousness of Harmony

Lorentz Transformation

The Lorentz transformation is a mathematical equation that describes the relativity of time as a function of an observer's position in space. It was developed by Lorentz, corrected by Poincare, and utilized by Einstein in his formulation of special relativity (Greene, 1999, Isaacson, 2006). The transformation validated time's role as the fourth dimension, which was reinforced by the Minkowski equation. It also revealed the dependency relationship between space and time, which is consistent with Tibetan Buddhist meditation practice, and Erickson's appreciation and utilization of space and time in his Resistance Protocol and other work with patients (Erickson, 1964, Erickson and Rossi, 1979, 1989, Tulk, 1979). By validating the dependency relationship between time and frame of reference the transformation supports an evolving appreciation of the two which is evident in the practice of tai chi.

The Lorentz transformation reflects a paradigm for the transformation of resistance which is consistent with and corresponds to the peng, lu, and ‘an’ sequence in tai chi push hands, that utilizes physics, and Erickson's Resistance protocol, where Erickson's utilization of validation corresponds to the peng stage of push hands (Erickson, 1964, Gregory, 2010, 1015, Man Ch'ing, 1985).

The transformation can be considered in terms of set theory, in that it represents a subset of the set of all transformations. In addition to transformations with respect to time, other subsets can include the transformation of victim states/positions and resistance. Victim states can include; victim of thoughts, experiences, feelings, conversations, etc.

Set Theory

By thinking in terms of sets and subsets, problems can be broken down into components, which can slow down the exploratory process, reducing anxiety. This can be understood as the result of the implicit permission contained within the process of separating a set from its subsets. Poincare's four stage creative process is a prime example. Poincare was describing mathematical thinking implicitly in his first stage of the four stage creative process, which was supported by the trusting and valuing of intuition and creativity to support the gathering of data. The gathering of data involves identifying variables and truisms(axioms), which practically function as subsets, and gives permission to experiment and explore different combinations, prior to the second stage, incubation.

As such, set theory, which is a subset of thinking mathematically, can also be viewed as a subset of the sources of comfort, as thinking logically, utilizing rules of inference, can spontaneously and naturally facilitate unconscious searches and activity dependent gene expression, transforming consciousness.

Calculus

Calculus is the mathematical study of change. It has two major branches, differential calculus (rates of change and slopes of curves), and integral calculus (quantities and areas under and between curves). Both make use of infinite series that converge to a defined limit. In terms of consciousness, calculus' primary applications may be found with the variables of time, space and motion, and the issue of dependency, and their relation to consciousness.

Calculus highlights the distinctions between linear and nonlinear functions, and whether there is an acceleration component, which reflects an appreciation of time, space and motion. When a yes set is established for acceleration, it can be used as the other side of the polarity with the momentum of resistance to establish a pair of opposites whose dynamic can be explored and integrated. In addition, calculus' appreciation of position complements the appreciation of position reflected in the Lorentz transformation. Differentials' expression of rate of change complements the various time parameters of gene expression (Rossi, 2002).

Exponential Function

The exponential function is a unique function in that its derivative is the function itself. It reflects a rate of change with a special subset of acceleration, and a connective bridge to time. It implies abundant capacity, which implicitly nurtures curiosity for the sources of such vitality.

It represents another way to address and focus attention around possible rates of change, which implies the fundamental importance of directionality (vectors), in that the exponential change can be either toward growth or decay. It exists as a possibility,
not as a preferred goal, and implies the value of exploring what is a preferred rate of change, and what are the variables, and their relative proportional combinations over time that are most conducive to the transformation required.

The aspects of mathematics identified above point to the set of all of the subsets of mathematics that can be utilized to focus attention in the process of transforming consciousness.

When one considers what in mathematics may correspond to the concept of fundamental particles in quantum physics, figure 10 below may reflect some of the core aspects of mathematics that can be utilized to focus attention once yes sets have been established for them.

