PROCEEDINGS OF THE
Jerusalem International Conference on
Neural Plasticity and Cognitive Modifiability

Jerusalem (Israel), 2-5 June 2013
Foreword

The coming together of the “disciplines” of cognitive education and the neurosciences enable a confrontation between the two. A consideration of the relationship between these two fields is now critically important because the modifiability of the brain has long been denied, by generations of scientists and educators, and is still not well acknowledged and reflected in practice.

The theory of structural cognitive modifiability (SCM) and the application of mediated learning experience (MLE), developed by Professor Reuven Feuerstein more than 50 years ago, particularly viewed in the context of what is now known and demonstrated by neural plasticity research serves as a paradigmatic framework for this conference. Recent evidence demonstrates that the brain is modifiable, responsive to structural and functional change as a consequence of external and internal stimulation, leading to neural plasticity. Major findings are coming to light daily, from both cognitive and neurogenetic perspectives, as scientists develop new research designs, focus on diverse and expanding variables, and exploit the new and expanding non-invasive technologies that enable the study of the brain in situations of “real-time” exposure.

The potential for modifiability is no longer confined to the “hard” and biologically based aspects of neural functioning. Philosophers and others who are concerned with spiritual and moral/ethical aspects of human conditions are being joined by the scientists as the brain’s modifiability potential is being explored. The conference offered an opportunity to consider the novel implications of this confluence.

Professor Reuven Feuerstein, Founder and Chairman, The Feuerstein Institute
Rabbi Rafi Feuerstein, Deputy Chairman, The Feuerstein Institute
## Index

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Cognitive Modifiability and Neural Plasticity: Confronting the Possibilities</td>
<td>1</td>
</tr>
<tr>
<td>Feuerstein R., Falik L.H.</td>
<td></td>
</tr>
<tr>
<td>Neuroplasticity and cognitive modifiability</td>
<td>5</td>
</tr>
<tr>
<td>Margiotta U.</td>
<td></td>
</tr>
<tr>
<td>Optimization Methodology and Functional Connectivities Inform the Cognitive Modifiability in the Rehabilitation of Developmental Language Difficulties</td>
<td>11</td>
</tr>
<tr>
<td>Leisman G., Carrick F.R.</td>
<td></td>
</tr>
<tr>
<td>Ego and Freewill: a Virtual Binomial Apt for Cognition</td>
<td>19</td>
</tr>
<tr>
<td>Bignetti E.</td>
<td></td>
</tr>
<tr>
<td>An exploration of brain adaptation as a result of impairment with a specific focus on congenital blindness</td>
<td>23</td>
</tr>
<tr>
<td>Burke A., Kruger T.N.</td>
<td></td>
</tr>
<tr>
<td>Mediating Musical lexical Functions Prepares Children Minds for Textual Reading</td>
<td>27</td>
</tr>
<tr>
<td>Carmon Y.</td>
<td></td>
</tr>
<tr>
<td>Fragmentation of Brain Reactions by Switching Phenomenon?</td>
<td>33</td>
</tr>
<tr>
<td>Doepp M., Thum C.</td>
<td></td>
</tr>
<tr>
<td>Analysis of infant neuromotor development using a computer-based approach</td>
<td>35</td>
</tr>
<tr>
<td>Friedman H., Bar-Yosef O., Gordon G., Forkosh O., Schneidman E.</td>
<td></td>
</tr>
<tr>
<td>Perpetuated Crimes of Human Atrocity. Modifiable or Just Predictable?</td>
<td>39</td>
</tr>
<tr>
<td>Goldberg G.</td>
<td></td>
</tr>
<tr>
<td>Homunculus of vision inside the brain: neuro-design of the functional organization</td>
<td>47</td>
</tr>
<tr>
<td>Kirvelis D.</td>
<td></td>
</tr>
<tr>
<td>Causometry, lech lecha challenge and cognitive modifiability*</td>
<td>51</td>
</tr>
<tr>
<td>Kronik A.</td>
<td></td>
</tr>
<tr>
<td>The Social Mediation of Classroom Behaviour</td>
<td>57</td>
</tr>
<tr>
<td>Moss G.</td>
<td></td>
</tr>
<tr>
<td>Smart Skirting Board: Snoezelen System in Alzheimer</td>
<td>61</td>
</tr>
<tr>
<td>Moutinho G.M., Fernandes V., Marujo J.P.</td>
<td></td>
</tr>
<tr>
<td>Reversal of cognitive disabilities by treatment with growth hormone</td>
<td>65</td>
</tr>
<tr>
<td>Nyberg F.</td>
<td></td>
</tr>
</tbody>
</table>
Important structural components influencing brain cognitivity: cortical folding, micro- and submicrostructures, liquid crystal smectics in the interstitial tissue
Koha R. .................................................................................................................................................................. 69

Implications of neuroplasticity in neuroethics
Serrão S., Jácomo A. ........................................................................................................................................... 73

The Influence of Exposure to Nationality Concepts on Stereotypes among Jews and Arabs in Israel
Shamoa-Nir L., Razpurker-Apfeld I. .................................................................................................................. 79

A case study of Alzheimer patient: brain plasticity & functioning- preservation of lifeline via KEG Cards (Keys to Emotional Growth)
Avinor E., Silman J. ........................................................................................................................................... 83

Correction the Motor Control System of the People Suffered with Cerebral Palsy
Skorbun S.D. .......................................................................................................................................................... 91

A retrospective of the “Journey out of the land of the In-Between” The trials and triumphs of reclaiming brain function, a life, marriage and sense of self after right anterior frontal lobe brain injury
Trotman P., House T. .......................................................................................................................................... 95

Are you living on AUTOPILOT, too? Or are you mastering your memory and mood states?
Prüm U.M. ........................................................................................................................................................ 103

Investigating the maturational lag and deviation models as explanation for the pathways of childhood ADHD into adulthood
Burke A., Edge A. ............................................................................................................................................... 107
Structural Cognitive Modifiability and Neural Plasticity: Confronting the Possibilities

Feuerstein R.¹, Falik L.H.²

¹ Founder and Director, The Feuerstein Institute (formerly the International Center for the Enhancement of Learning Potential), Jerusalem, Israel
² Senior Scholar, The Feuerstein Institute (formerly the International Center for the Enhancement of Learning Potential), Jerusalem, Israel

Welcome: A Frame of Reference

We welcome you to this international conference that brings together two allied disciplines and bodies of research and practice both dealing with the modifiability of the human being. We convene together as interested and committed scholars and practitioners in the fields of cognitive modifiability (an educational perspective) and neural plasticity (reflecting the current revolution in the neurosciences). It is timely for us to convene as the two disciplines are coming closer together and as the expanding knowledge base enables us to explore their relationship. Ultimately, our concern is for finding ways of bringing this potential into action to affect the lives of the many people who need it!

The revolution in the brain sciences, made possible by advances in technology, and a longer history development of cognitive approaches applied to psychology and education, a contribution that the Feuerstein Institute can claim some proprietary interest in, now presents a potential “call to action.” We have reason for optimism, but we also have reason for concern. So little of what is known and can be done has filtered down to the level of everyday practice and institutional restructuring, expectations, and services.

One can pose the concept of the changeable brain, whereby the plasticity of the brain can be enhanced by cognitive activity imposed on the brain. We developed applied programs to produce cognitive modifiability more than five decades ago, long before we knew what we now know as enhancing neural plasticity. Our efforts I generated the development of a method to dynamically assess the level and availability of the individual’s cognitive functions, resulting in the development of the Learning Propensity Assessment Device (LPAD), and an intervention program to build and/or strengthen the cognitive functions necessary for thinking and learning. These “applied systems” have been well validated by research, and in continuous and successful use ever since. They are based on the theory of Structural Cognitive Modifiability (SCM), that poses the potential for all learners to be modified, under carefully designed and applied conditions, in the nature of their behavior and cognitive structures. They are applied through the provision of mediated learning experience (MLE). More than five decades of application, in diverse settings and with a wide range of populations in need convinced us, and many others (given the extensive research that has been done—extending to hundreds of books and thousands of papers), that they are grounded and structured to materialize the potential for modifiability of both behavior and neurophysiological structures. Our current optimism is encouraged by the revolution in the brain sciences, that confirms our basic theoretical assumptions, and enables us to understand the way by which cognitive activities promote modification of the structures and functions of the brain.

The Need to Respond

Early in my studies with Professors Jean Piaget and Andre Rey, I began to formulate my theory of SCM. In its early and subsequent development and implementation, we (and many others in the field) were reluctant to attribute the modifiability observed, produced, and sustained to changes in the neurophysiological structure, even though we suspected that this might be the case.

However, in a lecture given in 1979 at a symposium on Brain Mechanisms in Memory and Learning: From the Single Neuron to Man Feuerstein made (what now seems to him to be) quite visionary statements:

We present an outline of a theory of cognitive development that may account for the modifiability of the organism. This theory is based on the assumption that the human organism is an open system, whose level of functioning depends on specific events impinging upon him at various stages of his development (Feuerstein, 1979, p. 364, italics added)…
must...consider the more lasting effects of intensive investment on the neural structure of the brain (op. cit., p. 371).

These predictions were made at the closing lecture of the symposium, where Professor Eric Kandel presented the first lecture, describing his early studies—that became quite seminal in the field—on the modifiability of the aplesia (stimulating further research on the potential for processes of epigenesis).

The then existent level of technology did not give us evidence regarding the effect of modifying the cognitive functions on the structure of the brain. Yet, the senior author on his strong need to respond to those individuals to improve the qualities of their lives, and reach their intellectual and social potential. He could not accept, first in the survivors of the Holocaust with whom he worked, and later with a diverse range of children, youth, and adults presenting developmental, genetic and chromosomal, traumatic brain injury, and social/educational deprivation, that their dysfunctions were inevitable or unchangable. Here we must face, as I did, the dilemma between science and belief, but not be immobilized by it. This need led to a belief system, that change was both necessary and possible, and leading to the development of applied systems, the LPAD and FIE, to assess and meaningfully intervene, and eventually a framework and strategies for the Shaping of Modifying Environments that we deemed essential to create and maintain the necessary conditions for promoting cognitive modifiability. Each of these systems was based on SCM theory, applying MLE, in a systematic manner according to the operational concepts embedded within them—the identifying and addressing the Deficient Cognitive Functions and analyzing dimensions of tasks in order to manipulate them effectively to improve or establish cognitive functions, what he has called the Cognitive Map.