Summary

The mathematical pathways for supporting the transformation of consciousness have been explored. Primary attention has been given to the roles of reasoning, logic and inference in providing a foundation for mathematical processes. The expression of mathematical processes has been explored in the context of Erickson Mind-Body Hypnotherapy and Tibetan Buddhist Meditation processes. Poincare’s four stage creative process has been highlighted to illustrate mathematics’ role in the creative process, which is reflected in the thought experiments of Galileo, Newton and Einstein. Appreciation of the roles of yes sets, opposites, time and space has been explored in detail. The application of mathematical pathways has been discussed in the context of the creative focusing of attention through the utilization of permutations, consistent with group theory, and Erickson’s resistance protocol.

![Fundamental Aspects of Mathematics that can Facilitate Transformation of Consciousness](image)

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References


Introduction:

This update of Milton H. Erickson’s (1964/2008) classic paper, “Burden of Responsibility in Effective Psychotherapy,” contains commentaries by Ernest Rossi (In this bold purple font) illuminating Erickson’s innovations as a psychotherapist. It is one of Erickson’s earliest papers that initially awakened Rossi’s recognition on how Erickson may have been turning on therapeutic epigenomic expression and brain plasticity as the psychosocial genomic basis of psychotherapy at least a decade before neuroscience was organized as a scientific discipline in the middle 1970s.

This paper illustrates the informality of the conversational approach to hypnotic induction that was so characteristic of Erickson’s naturalistic therapeutic technique. So subtle and apparently undemanding was his attitude, however, that many students have not understood the powerful therapeutic implications of his words. The authors of this update comment on Erickson’s seemingly humble and unassuming therapeutic conversations so students and clinicians can learn how to practice their own well-meaning empathetic efforts to facilitate creative consciousness and cognition in everyday life as well as the consulting room (Hill and Rossi, 2017).

Erickson’s three brief cases reviewed in this update remind us that the locus of creative transformation in all forms of psychotherapy is within the patient’s own mind and body – not the therapist’s – the burden of responsibility for effective psychotherapy is the patient’s own inner work. How to facilitate the patient’s own creative inner therapeutic work is the burden of the therapist’s responsibility in effective psychotherapy.

Erickson’s 1964 paper begins as follows:

The following case material is presented because it offers so concisely and clearly a modus operandi in hypnotherapy with the type of patient who has had long experience in failing to derive desired benefits from extensive, traditionally oriented therapy. The three persons reported upon are typical of dozens of others that this author [Erickson] has seen over the years, and the results obtained have been remarkably good despite the fact that the patients were seen on only one occasion for an hour or two.

[Rossi’s 2017, Introductory Comment: Immediately, right here within Erickson’s first two sentences, we witness his empathic, comforting and empathic informality with the words “patients were seen on only one occasion for an hour or two.” Apparently, no big deal! It wasn’t until a few generations ago that neuroscience recognized that the range of “an hour two” embraced the typical time parameters of the Basic Rest-Activity Cycle and 4-Stage Creative Cycle of Therapeutic Consciousness and Cognition (Lloyd and Rossi, 1992, 2008; Rossi, 1982, 2002, 2007, 2012).]

In each instance hypnosis was used for the specific purpose of placing the burden of responsibility for therapeutic results upon the patient himself after he himself had reached a definite conclusion that therapy would not help and that a last resort would be a hypnotic “miracle.” In this author’s understanding of psychotherapy, if a patient wants to believe in a “hypnotic miracle” so strongly that he will undertake the responsibility of making a recovery by virtue of his own actual behavior and continue that recovery, he is at liberty to do so under whatever guise he chooses, but neither the author nor the reader is obliged to regard the success of the therapy as a hypnotic miracle. The hypnosis was used solely as a modality by means of which to secure their cooperation in accepting the therapy they wanted. In other words, they were induced by hypnosis to acknowledge and act upon their own personal responsibility for successfully accepting the previously futilely sought and offered but actually rejected therapy.
CASE 1

A telephone call was received in the office from a man who stated that he wanted an appointment. He refused to give any reason except that it was for a proper medical reason he preferred to explain to person. At the interview the man stated that he was suffering from Buerger’s disease, that he was a diabetic, and that he had cardiac disease and high blood pressure—"Too much for a man with a family the size of mine and only 50 years old." He went on, "That isn’t all. I’ve been psychoanalyzed for eight months for five hours a week. During that time my insulin dosage has had to be increased, I’ve gained 40 pounds, my blood pressure has gone up 35 points, and from 1½ packs of cigarettes I have gone up to 4½ packs a day. I am still the psychoanalyist’s patient, I have an appointment with him for Monday, but he is paid up to date. He says he is slowly uncovering the psychodynamics of my self-destructive behavior. I myself think that I’m digging my grave with power tools."

Then with utter gravity he asked, "Would it be unethical for you, knowing that I am another physician’s patient, to give me the benefit of two hours of hypnotherapy this afternoon? My analyst disapproves of hypnosis, but he certainly hasn’t done me any good."

[Rossi, 2008, Comment #2: Note the patient’s intuitive understanding that 2 hours will be required to accomplish his inner creative work. Today we hypothesize this is an example of our natural Basic-Rest-Activity Cycle (a so called “mind-body ultradian rhythm”) that usually requires about 90-120 minutes in everyday life. While awake this is the natural rhythm of most life activities (work, play, seeing a movie, etc.). While asleep this is the natural rhythm of our Slow Wave Sleep and REM dream cycle for updating consciousness, memory, and behavior on all levels from mind to gene. We hypothesize this is the scientific rational for why Erickson utilized about 90-120 minutes as the length of his typical sessions of therapeutic hypnosis and psychotherapy with most of his patients (Rossi & 2014 Rossi, 2008, 2015a & b)].

The simple reply was made that, from my point of view, the question of professional ethics did not enter into the situation at all, that every patient, including mine, has the right to seek from any duly trained and licensed physician whatever proper help he desires, that medical ethics should properly be centered about the patient’s welfare rather than a physician’s desire to keep a patient.

He was then told to close his eyes and repeat his story from beginning to end, to do this slowly, carefully, to drop out the question of ethics and in its place to specify what he wanted from the author. This he was to do slowly, thoughtfully, appraisingly, and as he did so, the mere sound of his own voice would serve to induce in him a satisfactory trance in which he could continue to talk to the author, listen to the author, answer questions, do anything asked of him by the author and that he would find himself under a most powerful compulsion to do exactly that which was indicated.

[Rossi, 2008, Comment #3: These words in italics are not a formal induction to hypnosis in the usual sense when patients realize they are being put into a hypnotic trance with monotonous and repetitive suggestions to “relax” and “sleep,” etc. However, we can now recognize how Erickson’s words are actually “trance-inducing” for this patient who is so interested in telling his own numinous story and getting help that it (1) focuses his attention with (2) high expectancy—the two characteristics of modern therapeutic hypnosis. This leads me to call these words in italics an Ericksonian bridge between traditional therapeutic hypnosis and psychotherapy as we practice it today. Erickson often did not distinguish between formally induced therapeutic hypnosis and “The General Waking Trance” when his patients were in a state of high expectancy and focused attention. We hypothesize that this state of high expectancy and focused attention is the common denominator between Ericksonian therapeutic hypnosis and all other forms of effective contemporary psychotherapy that seek to facilitate consciousness, cognition and behavior change on all levels from mind to gene that we call “Psychosocial Genomics” today (Rossi, Erickson-Klein, Rossi, 2008 a & b, 2008/2016; Rossi, Iannotti, et al., 2008).]

The man was taken aback at these unexpected instructions, but leaned back in his chair, closed his eyes, and slowly began his recitation with pertinent additions. Shortly his voice began to trail off, indicating that he was developing a trance, and he had to be told several times to speak more loudly and clearly.

[Rossi, 2017, Comment: “unexpected instructions,” indeed! Only now, about 10 years after the first publication of this update, do I realize that this simple word “unexpected” could imply what I call, the Novelty-numinosum-Neurogenesis Effect (NNNE) when any unexpected surprise could turn on activity-dependent gene expression and brain plasticity to facilitate the growth of new neural networks in the brain that would underpin new therapeutic consciousness and cognition (Rossi, 1973a & b, 2002).]