Implications of The Revolution in the Brain Sciences

One of the consequences of the revolution that is taking place in neurosciences is confirming the neuroplastic potential of the human organism, pointing in direct ways to the potential for external interventions of an educational and social nature to promote neural plasticity. One of the most important implications of the revolution permits (we say "requires") a departure from the fixist conceptions of human intelligence, as a stable trait of the individual that is not affected by experience (exposure to external stimulation, responsive to processes of learning). It is no longer hyperbole to state that our brains are our most plastic organs! It also brings into view topics previously considered outside the spectrum of science—that of the spiritual, ethical, and moral aspects of behavior and the brain. But we must ask—and subject to research scrutiny—just what kinds of stimulation, under what conditions, using what modalities of exposure, over what duration and intensity will best promote the plasticity of the brain and the modifiability of learning potential? These are the questions that must be asked, and we must bring our developing knowledge and experience to their answers. There are many implications in these questions and answers, both from the perspective of the Feuerstein programs, and the many others that have developed of the course of the last several decades, in response to growing recognition of both needs and potentials. The revolution in the brain sciences, leading to a confirmation of the potential for significant modifiability, brings these issues into sharp relief. For the senior author, there is a great sense of personal affirmation in the confirmation offered by the scientific results that are accumulating and illuminating the potential for neural plasticity. Congresses such as this are important way stations in the ongoing journey, enabling a closer examination of these and related topics.

Why Do We Come Together?

Scientific advancements in technology make available new tools for professionals facing medical, psychological, educational, and societal problems facing human beings on a global scale. We encourage a confrontation! Neuroscience brings experimentally based evidence that the process of cognitive modifiability make it possible, that we now know (and have confirmed) how to make it happen! But the strategic connections and operational options are still not well understood, and certainly not widely implemented. This meeting offers the opportunity for a worldwide gathering of scientists, practitioners, therapists, and educators who come from different professional perspectives but share common interests to explore and become familiar with the developments in these related fields. The common theme is modifiability. If we accept that basic human behaviors and levels of functioning can be modified, as a consequence of and for our neural systems, we must move to the next level and explore why, how, when, under what conditions, and with what consequences.

We can join in benefitting from moving from hermetically isolated environments (the laboratories and limited “pilot programs”), and outmoded theories and concepts, to the active and vibrant considerations made possible by new knowledge and new technologies—finding ways to respond to people in need. This conference reflects the goal of responding from the perspective of new paradigms and reflecting a commitment to promoting positive human potential, overcoming unnecessary barriers, and laying foundations for support.
The Potential to Respond to Critical Needs

From the perspective of both disciplines it is now clear that the systematic application of dynamic assessment and intervention has the potential to produce change. The science, and the growing awareness that it has generated, indicates that the three conventionally accepted resistances to change can be overcome—notably etiology (the causative factors), the genetic, hereditary, chromosomal conditions; critical periods, indicating that there are developmental deadlines after which change is not possible; and severity of the condition, indicating that extreme conditions cannot be improved.

However, because we are at the frontier of this knowledge (the revolution is less than two decades old, a very short time in the history of science) there is much to be learned in order to understand the implications of the convergence of the theory and practice of cognitive modifiability and the revolution in the brain sciences and bring them into wide acceptance and practice. An understanding and strategic action to bring the theory of structural cognitive modifiability (SCM) will contribute to its (the convergence) materialization.

Outcomes and Opportunities from this Conference

It is the hope of the conference conveners that through interactions among people from different cultures and countries and from a diverse range of professional orientations, that our sharing of diverse contributions from our invited presenters, and action reports from those exploring these new frontiers will stimulate the furthering of the parameters of our knowledge and spur us to action!

This is a critical period in the development of this dialogue.

The Feuerstein Institute

A few words about our Institute as the hosts for this event. The Feuerstein Institute (formerly known as the International Center for the Enhancement of Learning Potential—ICELP) has a history of more than 50 years of experience with the development and implementation of theories and programs for cognitive modifiability. It’s work is now closely convergent with the rapidly expanding knowledge base coming from the new neurosciences, actively confirming through research and development, training and dissemination, and the provision of direct services to individuals presenting a variety of needs—brain injury, autism, learning deficiency and developmental delays due to a range of causes.

The Feuerstein Institute (FI) is devoted to bringing a positive theory of human potential—through applications of programs to materialize structural cognitive modifiability (SCM)—to all those who need it. Through this application we also hope to design new models through research and development that will extend our experience into the academic and professional world. One of the indicators of the acceptance and effectiveness of this work is attested to by the translations of theory and programs into more than 20 languages, and its active implementation on all continents of the world. A network of training centers and affiliations with universities and other program venues (government and non-governmental) further attest to its impact meeting diverse human needs on a global scale. Many thousands of teachers, psychologists, learning and behavior specialists have been trained, and are implementing programs in response to a diverse range of needs. Our programs have been applied to hundreds of thousands of individuals throughout the world, in clinical and educational settings, in classroom and other group environments, and across a spectrum of ages, learning needs, and social conditions. They have been considered paradigms, encouraging scholars and practitioners to use, adapt, and implement activities of an innovative and adaptive nature based upon them.

We want to conclude with a few remarks about the third of our programmatic interventions, the shaping of modifying environments (SME). We consider this of extreme importance if we are to create, establish, and sustain proper conditions for cognitive modifiability. We know that knowledge regarding needs and potential responses alone is not enough. Nor are the good intentions of those are informed and concerned! One must create structures supported by strategies to ensure that the paradigm shifts and hard work will occur, and then continue to work to sustain them—often in the face of resistances. We are seeing this clearly now, partially due to the circumstances I have just described, representing both political, academic, and cultural factors. Thus the importance of directing our efforts to the dynamics of SME. The application of SME increases the chances that individuals with potential, previously undetected, will have opportunities to be modified. Again, we reiterate that the effects of these theories and applied systems have been substantiated by numerous research studies conducted by a wide range of scholars and researchers, leading to an extensive bibliography of books, monographs, doctoral dissertations, and research studies. But more is needed to make the two domains (of theory and practice), cognitive modifiability and neural plasticity, converge. We are optimistic that conferences such as this, and the ongoing activities in academic and practice settings, will eventuate in positive options and awareness.
Reference

Neuroplasticity and cognitive modifiability

Margiotta U.

Ca’ Foscari University in Venice

The connection between neuro-plasticity and cognitive modifiability is our focal point.

A common claim in the literature from developmental neuropsychology is that the developing brain is plastic \(^1\). This means that during development the brain is capable of reorganizing patterns and systems of connections in ways that the mature brain cannot. One important consequence of this early and transient property is that the developing brain is much less vulnerable to the effects of injury than more mature neural systems.

The studies of brain development suggest that the organization and state of developing neural system is the product of dynamic processes involving interactions that extend from the genes to the environment. Neural pathways develop to serve specific functions both because these pathways have evolved to process specific classes of information and because in the course of ontogenetic development they received appropriate input. Thus, the course of normal neural development is not fixed. Rather, in the normal course of development, the specification and stabilization of neural systems relies on dynamic processes that are the product of the multidirectional interaction of genetic processes, neural systems, and input (for discussion of the closely related idea of probabilistic epigenesis, see Gottlieb, 1992, and Gottlieb, Wahlsten & Lickliter, 1997). One important component of this interaction appears to be an interactive sculpting process involving initial overproduction of neural resources, competition for resources, and the elimination of non essential connections.

The construct of plasticity is best defined by these complex dynamic processes, which are a central feature of normal brain development. They are not, optional, or reactive. Rather, plasticity is a fundamental and essential property of brain development. Furthermore, recent data from studies suggest that these dynamic plastic processes are not unique to development. This basic processes persist into adulthood.

Social neuroscience is a well-structured branch of the study of the brain. Above all is a description of the primary characteristics of social interaction from the point of view of the nervous system. The key structure is the mirror-neuron system. Mirror neurons are a distinctive class of neurons, originally discovered in the ventral premotor cortex and inferior parietal lobe of macaques. Mirror neurons have the property of activating both when a subject executes a voluntary motor action and when they observe the same action made by another individual. There is neurophysiological evidence that a similar mirror-neuron system exists in the human brain (Rizzolati, Craghero 2004).

---

\(^1\) Neuroplasticity is defined as the ability of the nervous system to respond to extrinsic or intrinsic stimuli by a reorganization of its function, structure, or connections. It has a significant functional, but also a therapeutic, role across brain diseases, as well as in health. It can be experience-driven, is time-sensitive, and it is influenced by the environment and internal states, such as motivation and attention. Not all plasticity has a positive impact on clinical or behavioral status. It might in fact have negative consequences, a phenomenon called "maladaptive plasticity," which has been demonstrated in animal and human research. There is a need for sophisticated methods to promote plasticity within specific networks or pathways. For example, consider therapeutic intervention after brain injury and the treatment of neglect syndromes. This requires pathways to be targeted with great specificity since multiple functional pathways controlling the motor areas deriving from parietal cortex are disrupted. Other complex disorders, such as neuropsychiatric states, are not characterized by a localized lesion, but by abnormalities in distributed neural circuits such as limbic, frontostriatal, etc. The idea that these targets, which are currently impossible to target with noninvasive plasticity inducing paradigms, might be selectively modificable by promoting changes through a combination with specific cognitive states is attractive. Following the approach presented by Buch et al. (2011) and others (Thabit et al., 2010), it is appealing to speculate that endogenous brain activity might, in theory, even serve as one of the stimuli of Hebbian plasticity.
The mirroring in the human brain, the neural equivalent of empathy, imitation and mimicry

According to recent studies in social neuroscience, human actions happen by following an ideomotor framework (Iacoboni, 2009). Therefore, the neural plasticity that depends on experience begins to modify the brain starting with the perception of others' actions.

The discovery of mirror neurons has corroborated the theories of social psychology concerning the pervasiveness of imitation and empathy. In fact, it is not only the sight of the motor patterns of others that makes mirror neurons fire, but also the observation of emotional reactions that generates a mirrored response: to see emotions in others can determine in the observer the activation of the same cortical region normally involved when the observer feels that emotion (Rizzolatti, Vozza 2008).

This properties resolves the problem of other minds: humans are social animals because our neural activity is devised with, and in part depends on, the neural activity of people surrounding us. This characteristic leads to intentional consonance: thanks to the mechanisms of mirroring and simulation, the other is perceived as an "alter ego" (Gallese, 2007).

The understanding of the actions of others implies an internal simulation, which in turn implies an imitative learning: to see people acting in a certain way makes us learn to act in the same way. This happens because we understand the actions of others at the moment we translate the visual representation into a mapping at motor level (Rizzolatti, Fogassi, Gallese, 2001). Therefore the motor/sensory cortices play an important role at a cognitive level; so human knowledge is embodied (Gallese, Lakoff, 2005).