No mention was made of the question of ethics, but with a wealth of detail he outlined the therapy which he thought to be indicated. He was asked to repeat this several times, and each
time he did so more positively, emphatically, and inclusively.

After four such repetitions the author pointed out that he, as a physician, had offered no advice or therapeutic or corrective suggestions, that every item in that regard had come from the patient himself, and that he would find himself under the powerful compulsion arising from within him to do everything that he thought was indicated. To this was added that he could remember any selected parts of his trance state, but regardless of what he remembered or did not remember he would be under a most powerful compulsion to do all that he himself thought to be indicated.

He was aroused, a casual conversation initiated, and he left.

A year later, in excellent physical shape, he brought in an old childhood friend of his and stated very briefly, “I eat right, I sleep good, my weight is normal, my habits regular, my diabetes is under good control, my Buerger’s disease has not progressed, my blood pressure is normal, I never went back to my analyst, my business is better than ever, I’m a new man and my whole family thanks you. Now this man is my boyhood pal, he’s got emphysema, a very bad heart, going unaccountably into a deep and deeper trance without any interruption of his story."

He was assured that this could not be done, but that the author would like to have him retell his story slowly, carefully, with his eyes closed, and to give it in good detail, letting his unconscious mind (he was a college graduate) take over all dominance, and that, as he related his story, he was to specify in full and comprehensive detail exactly what it was he wished in relation to cigarettes, but that during his narrative he would find himself going unaccountably into a deep and deeper trance without any interruption of his story.

The procedure and results were almost exactly comparable to the two preceding cases. Two years later another telephone call was received from the same man asking for a half-hour appointment at noon and volunteering to pay an hour’s fee. He again declared it to be an emergency.

Exactly at noon he came striding into the office and remarked. “You won’t recognize me. You only saw me for an hour two years ago. I am Mr. X, and I had had two years of analysis for excessive smoking with only an increase in my smoking. I can’t remember what went on when I saw you, but I do know that I haven’t smoked a cigarette since then. It’s embarrassing, too, because I can’t even light one for my girl. I’ve tried many times, but I can’t.

“But I went back to that analyst, and he took all the credit for my stopping smoking. I didn’t tell him about you. I thought I needed to see him about what he called a character defect in me. Here I am with a college education, and the longest I’ve worked at a job has been three months. I can always get a job, but I’m 34 now, and four years of psychoanalysis has wound up with my last job lasting only five weeks. But I’m 34 now, and I’ve got the promise of another job with a future to it. Now I want you to do something about whatever is wrong with me because I’ve quit the analyst. I’ve had better jobs than the one coming up, but there is nothing to hold me to it. It will be the same old story. Now, hypnotize me and do what I should have had you do two years ago, whatever that was.”

His former case record was looked up to refresh the author’s memory. As precisely as
possible the technique of the previous occasion was followed, and he was again dismissed. Two years later he was still at the “new job” but had been promoted to a managerial position which he has held for over a year. A chance meeting with him disclosed this fact and also that he is married and a father and that his wife voluntarily gave up smoking.

Erickson’s Original 1964 SUMMARY

Three of a long series of similar cases are reported here to illustrate the use of hypnosis as a technique of deliberately shifting from the therapist to the patient the entire burden of both defining the psychotherapy desired and the responsibility for accepting it. Often this is the most difficult part of psychotherapy. In all the patients this author has handled successfully in this manner, all had a history of a steady, persistent search for therapy, but a failure to take the responsibility for accepting it. Additionally, all such patients with whom the author has had a known success were of a superior intelligence level.

In traditional ritualistic and conventional psychotherapies much, often futile, effort is made to induce patients to assume adequately the responsibility for their own behavior and for future effort. This is done without regard for the patients’ consciously thinking and firmly believing as an absolute truth the futility of any effort on their own part.

But utilizing hypnosis as a technique of deliberately and intentionally shifting to the patients their own burden of responsibility for therapeutic results and having them emphatically and repetitiously affirm and confirm in their own thought formulations and their own expressed verbalizations of their own desires, needs and intentions at the level of their own unconscious mentation, facilitates the therapeutic goals becoming the patient’s own goals, not those merely offered by the therapist he is visiting.