Therefore internal simulation and imitation affect brain plasticity and, consequently, the learning. The recent discoveries from Iacoboni (2009) and Rizzolati (2011) about the speech area show that the mirror-neuron system is also involved with the learning of language. So that, on the one hand the meaning of words implies a number of motor representations at the cerebral level, on the other hand making eye contact with the face of the person we are talking to, can facilitate the understanding. Especially in the early phases of development, the contribution of mirror neurons proves to be important in the learning of language.

There is an aspect of the Mediated Learning Experience not completely captured by mirror neurons: the mediation as a bridge between neuroplasticity and cognitive modifiability.

The mediation as a bridge between neuroplasticity and cognitive modifiability

If learning is enabled through the ability to modify oneself in order to adapt to an environment, mediation is made possible through the ability to co-mimic adaptive modifications. But besides exploiting the mirroring, the Mediated Learning Experience is aimed at selecting, planning and offering stimuli, by manipulating the environment that the learner is trying to adapt to. In other words, since humans adapt, and therefore learn, not exclusively by themselves but very often in a social manner, the Mediated Learning Experience tries to establish a connection between the learner and the external reality, so that they can explore it autonomously and, above all, so that they can adopt the co-imitated behaviors and mental acting. The mirroring of brain activity between mediator and learner ensures that both are modified as a consequence of the interaction. Therefore each human is directly modified through the interaction with the environment, by proceeding through variation and selection, so that cerebral structures adapt their functions. At the same time, cerebral activities mirror each other, favoring similar types of adaptation. The mediation is an expression of inclusion and cooperation. On the other hand, the presence of mediation does not necessary imply the lack of adaptation, as adaptation cannot prescind from the environment.

2 Intentionality-reciprocity, transcendence, and mediation of meaning are the basic parameters that define mediation. Those features would not be possible without the mirror neurons activity. Through the mirror neurons activity it is possible to induce neuronal recycling processes (Dehaene, 2009). In simple terms, neural maps do not emerge from the synaptic strengthening of individual neurons, but of whole neural pathways, which are linked together by mechanisms of synaptic enhancement and depression. The already existing synaptic pathways serve as base modules that are activated in a coordinated manner by mirror neurons. After activation, experience dependent plasticity comes into play and strengthens the synaptic connections. The categories of mediation are enabling conditions: the selection of stimuli, the planning of the stimuli, their anticipation, imitation of the intention, the supply of specific stimuli, repetition and variation, and the comparative behaviour; those are all means of manipulating the learning environment, with the goal of promote adaptive change in neural activity, and to determine the synaptic enhancement rather than depression. Without intentionality and reciprocity, allowed by the mirror neuron system, it would not be possible to guide the acquisition and transcendence of meaning. Of course this does not mean that each person cannot transcend the here and now, and learn new meanings on their own through the ability given by the synaptic plasticity to connect memories to each other and to emotional states. Mediation exploits the properties of mirror neurons in order to use the basic synaptic pathways, which are the fundamental and recurring elements of behavior and mental activity and that each person develops spontaneously from early experiences and exploration of the environment, to create shared brain adaptations. Given the phenomenon of mimicry, empathy and mirroring it is completely normal that getting in touch with well adapted people, leads quickly to an improvement in terms of
For this reason, Feuerstein states that the mediation is empty of specific content: because it aims at increasing the behavioral flexibility, and not towards creating an adaptation to any specific environment. Herein lies the difference between mediation and simple cultural transmission.

Clearly, this aspect leads us to consider the mediated interaction as educational and not simply a human relationship. In fact the mediator not only filters but generate the environment in order to promote the autoplasicity, defined by Feuerstein as the way an organism modifies itself in response to environmental changes, in contrast with alloplasicity, defined as the ensemble of changes aimed at adapting the external reality to the organism. Feuerstein uses the mediation, as a process that transform the learner; in other words, he does not pursue harmony, he does not accept the learners as they are, he does not provide the learners with an environment that they are already well adapted to. Therefore, the aim of mediation is to transform the subjective and natural mind into autonomy.

So, cognitive modifiability is possible and practicable. Recent evidence now available through extensive and ongoing research demonstrates that the brain is modifiable, responsive to structural and functional change as a consequence of external stimulation, leading to neural plasticity. This conference brings together of the perspectives of two disciplines—that of cognitive education and intervention and the "new" neurosciences. A consideration of the relationship is now critically important because the modifiability of the brain has long been denied, by generations of scientists and educators, and is still not well acknowledged and reflected in practice. Major findings are coming to light daily as scientists develop new research designs, focus on diverse and expanding variables, and exploit the new and expanding non-invasive technologies that enable the study of the brain in situations of "real-time" exposure.

The biological basis of cognitive modifiability

There are several considerations that must be made about the biological basis of cognitive modifiability, especially in relation to the cognitive functions proposed by Feuerstein.

So social neuroscience is consistent with Feuerstein's idea about the importance of the role played by mediation. However, the activity of the mirror neuron System does not determine neural plasticity.

But the structural cognitive modifiability is the form of neuro-plasticity.

Intentionality-reciprocity, transcendence, and mediation of meaning and that define mediation. Through the mirror neurons activity it is possible to induce neuronal recycling processes (Dehaene, 2009). In simple terms, neural maps do not emerge from the synaptic strengthening of individual neurons, but we are linked together by mechanisms of synaptic enhancement and depression. The already existing synaptic pathways serve as base modules that are activated in a coordinated manner by mirror neurons. After activation, experience dependent plasticity comes into play and strengthens the synaptic connections. The categories of mediation are this enabling processes the selection of stimuli, the planning of the stimuli, their anticipation, imitation of the intention, the supply of specific stimuli, repetition and variation, and the comparative behaviour; those are all means of generating the learning environment.

Without intentionality and reciprocity, allowed by the mirror neuron system, it would not be possible to guide the acquisition and transcendence of meaning.

The important thing to underline is that neuroscience show how the cognitive modifiability is plausible not only at a metacognitive level, but also at deeper level. Neuroscience show we can improve both operational capabilities and learning conditions. Therefore, according to neuroscience, Feuerstein's main assumption, that humans are able to improve their cognitive and learning capacity, is not only confirmed but expanded. On the contrary, the claim that cognitive functions are completely disconnected from any content it is not corroborated by brain studies: in addition to improvement on Working Memory efficiency, the formation of neural maps affects the cognitive processes on a conditional level. The formation of neural maps is the neural correlate of cognitive functions such as "Well-developed Orientation in Time and Space", "Using Logic to Arrive at and Defending Conclusions", "Planning Behavior" and "Thinking Things Through before responding". Those neural maps are always developed in relation to contents, although they
can later be recycled and transferred to different cognitive tasks. The maps are formed from the specific, and only at a second stage can be reused in a more general way.

A correspondence between Feuerstein's thought and brain studies also occurs with regard to the creation of an intrinsic motivation to the task. According to Feuerstein's idea, motivation plays a key role as an optimal condition for learning and cognition, and it's transversal to the input, processing and output phases.

Feuerstein considers motivation as a modulatory factor. Those ideas are confirmed by brain research, and are corroborated by the studies on how Working Memory processes can be maintained more steadily thanks to high motivation. Motivation pushes the physiological limits of synaptic connectivity, but is always tied to personal emotional states, and therefore it is subject to sudden changes. So the motivation exerts profound but unstable effects on cognition.

**New Deals : Building a trans-disciplinary field**

Many neuroscientific discoveries are coherent with Feuerstein's theory of Structural Cognitive Modification. However, so far there isn't any study that investigates the impact of Feuerstein's Instrumental Enrichment Program on both cognitive functioning and brain activity. In my opinion such a study is a promising research direction about cognitive modifiability. The cognitive neuroscience make it possible to explore new possibilities, to carry on the work and thought of Reuven Feuerstein, while remaining faithful to his humanitarian ideas. Thanks to the comparison between different research field, such as cognitive sciences, brain sciences and education, we can find converging evidence concerning cognitive modifiability and structure. This multidisciplinary research should be longitudinal studies aimed at showing how the educational practices have an impact on brain and cognition. Thanks to this research we will be able to redefine the meaning of "intelligence".

Progress is not only dependent upon the scientific results, but also on the commitment to build avenues of communication. Strengthening connections among neuroscientists and educators, and aligning their activity and focused intervention were identified as primary goals. It was suggested that colleagues from neuroscience and education jointly review the international literature in both fields; accuracy in interdisciplinary work can only be achieved when work is read in the original. The creation of a common lexicon was identified as a critical step in fostering communication. Such a lexicon could provide functional definitions for key terms in the domain of lifelong learning, such as a collaborative definition of learning. A few participants also suggested inviting other relevant experts (i.e. psychologists, anthropologists, sociologists, cognitive psychologists, educational psychologists, etc.) into the dialogue to help build multiple pathways between the disciplines of neuroscience and education. Another fundamental aspect of building this field is educating its members. It is necessary to develop a pool of human resources capable of managing the emerging knowledge. This involves creating a new career path. Toward this end, participants encouraged the establishment of interdisciplinary laboratories, societies, journals, conferences, and electronic discussion forums. Additionally, it is important to implement programs designed to train educational practitioners (i.e. teachers, daycare staff, coaches, elder care staff, etc.). One participant suggested that such programs’ curriculum could follow a trans-disciplinary sequence: molecular to cellular to brain systems to individual body systems to social systems. It would be prudent for these programs to include components aimed at generating motivation and building positive attitudes to ensure that knowledge is infused into practice. It is critical that information is communicated strategically and cautiously to non-expert.

It would be practical to consider social, political, and economic forces and disseminate relevant knowledge. In addition, it is crucial that information is communicated precisely and with clear caveats and qualifications. Oversimplifying knowledge could lead to dangerous misinterpretations and distortions. One participant proposed the development of trans-disciplinary models, visuals, and graphics to augment communication. Neuroscientists and educators must develop mechanisms for communicating the field’s shared knowledge in a clear and unified manner.

**References**


Olesen, P. et al. (2006). Brain Activity Related to Working Memory and Distraction in Children and Adults. Cerebral Cortex.


Optimization Methodology and Functional Connectivities Inform the Cognitive Modifiability in the Rehabilitation of Developmental Language Difficulties

Leisman G.1

1 The National Institute for Brain and Rehabilitation Sciences, Nazareth, Israel
Biomedical Engineering, Department of Biomechanics, O.R.T.-Braude College of Engineering, Karmiel, Israel
F.R. Carrick Institute for Clinical Ergonomics, Rehabilitation, and Applied Neurosciences, Garden City, NY
11530, Universidad de Ciencias Médicas de la Habana Facultad Manuel Fajardo, Havana, Cuba

Address for Correspondence: Dr. Gerry Leisman, Biomedical Engineering, Department of Mechanics, O.R.T.-Braude College of Engineering, Snunit 51 Street, P.O. Box 78, Karmiel 21982, Israel

Introduction

Recent spectacular advances in neurosciences have stimulated the hope that the application of our understanding that it is no longer about cerebral asymmetries and simplistic left-right differences but more complex applications of networks, and communication system principles that have led to newly developed concepts and findings that have not, as yet, found there way into the classroom. We are at the cusp of developing breakthrough concepts in the understanding of how children learn in the formal setting of the classroom in the context of brain function and how that function can be modified. Gradually it is being appreciated that there is considerable overlap between the problems of educational, sociological, and psychological processes and those of neurobiology, biochemistry and neurophysiology, and there is every possibility of reciprocal assistance. Researchers in these fields are willing to approach complex functions such as memory and learning on a physiological basis. We believe that the techniques and knowledge of neuroscience as well as Human Factors and Industrial Engineering notions of efficiency and production management can provide a service to education at all stages throughout life. There are findings of relevance for educators from those in the most diverse biological fields. Although the human brain - the most crucial part of the anatomy - is the most complex mechanism known to man, it is now being analyzed in ways that are clearly significant for education. Recent research on the human brain has provided data relevant to understanding the processes of human learning and therefore to improving methods of teaching.

Most currently prevailing patterns of education are heavily biased to wards left cerebral functioning and are antithetical to right cerebral functioning. Reading, writing and arithmetic are all logical linear processes, and for most of us are fed into the brain through our right hand. Most educational policies have tended to aggravate and prolong this one-sidedness. There is a kind of damping down of fantasy, imagination, clever guessing, and visualization in the interests of rote-learning, reading, writing, and arithmetic. Great emphasis is placed upon being able to say what one has on one's mind clearly and precisely the first time. The atmosphere emphasizes intra-verbal skills, "Using words to talk about words that refer to still other words" (Bruner, 1971).

If there is any truth in the assertion that our culture stresses left hemisphere skills and discriminates against the right hemisphere, this is especially true of school systems. Our society's overemphasis on "propositionality" at the cost of "appositionality" does not only result in adjustment difficulties but also in a lopsided education for the entire student body. Our students are not being offered the education they require to understand the complex nature of the world and themselves, an education for the whole brain. Sperry wrote: Our education system and modern society generally (with its very heavy emphasis on communication and on early training in the three R’s) discriminates against one whole half of the brain. I refer, of course, to the nonverbal, non-mathematical, minor hemisphere, which we find has its own perceptual, mechanical and spatial mode of apprehension and reasoning. In our present school system, the attention given to the minor hemisphere of the brain is minimal compared with training lavished on the left, or major hemisphere (Sperry, 1975).

Educational institutions have placed a great premium on the verbal/numerical categories and have systematically eliminated those experiences that would assist young children's development of visualization, imagination and/or sensory/perceptual abilities. The over-analytic models so often presented to children in their textbooks emphasize linear thought processes and discourage intuition, analogical and metaphorical thinking.
These factors of neural functioning among children have been left to modification by random environmental rather than systematic institutional means. Education, which is predominantly abstract, verbal and bookish, does not have enough place for raw, concrete, esthetic experience, especially of the subjective happenings inside oneself. Education imposes a structure of didactic instruction, right-wrong criteria, dominance of the logical-objective over the intuitive-subjective on the learning child so early in the course of emergent awareness of his world and of himself, that except in rare cases creative potential is inhibited, or at least diminished. (cf. Melillo & Leisman, 2009).

This leads us to affirm that our system of education is one, which leads to the underdevelopment of the right hemisphere. As a result of excessive emphasis on intellectualizing, verbalizing, analyzing and conceptualizing processes, 'curriculum' has become equated with mere 'understanding'. This imposes 'neurotogenic limitation' and binds mental processes so tightly that they impede the perception of new data. In the words of Gazzaniga a long time ago (1975), curriculum is "inordinately skewed to reward only one part of the human brain leaving half an individual's potential unschooled." The traditional preoccupation with formal intellectual education effectively blocks the possibility for the students to recognize and cultivate creativity and transcendence. It has been the adaptation an by educators of applications of brain sciences into the classroom and the culture of dichotomies of the Behavioral Sciences over the past 150 years that have placed undo reliance by our educational systems on functional brain models that may be irrelevant at best and damaging at worst to children’s classroom performance and its evaluation.

What emerges as the central proposition of this paper is that (A) the examination and study of regional cerebral differences in brain function as a way of explaining and evaluating the learning process within the educational system is a non-starter. (B) The evaluation of students by standardized aptitude and achievement tests is not sufficient although probably still necessary and (C) the educational systems would be better to examine student performance and teach towards “cognitive efficiency” rather than simply mastery v. non-mastery with methods that employ both psychophysics that examine person-environment interaction and mathematical means of examining optimization and the strategy used to get there as well as how far or close a student is functioning from a mathematically derived optimization regression line or, in fact, how quickly the learner is progressing in that direction. Educators, although perhaps not palatable to conceive of early childhood education as such, are producing a product and production management techniques should be useful for evaluating not just the product but the process or “manufacture” of that product as well.

**Brain Anatomy is Irrelevant to Educational Practice**

In attempting to understand why neuroanatomic conceptualization is a non-starter for educational practice it is important to understand that what we are really attempting to achieve both in educational practice as well as in understanding the neurological basis of cognitive development is not which brain area controls a given cognitive function, but how efficiently it is operating. Whilst not the scope of this paper to provide a detailed overview of this principle, the reader is invited to review these concepts more comprehensively elsewhere (Melillo & Leisman, 2009; Leisman, 2011).

To illustrate how it is that localization has greater relevance Fig. 1(A) below presents a CT-Scan of the brain of Terry Schiavo whilst in a persistent vegetative state and 1(B) of a young lady of normal intelligence born with hydrocephalus where no significant anatomic difference is evidenced between the PVS patient and the normally functioning young lady, but clear functional differences are noted during language processing.

![Figure 1: (A) CT of normal (l.) and that of the brain of Terry Shiavo (r.) when the latter was in Persistent Vegetative State. (B) CT of normally functioning teenager with congenital hydrocephalus and a CT similar to that of the patient. (C) Regional Cerebral Blood Flow image of individual in (B) while performing language-based cognitive tasks.](attachment:image.jpg)

The concept of “cortical efficiency” (Ertl & Schafer, 1969; Grabner et al., 2003; Grabner et al., 2004; Gilchriest, 2011) implies that higher ability in a cognitive task is associated with more efficient neural processing and not necessarily which brain region is involved in that processing. Whereas intuitively, we would expect higher performance to correlate with more activity, for the cerebral cortex the contrary is the case. Higher
performance in several tasks, including verbal (Parks et al., 1988), numeric, figural, and spatial reasoning (Lamm, 1999; Vitouch et al., 1997) are consistent with the reduced consumption of energy in several cortical areas. This phenomenon has also been studied with EEG techniques in different frequency bands. The amount of a background power (7.5–12.5 Hz) decreases during cognitive activity compared with a resting state. This decrease has been observed to correlate with higher performance in subjects with higher IQ scores (Grabner et al., 2004) or with higher performance after training, indicating a more efficient processing strategy for a cognitive task (Neubauer et al., 2004). Most of these studies come from the psychological literature, focusing mainly on the domain of intelligence but drawing relatively little attention to the investigation of task performance in second language learners or bilinguals.

In an EEG coherence study on second language (L2) processing/bilingualism, an extension of the “cortical efficiency” paradigm was examined. Coherence is the amount of shared activity between any two electrode pairs and taken over the entire scalp surface, gives an index of inter-regional communication effectiveness. The acquisition of an L2 is equivalent to the training of a cognitive–behavioral skill, and some individuals respond to this training more efficiently than others. If an L2 is acquired before a certain age or critical period, even native speaker proficiency is achieved easily (early bilingualism). If training starts later in life, the proficiency level achieved depends on the amount of training, exposure, and on some kind of “predisposition” or aptitude of the individual. Whereas, in general, L2 processing involves the same language-specific cortical areas (with left hemisphere preference) as native language (L1) processing (cf. review by Perani and Abutalebi, 2005), neuroimaging studies have repeatedly shown that lower L2 proficiency is correlated with more widespread cortical activity (Perani et al., 2003), tacitly in line with the “cortical efficiency” concept, but not explicitly investigating it.

Adding to the point about anatomical brain regions being less important to cognitive modifiability than ultimately the networks is also the nature of developmental differences in cell connectivities within the networks of the brains of individuals from infancy through adulthood and exemplified in Fig 2.

![Figure 2](image.png)

**Figure 2.** Elevated (cerebral metabolic rate of glucose consumption) from ages 3-10 yrs. Corresponding to era of exuberant connectivity needed for the energy needs of neuronal processes in learning. This is greater by a factor of 2 compared to adults. PET scans show relative glucose metabolic rate by age. We also see the complexity of dendritic structures of cortical neurons consistent with the expansion of synaptic connectivities and increases in capillary density in the frontal cortex as a function of age.

Reiterer and colleagues (2005) applied this concept in studying late bilinguals/second language learners, comparing, with EEG recording techniques, the recruitment of cortical areas during L2 processing in two groups of individuals differing profoundly in L2 proficiency (although both had started to learn L2 at the same age). In using coherence analysis or the amount of sharing between any two wave trains and thus reflective of brain integration of functioning and efficiency, the coherence brain maps (exemplified in Fig. 2) revealed more pronounced and widespread increases in coherences in the $\alpha_1$-band (8–10 Hz) in low-proficiency than in the high-proficiency L2 speakers. Surprisingly, this difference was obtained also during L1 processing and corroborated for both languages by multivariate permutation tests. These tests revealed additional differences between the low- and the high-proficiency group also for coherences within the $\beta_1$- (13–18 Hz) and the $\beta_2$-band (18.5–31.5 Hz).