That this procedure always is successful is not true. There are many patients who want therapy but do not accept it until adequately motivated. There are other patients whose goal is no more than the continuous seeking of therapy but not the accepting of it. With this type of patient hypnotherapy fails as completely as do other forms of therapy.

Another of Erickson’s most original contributions was his invention of “hand levitation” in facilitating the induction of therapeutic hypnosis and psychotherapy (Rossi & Rossi, 2008). What was most innovative about Erickson’s hand levitation approach is that he replaced the traditional hypnotic induction via “passivity-inducing” suggestions for relaxation and sleep with the exact opposite: hand levitation is a rather paradoxical activity that usually requires an “active effort by the patient.” Erickson would typically offer positive suggestions for achieving positive therapeutic goals while the patient was experiencing the active effort of hand levitation.

Erickson (Erickson & Rossi, 1981/2014) frequently commented that successful hand levitation requires activating muscle tonus (the slight continuous contraction characteristic of a muscle at rest) on a deep physiological level. Erickson’s patients would often tremble, vibrate, shake, sweat and feel hot with the strain they were experiencing) – the opposite of the traditional passive hypnotic induction via quiet suggestions for relaxation and sleep. Erickson’s hand levitation technique activated the patient’s mind and body while they were receiving positive inspiring suggestions for therapeutically reconstructing themselves. Erickson, of course, did use the traditional passive eye fixation techniques with relaxation suggestions when they were appropriate but there was always a special twinkle in his eyes when he used his active hand levitation approach that he seemed proudest of – he got his patients to work and sweat just as farmers and laborers did! What was the patient’s work and sweat all about? There seemed to be some secret and unexpected therapeutic efficacy associated with activating the patient’s mind-body while administering positive therapeutic suggestions.

What could this secret be?

It was while searching for the source of this secret efficacy of associating positive therapeutic suggestions with hand levitation and thereby activating the patient’s mind-body that Rossi (1986, 2002) accidently stumbled upon the concept of “activity-dependent gene expression and brain plasticity” in the new neuroscience of psychosocial genomics, The 4-Stage Basic Rest-Activity Cycle and the 4-Stage Creative Cycle of Creative Consciousness and Therapeutic Cognition. (Lloyd & Rossi, 1992, 2008; Rossi, 2002; Hill and Rossi, 2017). It suddenly seemed intuitively obvious that Erickson’s activating hand levitation approach could be turning on what the molecular
biologists and neuroscientists were calling “activity-dependent gene expression and brain plasticity.”

Could this really be the secret of the therapeutic efficacy of Erickson’s hand levitation approach?

Rossi (2002, 2004, 2007) simply generalized Erickson’s activity-dependent hand levitation approach to an ever-growing potpourri of “novel activity-dependent hand mirroring approaches” to therapeutic hypnosis, psychotherapy and psychosocial genomics (Hill and Rossi, 2017). Pilot studies document how these therapeutic approaches are efficacious in turning on gene expression in the consulting room (Rossi, Iannotti, et al., 2008). The broader cultural and educational implications of such research is that all novel, fascinating, awesome, mysterious, and numinous psychological experiences of art, beauty, and truth turn on gene expression and brain plasticity when we are creatively engaged while awake as well as when we are updating and re-constructing our mind, memories, and well-being during our dreams while asleep (Rossi, 1972/1985/2000). Current research on brain rhythms and diurnal variations in hypnotic responsiveness (Jensen, 2016, Jensen et al. 2015a, 2015b) continues to explore the role of activity-dependent gene expression, brain plasticity and the basic rest-activity cycle in the new neuroscience of psychosocial genomics (Cozzolino et al., 2014a 2014b; Lloyd & Rossi, 1992, 2008).]