The point is that greater activity is demonstrated with less proficiency and vice versa. The function of childhood neurological development is precisely to facilitate the creation of localized function. This localization of function is not the explanation of a process, but rather the end-result of training. The efficiency of cognitive function is directly a consequence of the effectiveness of networks that now can be measured. Fewer brain regions necessary to accomplish a single task in one individual compared to another for the same task is a measure of efficiency. These networks active during learning and problem solving of all kinds are plastic and can be changed as a direct consequence of experience and training.
Figure 3: Coherence, or the amount of shared activity between EEG electrode sites, demonstrates significant coherence differences in high-proficiency versus low-proficiency bilinguals relative to the default condition (silence, noisy screen) in the $\delta$ frequency band (0.5–3.5 Hz) during processing of visual and acoustic signals (A), and in the $\theta$-band (4.0–7.5 Hz), during processing of visual and acoustic signals (B), and of visual signals only (C). The text was either in British English (1st row), American English (2nd row), or in Austrian German (3rd row). (cf. Reiterer et al., 2005).

We can characterize the organization & development of large-scale brain networks using graph-theoretical metrics as represented in Fig. 4 below.

![Graph representing functional connectivity](image)

**Figure 4:** Functional connectivity along posterior-anterior & ventral-dorsal axes showing increased subcortical connectivity ($\bigstar$), decreased paralimbic connectivity ($\bigstar$) in children, compared to young-adults. Brain regions plotted using $y$ and $z$ coordinates of centroids (in mm), 430 pairs of regions show increased correlations in children & 321 pairs show increased correlations in young-adults.

What we can learn from the characterization, organization and development of large-scale brain networks in children using graph-theoretical metrics is that small-world networks are characterized by an increased clustering coefficient or an average node-to-node distance (also known as average shortest path length) and a decreased characteristic path length (and represented in Figs. 4). Functional brain networks in children and young-adults show small-world properties. In mathematics, physics and sociology, a small-world network is a type of mathematical graph in which most nodes are not neighbors of one another, but most nodes can be reached from every other node by a small number of steps. Specifically, a small-world network is defined to be a network where the typical distance $L$ between two randomly chosen nodes (the number of steps required) grows proportionally to the logarithm of the number of nodes $N$ in the network, that is (Watts & Strogatz, 1998):

These findings suggest sub-networks of densely connected nodes, connected by a short-path. Functional connectivity networks of brain from EEG (Leisman, 2011) as well and MEG (Stam, 2004) have also been shown to possess small-world architecture. Large-scale brain networks in 7-9-y-old children show similar small-world, functional organization. Functional brain networks in children show lower levels of hierarchical organization compared to young-adults. Children and young-adults possess different interregional connectivity patterns, stronger subcortical-cortical connectivities in young adults and weaker cortico-cortical connectivities in children. Large-scale brain connectivity involves functional segregation and integration, stronger short-range connections in children, and stronger long-range connections in young-adults.

In taking this concept further, we note that represented in Figs. 5(a) and (b) below is a representation of functional connectivity along the posterior-anterior and ventral-dorsal axes showing elevated subcortical connectivity and decreased paralimbic connectivity in children, compared to young-adults. This clearly
demonstrates that the wiring and connectivities of young children is significantly different that teenagers and beyond and the change in organization of these connectivities directly speaks to the issue of optimization of pathways and is a direct consequence of training and therefore of education. In attempting to apply graph theory to an understanding of language acquisition, Fig. 4(b) below shows the responses of both typically developing (TD) and at-risk, late-talkers (LT). There is exists a significant and apparent visual difference in the networks with the TD's network showing higher clustering coefficient and higher median in-degree, but lower geodesic distance, than the LT. These differences are consistent at both the individual and population level.

It has been thought since the time of both Broca and Wernicke that there exists a high degree of localization of function with an area anterior to the Sylvian fissure of the temporal lobes being responsible for expressive language and Wernicke’s area responsible for comprehension. Today we better understand that there no longer exists the localization of receptive functions in one area (cf. Fig 6(a)). Multiple stream models are more likely. Receptive language functions are organized into multiple self-organizing simultaneously active networks. It appears also as represented in Fig. 5 (b) that the meaning of words and sentences have been grounded indicating that there is an “embodiment” of meaning in brain networks as previously described.
Figures 7(A) and (B) represent the effect of brain on early as opposed to late exposure to a second language. The figures clearly indicate the nature of the optimization and efficiency of brain function connections when notions that related to early training and critical periods are applied.

**Figure 7: Bilingual brains (A) early exposure and (B) late second language exposure.**

**Discussion**

We have attempted to overview the nature of neurologic processing efficiencies. We have seen that brain connectivities are variously organized efficiently or inefficiently in systems that can be relatively easily measured. It is possible to evaluate optimized changes in brain connectivities after training and learning with applications ranging from progress in early child development, classroom instruction, and bilingualism. These brain connectivities are different and delayed in some as a direct consequence of experience. The measurement of skill and function based on grade level or binary considerations such as a child possesses or does not possess certain skills “medicalizes” the learning paradigm. The focus should be less on binary thinking and more on strategy and optimized performance most easily measured by processing speeds, and strategic solutions. For example individuals learning a second language late possess brain activity in regions that are not optimally coordinated and synchronized. As the brain continues to develop, more distant but simultaneously active areas require synchronization (Koch & Leisman, 2001). It is the developmental lack of effective synchrony that we hypothesize speaks to the connections between motor and cognitive function and to the very nature of learning itself or cognitive modifiability.

**References**


Sperry RW. Right Brain-Left Brain. *Sat Rev.* August 9, 1975, 30-33.


Ego and Freewill: a Virtual Binomial Apt for Cognition

Bignetti E.

University of Parma, via del Taglio, 43100 Parma, Italy
Enrico.bignetti@unipr.it; biriko@icloud.com; Cell +39 342 8066908

Summary.

Mind sciences have not yet given a definitive answer to the following questions: a), do we need a central agent charged with direct responsibility for decision-making, b) is the agent really or only apparently free when exhibiting a purposive action? From a reductionist perspective the Bignetti model (TBM) first assumes that conscious personal identity (Ego) and freewill (FW) are illusory products of mind and then proposes: 1) A “Voluntary” action is decided and performed by the unconscious mind by means of probabilistic brain responses to inner and outer stimuli; 2) The conscious mind is then awakened by feedback signals (somato-sensory, etc.) conveyed to the brain as a consequence of action execution; 3) This awakening corresponds to the arousal of a virtual Ego. Being unaware of the primary role of the unconscious mind, Ego erroneously believes that it is itself that has freely decided and executed the voluntary action; 4) This illusion can activate the subjective experience of both the sense of agency (SoA) and sense of responsibility (SoR) which in turn, activate the affective circuit of reward or blame, depending on action outcome; 5) So Ego is motivated to learn and memorise new experiences from the action outcomes; 6) The updating of memory stores may foster more efficient decisions and executions of future actions.

Introduction.

A popular definition states that FW is “an art for a particular sort of capacity for rational agent to choose a course of action from among various alternatives” (O'Connor 2013). But the question arising is then: “Who is the rational agent? Is it an immaterial soul or a virtual self identified with a bundle of individual memories?”. The philosophical origin of mind-body dualism, in the west, dates back to Plato who conceived the production of ideas without physical limits in a no-man's land. About two thousand years later, Descartes (1596-1650) stil supported the separation of the soul from a physical body almost till the end of his life. Contemporary with Descartes, the Englishman John Locke (1632-1704) and the Dutchman Baruch Spinoza (1632-1677) debated his issue. Locke suggested in the Essay Concerning Human Understanding” (Locke 1690) that "persons" are independent of "bodies" and what makes a person is consciousness (self-awareness) of one's thoughts and actions. The “individual self” is considered as an organized and uniform set of autobiographical memories; in particular, in individual decision-making and expectations. All this was sufficient grounds to be considered an atheist by the West. Spinoza in Ethica Ordine Geometrico Demonstrata (Spinoza 1677), made revolutionary assertions such as that body and mind are not separate substances and that God must be indistinct, abstract and impersonal, a sort of Natura naturans; moreover, his general view of life was deterministic and strictly rationalistic. Oddly he criticized body and soul dichotomy and developed his philosophy towards a unifying perspective of life. He claims that “free will” does not exist, since the whole of life synchronically exists. Both philosophers belonged to two of the most powerful colonial countries that founded the East India Company at that time, so it is natural to think that they had plenty of opportunity to borrow fruitful ideas from the many Eastern civilizations. Self-realisation in Hindu non-dualistic philosophy “Advaita Vedanta” (Radhakrishnan 1991) corresponds to the understanding of the ultimate nature of the reality and to the replacement of the idea of “individual self” (“Ego”) by the idea of “universal self” (“Atman”), the first principle of the true self of an individual beyond identification with phenomena, the essence of an individual which is common to everyone. Spinoza’ philosophy has many analogies with Vedanta. In particular, the concept of “Substantia”, a self one and infinite, analogous to “Atman”.

The mind-body controversy in the West passed through the centuries without a satisfying solution. Today, we feel the heavy heredity of the hostilities of religions of the West against a convincing theory of mind which could not be entangled in religious questions. The first example refers to Gnosticism which is teaching mainly the dualism between a couple of opposite or hierarchically dependent elements or forces, as in the case of matter (heavy, harmful and incompatible with mysticism and far from any spiritual realisation) and gnosis (elevated noetic or intuitive knowledge, the deep-rooted attitude of soul to moral behavior). The second example is the philosophical perspective based on “the ethics of the Other” considered as irreducibly different. Emmanuel
Levinas, French philosopher and religious thinker was the major proponent of this approach (Levinas 1991). Remarkably, out of the chorus, Dennet (1992, 1992b) says that consciousness is a physical, biological phenomenon, like metabolism or reproduction or self-repair. For many, Dennett’s representation of mind has no self, no central witness and only an abstract “Center of narrative gravity” where soul has been eliminated.

However, in the absence of a spiritual “self”, we need to ask two important questions: first, do we need a central agent charged with direct responsibility for decision-making, and second, is the agent really or only apparently free when exhibiting a purposive action? Searle believes that mind and body are not two different entities, that consciousness is an emergent property of the brain, and that consciousness is a series of qualitative states (Searle 1997), therefore he is astonished that the problem of duality has not been yet solved. In particular, he says: “The persistence of the traditional free will problem in philosophy seems to me something of a scandal”. It seems that little progress has been made, so he argues: “Is there some conceptual problem we have simply ignored? Why is it that we have made so little progress compared with our philosophical ancestors?” He is not able to give a philosophical solution to the question, and rather than adding a further proposals none of which would be convincing, he claims that “the philosophical solution kicks the problem upstairs to neurobiology” posing other difficult problems relative to the nature and the mechanism of conscious states and experiences in brain structures.