Jensen (2016), for example, reviews the most recent research as follows:

If the absolute power of theta or the amount of theta power relative to other oscillations facilitates hypnotic responding as proposed by the theta hypothesis, then not only would we predict more hypnotic responsivity when theta tends to peak during the day (e.g., in the midmorning and late afternoon/early evening, on average) but we would anticipate that there would be times within each 90 to 120-minute cycle when individuals are more prone to respond to suggestions. As Green and colleagues (2015) point out, an ultradian pattern of hypnotic responsivity was noted by Ernest Rossi more than 30 years ago (Rossi, 1982). Rossi has also noted that Milton Erickson preferred to meet with clients for 90 minutes or longer and that Erickson was aware that people cycled in and out of receptive states. Erickson would then pay close attention to clients and simply wait until they became naturally more open to new ideas and suggestions during the session. His work did not always involve the use of a formal hypnotic induction. Thus, Rossi notes, Milton Erickson was less a genius of manipulation “but rather a genius of observation” (Rossi & Nimmons, 1991, pp. 2–3). Given these considerations, Green and colleagues’ conclusion that the midmorning may be the best time to be hypnotized might be qualified by saying that all else being equal, and on average, the midmorning might be the best time to be hypnotized. However, close observation of individual clients for signs of responsivity to the Mirroring Hands to therapeutic hypnosis (Hill & Rossi, 2017) even in the late afternoon (~ 4:00 pm when researchers document that a massive shift in gene expression is taking place at “Breaking Point” when there apparently a massive transition from gene expression that optimizes outer performance in the early hours of the day to the genes that optimize nurture, recovery and healing during evening and sleep).

Summary of our 2017 updates and proposals

In hindsight we now have a clear 20/20 vision of the major insights in the 200-year history of hypnosis from its pre-scientific sources before James Braid (Zilboorg & Henry, 1941) to the present in four steps.

Continuing case studies of Milton H. Erickson’s naturalistic approaches to therapeutic hypnosis as illustrated in this paper is fomenting evidence-based neuroscience and psychosocial genomic research on the mind/body nature of therapeutic consciousness and cognition (Erickson, 1958/2008, 1964/2008).

Ernest Rossi’s (1982) related 30-year-old question about the naturalistic basis of Erickson’s therapy, “Hypnosis and ultradian cycles: A new state(s) theory of hypnosis?” is now being evaluated as a hypothesis about a biopsychosocial model of therapeutic hypnosis by other research groups (Green et al. 2015; Jensen, 2016; Jensen et al., 2015a b).

More recently well documented scientific evidence for natural circadian (~ 24 hours) and ultradian (less the 24 hours) cycles and rhythms of responsiveness in human behavior, cognition in everyday life represents a new integration neuroscience, psychobiology and medicine as well as therapeutic hypnosis. The Nobel Prize in Physiology or Medicine in 2017, for example, was awarded jointly to Jeffrey C. Hall, Michael Rosbash and Michael W. Young for their discoveries of molecular mechanisms controlling the circadian rhythm of life and consciousness. Jerome Groopman (2017) a staff writer since 1998, who writes primarily about medicine and biology, had this to say about the profound implications of the Nobel Prize for all of us.
“The Nobel committee made clear this morning, the science that informs and occasionally upends our understanding of human health and disease often comes from unexpected places. Ohsumi used yeast cells to explore autophagy, but a similar garbage-disposal system exists in you and me. Similarly, studies of the circadian rhythm in flies have shed light on the genes and proteins that synchronize our own bodies with the day; they may lead to treatments for a wide range of maladies, from jet lag to obesity to heart disease. The joy of science is to learn for learning’s sake; whatever wondrous insights emerge may then be used to address the problems that we confront in our daily lives. The message embedded in today’s Nobel Prize announcement couldn’t come at a better moment—or a more fraught one.”

This leads us to propose that the ultimate foundation of therapeutic consciousness, cognition, hypnosis, meditation and virtually all the so-called alternative and complementary approaches to medicine may be emerging as an integrated quantum field theory of the fundamentals of physics, math, biology and psychology (Feynman & Hibbs, 2005; Loewenstein, 1999, 2013; McFadden, 2008; McFadden & Al-khalili, 2014; Rossi & Rossi, 2014–2016).
References