Wegner introduces his book ‘The Illusion Of Conscious Will’ (Wegner 2002) saying that scientific explanations account for our decisions and actions, and he proposes looking for an objective mechanism, i.e. a precise relationship between causes and effects. Wegner proposes that we think that we consciously will what we are doing because our Ego feels free from causes and we experience this feeling many times a day. So, the psychological mechanism and the subjective perception of inner freedom have never been reconciled. The experience of conscious will is utterly important to the person so that an extensive model explaining the origin of FW should be compatible with the individual experience as well. In our model (TBM) we assume that Ego (conscious mind) is a virtual illusory construct of the brain that illudes to possess FW. Ego and FW are psychological unavoidable belief of individuals serving a functional role in connection with both the necessity of self-attributing the responsability of voluntary actions and cognition (Bignetti 1994, 2001, 2003, 2004, 2010, 2012; Bignetti and Ghirri 2010).

The Bignetti Model. Under a reductionist perspective, let’s assume the psychological error of our mind that Ego is implicitly made of an immaterial, body-independent substance (instead of being, as Locke suggested, an organized and uniform set of autobiographical memories). Then it is conceivable that Ego may self-attribute arbitrarily a certain degree of freedom. The persistence of the idea of an immaterial Ego instantiated in our mind is imperishable, despite fact that the body is getting older and worse The inner sensation accompanying Ego is “sameness”, an inferential activity elaborated by the prefrontal cortex (James 1890; van Den Berg et al. 2011). As far as it regards FW, at the very moment we do something, we are beset with the sensation of having “wanted” and caused it. Both sense of agency (SoA) and sense of responsibility (SoR) might serve as a functional, psychological role to activate cognition on the basis of reward/blame motivational circuit Moreover, our Ego believes it has “chosen” an action freely from a number of options; this is our basic premise for the existence of FW. On the basis of these assumptions, TBM predicts that:

1. A “Voluntary” action is decided and performed by the unconscious mind by means of probabilistic brain responses to inner and outer stimuli.
2. The conscious mind is then awakened by feedback signals (somato-sensory, etc.) conveyed to the brain as a consequence of action execution and residual sensory memories. This awakening corresponds to the arousal of a virtual Ego.
3. Being unaware of the primary role of the unconscious mind, Ego erroneously believes that it is itself that has freely decided and executed the voluntary action.
4. This illusion can activate the subjective experience of both the sense of agency (SoA) and sense of responsibility (SoR) which in turn, activate the affective circuit of reward or blame, depending on action outcome;
5. It is known that in aware subjects reward and blame are motivational incentives, effective in fostering learning and memory processes, so Ego is motivated to learn and memorise new experiences from the action outcomes;
6. The updating of memory stores may serve the unconscious mind (see point1) for performing further actions in a more efficient and faster way.

Fig. 1 shows an example of the application of the Bignetti model to an imagery example of voluntary action (by the way this action has been segmented in a set of multiple, self-consistent actions in series). Voluntary action in response to an outer stimulus is performed by the unconscious mind. During the performance of a voluntary action the Ego is awakened (timing is only presumptive) and is immediately pervaded by the feeling of having decided the action; this feeling activates the affective circuit of reward/blame conditional learning. So reward/blame motivational incentives can foster cognition (the lowest trace); FW is the
illusionary by-product of Self-perception and is the key to learning how to manage the same or similar situation in the future.

**ILLUSION OF FREE WILL**

---

**Conclusions.**

In conclusion, consciousness can learn but cannot decide. Moreover, if one compares TBM with the model on FW illusion proposed by Wegner and Wheatley (WW) (1999), one can note that not a single point of similitaty can be found: neither in the general strategy by which a voluntary action is performed nor in the specific timing. In particular, in TBM unconscious and conscious minds are completely different brain activities that start and intervene at different times. The unconscious mind can only decide and execute an action, while the conscious mind is awakened (depending on on the strength and the multiplicity of feedback signals conveyed by action outcomes) with the sole aim of learning and memorizing new experiences offered by action outcomes. So, in Fig.1 the conscious mind “is/must” always lag behind the decision and the execution of the action. Conversely, in WW, action ‘execution’ is delayed with respect to the thoughts causing it. So the causal thought is a sort of prediction which can be validated after the action execution with the perception of the apparent causal path (which the authors imply probably give rises to the experience of will). In our opinion, the psychological need in WW for a conscious mind which might decides on the basis of intentions and expectations, is the sort of ambiguity on doby/mind duality, latent in cognitive sciences. The only way to resolve Searle’s issue is to attribute both decision and action (with intentions and expectations) totally and exclusively to the unconscious mind (see TBM). The unconscious mind has nothing to do with soul though it is able to manage both rationale and affective information as well by means of a probabilistic mechanism (Bignetti 2003, 2010, 2012; Deco and Rolls 2009; Kock 1999). Moreover, WW goes no further than an apparent causal path causing the experience of will without any teleological meaning; instead, in TBM, FW illusion foster cognition. Learning and memory processes can occur by observing and evaluating the effectiveness of action outcomes. Memory stores updating plays a crucial role for future actions. Thus FW illusion is a psychologically unavoidable belief serving a functional role in connection with both attribution of responsibility and learning.

**References**

An exploration of brain adaptation as a result of impairment with a specific focus on congenital blindness

Burke A¹, Kruger T N.²

¹ Department of Psychology, University of Johannesburg, (South Africa)
² Department of Psychology, University of Johannesburg, (South Africa)
e-mail: aburke@uj.ac.za

Abstract

The aim of this study was to determine how the brain adapts to impairments with a specific focus on congenital blindness, by comparing cortical activation of a visually impaired person to that of a sighted person during mathematics tasks. In order to meet this aim an EEG study was done to record cortical activity in the parietal and occipital lobes of a visually impaired participant and a sighted participant. For this purpose a Cognitive Energetic Model (CEM) was used in which three conditions were staged, i.e. Eyes Closed (EC), Eyes Open (EO) and a Mathematical Task (MT). The findings revealed significant neural activity (especially theta wave activity within the occipital lobes of the blind participant in the eyes open and mathematics problem solving conditions. These findings provide evidence for the extraordinary capacity of the brain and offer support for brain functionality and plasticity. Thus it is argued that in the presence of impairments, areas of the brain are able to perform different to roles to those originally intended to compensate for deficiencies.

Keywords: Neural plasticity, visually impaired, occipital lobe, EEG, theta wave.

Introduction

With the advances in diagnostic and investigative procedures in the field of Cognitive Neuroscience, evidence is mounting to support the assumptions that brain regions are able to take over functions that they were not genetically destined to perform. A number of studies have been conducted on the functional reorganization of the brain in the case blindness. Many of these studies have attempted to investigate to what extent the visual cortex of blind people may be involved in other functions, for example language processing [1], speech processing [2], touch and hearing [3]. These, and other studies, illustrate the possibility that the occipital cortex may possibly have the capabilities to perform additional tasks over and above visual processing.

The aim of this study was to determine whether the occipital role plays a role in assisting a congenitally blind person in solving mathematical problems.

Methodology

An exploratory experimental design was conducted to compare the neural activity within the occipital and parietal lobes of one congenitally blind male student to that of a matched sighted male student.

Participants

Only two participants were included. The first participant was a twenty-one year old, male, third year university student, whose blindness was reportedly caused by too much oxygen being administered immediately after birth. The second participant was a twenty-three year old male third year university student with no visual impairments. The participants were matched according to the course they were studying and the marks they obtained from their Psychology Research and Statistics Module they completed in the first semester of their third year.

Instruments

Biopac EEG system: A standardized skullcap (International 10-20 electrode placement) was used to record delta, theta, alpha and beta wave activity. The EEG readings were translated into raw scores by means of
the Acknowledge® software. Only the occipital (O1 and O2) and parietal lobes (P3, P4 and Pz), as depicted in Fig. 1 were targeted in this study.

![Illustration of the International 10–20 system for electrode placement](image)

**Fig. 1: Illustration of the International 10–20 system for electrode placement**

**Mathematical Test:** Five questions of the mathematical questions were extracted from the verbal arithmetic subtest of the Wechsler Adult Intelligence Scale III (WAIS - III), which were used in the third stage of the experiment.

**Procedure**

The researcher explained to the participant the process that would be followed and the electrode cap was fitted onto the participant’s head. The participant was asked to sit comfortably and to refrain from moving around too much during the procedure. Two baseline EEG readings were taken, first (2 minutes) with the participant’s eyes closed (EC), and then with the participant’s eyes open (EO)(2 minutes). Finally, the researcher read five mathematical questions taken from the WAIS - III and the participants were given 30 seconds to work whilst an EEG recording was done.

**Analysis of data**

Data was transformed using the Acqknowledge software with the digital filters set at 0.001Hz to 25Hz. For each condition, and each cortical site four epochs of data, were extracted. A frequency graph was produced for each epoch by computing a logarithm function, followed by a Fourier transformation/power spectral density. A power score was then determined for each frequency band. The power and relative power scores, as well as theta/beta and theta/alpha ratios were calculated. Due to the fact that the sample was small, no inferential statistical procedures were performed, and data is merely reported for qualitative interpretation purposes.

**Results**

The mean absolute and relative power scores, as well as the mean ratio scores are reported in Table 1. These are reported per cortical site for each of the participants across the different conditions.
Table 1: Mean scores for the different frequency band widths for the 2 participants

<table>
<thead>
<tr>
<th>Wave</th>
<th>EC</th>
<th>Occipital</th>
<th>Pz</th>
<th>P1,4</th>
<th>EO</th>
<th>Occipital</th>
<th>Pz</th>
<th>P1,4</th>
<th>Math</th>
<th>Occipital</th>
<th>Pz</th>
<th>P1,4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sighted Absolute power</td>
<td>D</td>
<td>0.051</td>
<td>0.051</td>
<td>0.065</td>
<td>0.082</td>
<td>0.131</td>
<td>0.104</td>
<td>0.016</td>
<td>0.012</td>
<td>0.017</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>0.025</td>
<td>0.022</td>
<td>0.025</td>
<td>0.035</td>
<td>0.037</td>
<td>0.039</td>
<td>0.008</td>
<td>0.007</td>
<td>0.009</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>0.009</td>
<td>0.013</td>
<td>0.007</td>
<td>0.011</td>
<td>0.013</td>
<td>0.013</td>
<td>0.008</td>
<td>0.003</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.004</td>
<td>0.004</td>
<td>0.004</td>
<td>0.004</td>
<td>0.008</td>
<td>0.006</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative power</td>
<td>D</td>
<td>58</td>
<td>57</td>
<td>64</td>
<td>62</td>
<td>70</td>
<td>64</td>
<td>48</td>
<td>50</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>28</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>19</td>
<td>24</td>
<td>24</td>
<td>30</td>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>10</td>
<td>14</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>24</td>
<td>14</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td>T:A</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3.1</td>
<td>2.8</td>
<td>3.0</td>
<td>1.0</td>
<td>2.2</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T:B</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>8.6</td>
<td>4.7</td>
<td>6.2</td>
<td>6.4</td>
<td>5.6</td>
<td>5.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visually impaired Absolute power</td>
<td>D</td>
<td>0.064</td>
<td>0.026</td>
<td>0.026</td>
<td>0.051</td>
<td>0.073</td>
<td>0.025</td>
<td>0.051</td>
<td>0.022</td>
<td>0.032</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>0.043</td>
<td>0.008</td>
<td>0.007</td>
<td>0.018</td>
<td>0.006</td>
<td>0.007</td>
<td>0.014</td>
<td>0.008</td>
<td>0.012</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>0.024</td>
<td>0.002</td>
<td>0.002</td>
<td>0.005</td>
<td>0.002</td>
<td>0.002</td>
<td>0.004</td>
<td>0.002</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>0.006</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td>0.001</td>
<td>0.001</td>
<td>0.002</td>
<td>0.001</td>
<td>0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative power</td>
<td>D</td>
<td>46</td>
<td>71</td>
<td>71</td>
<td>68</td>
<td>90</td>
<td>72</td>
<td>72</td>
<td>67</td>
<td>64</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>31</td>
<td>21</td>
<td>20</td>
<td>23</td>
<td>7</td>
<td>19</td>
<td>20</td>
<td>24</td>
<td>25</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>18</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratio</td>
<td>T:A</td>
<td>1.8</td>
<td>3.8</td>
<td>3.2</td>
<td>3.7</td>
<td>4.0</td>
<td>3.4</td>
<td>3.8</td>
<td>3.9</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T:B</td>
<td>7.2</td>
<td>7.5</td>
<td>7.3</td>
<td>10.0</td>
<td>8.0</td>
<td>6.8</td>
<td>9.5</td>
<td>10.3</td>
<td>9.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Discussion and conclusions

It would seem as if in most cases the visually impaired participant (VI) had higher slow wave activity, as compared to fast wave activity, than the sighted participant (S) across a number conditions and cortical sites (See Table 2).

Table 2: Summary of comparison of T:A and T:B ratios between the 2 participants

<table>
<thead>
<tr>
<th>EC</th>
<th>Occipital</th>
<th>Pz</th>
<th>P2 &amp;4</th>
</tr>
</thead>
<tbody>
<tr>
<td>T:A S</td>
<td>VI</td>
<td>S</td>
<td>Equal</td>
</tr>
<tr>
<td>T:B VI</td>
<td>VI</td>
<td>VI</td>
<td>Equal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EO</th>
<th>Occipital</th>
<th>Pz</th>
<th>P2 &amp;4</th>
</tr>
</thead>
<tbody>
<tr>
<td>T:A S</td>
<td>Equal</td>
<td>VI</td>
<td>Equal</td>
</tr>
<tr>
<td>T:B VI</td>
<td>VI</td>
<td>VI</td>
<td>Equal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Math</th>
<th>Occipital</th>
<th>Pz</th>
<th>P2 &amp;4</th>
</tr>
</thead>
<tbody>
<tr>
<td>T:A VI</td>
<td>VI</td>
<td>VI</td>
<td>VI</td>
</tr>
<tr>
<td>T:B VI</td>
<td>VI</td>
<td>VI</td>
<td>VI</td>
</tr>
</tbody>
</table>

Intuitively these findings seem to suggest that increased slow wave activity indicates that the occipital lobe is not actively involved in mathematical processing, however this conclusion would be based on a simplistic
understanding of the functions of the different frequency bands. It must be kept in mind that the different frequency bands work in tandem.

Some authors [4] argue that lower alpha wave activity in the posterior regions of the brain, in visually impaired people, may reflect a: “stronger activation of multisensory and visual brain areas during non-visual perceptual and cognitive functions in the blind than in the sighted”. This may, according to these authors, be due to the functional reorganization of deprived ‘visual’ areas.

The role of theta also more complex than is generally assumed, as increased theta activity is thought to be linked to learning and memory retrieval [5][6]. Based on this, the preliminary conclusion that was drawn from this study was that the occipital lobe was indirectly involved in the solving of mathematical problems in the visually impaired participant. It seems as if, given the fact that this participant could not rely on sight to keep track of his calculations; he made use of his memory to do so. The higher theta wave activity in the occipital lobe of the visually impaired participant, compared to the sighted participant, seems to support this conclusion. These findings must be considered to be tentative, as a larger sample is needed to confirm this.

References


Mediating Musical lexical Functions Prepares Children Minds for Textual Reading

Carmon, Y.

PhD Graduated Bar-Ilan University, ISRAEL carmonj@013.net

Abstract

Feuerstein cross disciplines mediation tool included in first reading. Researchers consider first reading as most difficult task that change audio language into visual symbols, building reading Schemata in minds. Intrinsic built-in instruction error is implicitly teaching the general abstract lexical functions to children with concrete concept, causing most difficulties. These functions can be taught explicitly via music concrete playing, enable to build first reading schemata in minds, to simplify any further reading. Music contribution to enhance academic learning is known and fits children natural development, was not tried being itself too complicated. Toy-Musical-Notes easy method integrated computer used in three studies, resulted in significant abstract grasp enhancing of lexical functions taught explicitly in Feuerstein mediation

Keywords: First/second reading schemata; Musical innovative easy notation; implicit/explicit mediating; concrete/abstract concept.

Introduction

All researchers agree that the first time a child reads, is his/her most difficult task of learning. Aiming to understand what does a child take from 1st to 2nd language to ease the later, the author analyzed dozens of reading instruction methods, all found divided into three approaches: phonetic, holistic or eclectic-from both, according to child's needs. All approaches teach three components: letters (consonants/vowels), spelling and syntax, in a concrete explicit way. These components are specific at each language and need to be relearned at any new reading besides lacking to provide all needed tools for reading.

A second kind of ten reading components was found basic, general, and common to all alphabetical languages including music. They provide first reading schemata which are a series of mind activities resulting in reading, and used in second reading to ease it, but are too abstract and taught implicitly.

The problema

The Problem is that 5-6 years old children have concrete grasp; while enabling to read needs also the second kind of abstract components. Imagine a child that cannot grasp abstract components and is sentenced to learn them implicitly! This intrinsic error occurs in all approaches and hinders children reading. Though today we label deficiencies better than ever, this intrinsic error is still ignored and leads millions to illiteracy.

Towards solution

Playing music is concrete by activating audio-visual-motor senses. Thus in music even the second kind of reading components can be instructed in explicit way and enhance reading abilities towards easier learning of verbal reading as a second one. It seems a paradox: music language – known as most abstract art - is free of semantic for beginners, and its reading is concretely played, enabling all common reading-components to be instructed concretely. Besides, they create in children's minds the first reading schemata that ease second language reading.

Music is known in educational literacy as fitted to early children and a tool for enhancing academic abilities (Rauscher, 2000). Even though, no school uses music as the first preceding reading to verbal text. The reason lies in the conventional notation system too complicated for young children (Schafer, 1980), and used generally to be instructed after a child acquired verbal reading.
Our solution

The author dedicated nearly two decades to develop an easy music-reading system. Only after 10,000 children, from low SES (Social Economy Status) underwent the TMN (Toy Musical notes) method pioneer study, and no one was found dyslectic, ADHD, or any other learning deficiency, she made her PhD study. The pioneer study’s result was unusual hence the average percent of deficiencies at the low SES, are 20-40%. The PhD’s significant results encouraged more studies which had also significant findings and the method became established. Once a workable system is discovered, it has many positive aspects one of which is detailed here in the next paragraph:

The development of children’s hearing

Music is primary; hearing is a prenatal sense; newly born children recognize their mother's timbre voice happily, listen eagerly to soft voice and are afraid of alien harsh ones. Three-four months old babies enjoy pitch changing in tunes and soon respond by rhythmical motor movements, preceding their mimicry of speaking. So, four musical components order: timbre, volume, pitch and rhythm, precede natural consonants and vowels. This order of universal order, proved in studies as important tool of language comprehension development, and won general consensus (Adams & Bruck, 1993). Mother tongue is learned by hearing only, but when children learn to read teachers focus on letters only; the natural order of development is not kept and harms reading understanding. Ignoring pitch/ rhythm of text reading results in monotonic robotic reading. Preceding naturally reading of pitches and rhythms to consonants and vowels is therefore necessary.

The ten functions

The ten functions of second components kind, taught in music explicitly, provide the common components that create first reading schemata in children's minds, and ease further reading. They are a) Audio-memory; b) Audio–visual integration; c) Accumulating decoded data into meaning d) The alphabetical principle that says: each sign has its specific sound in every context; e) Reading comprehension, the main cognitive reading goal; f) Accuracy, the right base for knowledge; g) Fluency and velocity assist comprehension; h) Directivity and sequence organize order, showing how to read; i) Inclusion - cognitive learning from known to varied develops independent thinking. J) Structure analyzing of: repeated –varied –similar, is the base of cognitive analyses that build smart pupils.

The Lexical functions are divided into senses: hearing, seeing and movements that a child feels. The cognition is built on the feelings; only then, the higher cognitive functions (as meta-thinking) are developed. All these are taught concretely in music, facilitate playing-reading by finger contiguity on keyboard; using hearing, visualizing, touching and motor movements; while on the other hand, the text reading is abstract.

The TMN way is revolutionary: it precedes music reading before text which becomes a second easy language, while using Feuerstein mediation tools.

Considering musicality- children who started to learn music with T.M.N. method and moved to the conventional script notation, achieved much higher musical level compared to control conventional notation group. TMN enabled the transfer to conventional music script within 2 to 4 lessons. Kindergarten-children enjoy playing tunes and integrated computer games with TMN system, not being aware they’re learning to read. Children learn 8 signs only (instead of text 26), internalize the common functions and become easily prepared for text-reading.

Feuerstein tools:

In the TMN method we use five general principles from the mediating tools of Prof. Feuerstein (Feuerstein & al, 2013) assigned by Prof. Klein to be relevant for early children. 1) Focusing: Concrete keyboard touching uses audio-visual-motor senses to activate reading; eyes focus between notation; keyboard; hands; cognitive control; including the teacher’s eye contact and mediating. 2) Reciprocity between teacher and pupil: Feeling excitement is what real music does with insight, increasing memory and emotional involvement. 3) Distance, extension: an example to extend and internalize learning is repeating the played tunes by singing. 4) Encouraging: the easy way of reading increases self confidence in the ability to succeed, which leads to motivation, satisfaction and Joy of learning. 5) Organizing behavioral regulation: playing together causes listening to others, match playing-times together, and incorporate social relationships.

The next after explaining the main intrinsic error and our solution, is to detail how every mediating principle works on the abstract lexical functions, in our concrete TMN way. This full course is in preparation with the new technology of E-learning.
Results:

Ten thousand children of low-medium SES have experienced T.M.N. during the trial years and had no reading difficulties at school, while the average percent of deficiencies at that SES, are 20-40%. (OECD)

The 1st interventional study

First study (Carmon, 2002) took place with 150 kindergarten children equal numbers of boys and girls from low-medium SES, divided into three groups: TMN; Conventional music; and Non-music programs. Reading acquisition follow-up at the middle of 1st grade showed mean number of vocal reading mistakes: TMN 16; Conventional music 19; and Non-music 35 mistakes.

![Fig1: Vocal Reading Mistakes Middle of 1st grade](image1)

At the end of first grade, vocal reading of same stories, were taped. The average velocity and fluency was found: TMN – 55 seconds; Conventional music -.60 seconds; and non-music - 108 seconds.

![Fig2: Vocal Reading Time in Seconds End of 1st grade](image2)

Up to this point conventional music group was behind TMN since music helps anyway. But the comprehension questions on the taped vocal story showed significant differences: The comprehension averages were: TMN –70 %; Conventional music -61% and non-music - 65%. The conventional music was not helpful.
“Draw a man” test
This test shows the achieved level of cognition, taken: at pre-post intervention and after the summer holidays incubation, at the beginning of school. In the pre-test TMN was a bit lower than non-music group, at the post test TMN advanced a bit compared to non-music group, but after the incubation period TMN showed significant achievement compared also to conventional music group.

The 2nd study
Population of 120 kindergarten-children in the experiment group and 25 in the control one were all of a very low SES. (Carmon, Whol & Even-Zohar, 2008) After significant results were synonym to the preceded study, TMN group was divided into low/high achievers according to pre test, aiming to find the most benefitted children. The pre-post test example of print conceptualization shows that the top half of the class in post test results achieved up to 10% higher, compared to pre-test. But the lower half advanced more than 30%. The positive point is closing gaps significantly of TMN two half groups. This print conceptualization result fits other preceding studies that predict reading status (Carmon & Even-Zohar, 2010).
Study collaborated with Dr. Elkoshi, R., (Carmon & Elkoshi 2008, in Hebrew; 2010,) took place with 83 school beginners in four classes: experiment group of 19 boys and 25 girls in single gender classes of a religious school, and the control group of 19 boys and 20 girls of same school classes. The TMN intervention program took four meetings only. The pre-post CMS painting test (Elkoshi’s development): analyzed children’s painting of music lessons according to children’s concept level of music. Elkoshi gave the pre-post lessons, got children’s paintings, and analyzed the change of print concept behavioral as shown in their paintings on her aural music lessons, including children's description analyzed on their paintings. The great change in the experimental boys’ group symbolic-behavior-level compared to control group is clear, in the graph. The girls were of higher symbolic behavior level and changed a bit less. The gaps between boys and girls were closed in four TMN sessions. The graph shows Pre-post intervention results of boys experiment group compared to control group, at the beginning of 1st grade.

Conclusion:

The T.M.N. method enables gradually to extract music's potential. It precedes concretely the general lexical functions to school creating reading schemata. Verbal reading becomes a second, proved by researchers as much easier than the first (Rayner & Pollatsek, 1994; Levin & Korat, 1994). The concrete music reading - playing needs less attention than text, fits earlier ages, prepares maturity to text reading, in a way never imagined before. It prepares children also for conventional notation, making superfluous the arguments of whether it's better, for musicality's sake, to begin music-teaching with or without script. Now early children can read first
concrete music easily with integrated computer games, while preparing for textual second reading, preventing frustration. TMN opens gates to success in learning; considers also low SES children with labeled deficiencies, and cures them.

Another domain is taking care of elder people at risk. The head of World Neurologists Association, Professor A. Kortcyn suggested (2012, aurally) using the TMN also for the elderly as a way to reduce the risk of Alzheimer. He opened the concept that Alzheimer is caused by depression which can be cured by three means: motor movements, cognitive activities and social inclusion, all of which exist in TMN. The above comment of higher cognition in the ten lexical functions, adds the base on feelings: Since adults tend to cling on to their remote past, when thinking was based on feelings, it seems that the feeling indicator can be added to: motor, cognitive and social inclusion, as important function that music arises. Prof. Kortcyn, shifted the TMN method from reading. This is not a study for one individual, and we'll be glad to add partners and supporters to explore the huge challenges together, and bring to the world music enunciation for young and older people's wellbeing. We invite professionals and supporters interested to continue developing this way to write us.

References

Fragmentation of Brain Reactions by Switching Phenomenon?

Doepp, M., Thum, C.

TimeWaver-Health-Centre, 28 Dorf St., Bichwil 9248, Switzerland

Summary

Complementary medicine techniques show strange and paradox reactions on stimuli in persons who have a combined exposition to stress and electro-smog. This concerns to articles of Goodheart (the founder of Applied Kinesiology) in 1978. He called the phenomenon „Switching” of the Central Nervous System (CNS). A switched brain is functionally fragmented or dissociated, resp. In our study we could prove that by testing the vegetative nervous system (VNS) by means of the Heart Rate variability (HRV) before and after 3 de-switching exercises - [http://youtu.be/x6KKvPjnhJ]. Before: toxins were accepted and detox-agents were rejected, after: opposite and correct results. The differences were significant.

Introduction

In 1978, Goodheart the founder of Applied Kinesiology (AK) found some strange behaviors of muscle reactions on stimuli. Stress (meaning dis-stress) seemed to be a main reason. The same was found by the author in 1999 using the Meridian Diagnostics method (Prognos®). Hence, the regulatory systems of the CNS can work in a paradox way in certain situations. This was called „Switching“. Later the same was found using the HRV examining the VNS. In several Youtube videos the author described a de-switching procedure consisting of 3 simple exercises.

Materials and Methods

28 test persons were exposed to stress and electro-smog (cellphone calls for > 4 minutes). Their stress state was examined by HRV measurements (TimeWaver Cardio®) = „before“. Criteria were VLF, LF, and HF, incl. calculations of VLF/HF, and VLF+LF. They were exposed to a mixture of chemical toxins holding the bottle in the left hand. The HRV was done again, an improvement was „yes“, a deterioration was „no“ = „before“. They performed the 3 de-switching exercises. Then they were exposed to the same mixture of chemical toxins. and the HRV was done again, an improvement was „yes“, a deterioration was „no“ = „after“. The results of „before“ and „after“ were compared. The same procedure was done for a mixture of detox agents (chlorella, spirulina, DMSA).

Results

Before: 23 of 28 resulted in „yes“ to toxins, 5 of 28 resulted in „no“ to toxins; 19 of 28 resulted in „no“ to detox, 9 of 28 resulted in „yes“ to detox.

After: 5 of 28 resulted in „yes“ to toxins, 23 of 28 resulted in „no“ to toxins; 4 of 28 resulted in „no“ to detox, 24 of 28 resulted in „yes“ to detox.

According to Student’s t-test all differences are significant für p < .0005.

Conclusions

1. The addition of stress and electro-smog produces paradox results of the VNS examined by the HRV. This may be called „Switching“ of the CNS which is unable to judge toxins as dangerous and detox agents as positive. Reason may be a fragmentation of the brain reactions on stimuli.
2. This behavior of the CNS is similar to that one concerning states of addictions.
3. A de-switching procedure described by the authors earlier is able to normalize the reactions of the VNS.
References

Analysis of infant neuromotor development using a computer-based approach

Friedman H.1*, Bar-Yosef O.2, Gordon G.3, Forkosh O.3, Schneidman E.3

1Department of nursing. Faculty of Social Welfare & Health Sciences, University of Haifa, Haifa, Israel, 2Pediatric Neurology Institute, Edmond and Lily Safra Children’s Hospital, Chaim Sheba Medical Center affiliated to Tel Aviv University, Ramat Gan, Israel, 3Department of Neurobiology, Weizmann Institute of Science, Rehovot, Israel
* e-mail Dr Friedman: hmts@netvision.net.il

Background

Prematurity, a continuously growing phenomenon is a risk factor for multisystem injury, as body systems of the premature infants are not ripe for life out of uterus. In the long term, prematurity leads to high risk for brain injury and developmental impairments, ranging from Minor Neurological Dysfunction, through ASD, to Cerebral Palsy (Woodward 2006, Allen 2008, Kiechl-Kohlendorfer 2009, Volpe 2009, Kinney 2005, Movsas & Paneth 2012, Pinto-Martin 2011, Bassan 2007, Roze 2009). Early assessment and detection of developmental impairments is crucial for early and effective intervention, as early identification will support the initiation of early treatment and may minimize neurological and functional deficits (Nordhov 2012, Spittle 2009, Orton 2009). In many western countries children are now diagnosed at a relatively early age (2-3 years old), but even this age may be late due to the rapidly changing plasticity of brain neural circuits, that regulate the infant's sensory-emotional-cognitive development and behavior. Studies that examined children diagnosed with a neurodevelopmental impairment at the age of 2-3 years, using retrospective analysis of video-recordings of their first year of life, found that the majority of children exhibited early motor and behavioral signs associated with brain injury, already during the first year of life. These findings assert that preliminary signs of neurodevelopment impairment frequently appear in the first year of life, and can be observed and quantified in the newborn and young infant. Infants with brain injury show typical specific early neuromotor signs, including: Movement synchronization, Floppy or less active arms, Persistent asymmetry, Poor repertoire of general movements, Absent or abnormal fidgety general movements, ATNR, feeding movements and head lag (Esposito & Venuti 2009, Phagava 2008, Karmel 2010, Teitelbaum 1998, Hadders-Algra 2004, Burger 2011).

Objectives

To examine the feasibility and efficiency of the 3D Kinect system to track and characterize the kinematic parameters of normal and abnormal infants' spontaneous movements, through their first 4 months of life. Specifically, we aim to identify early neuromotor signs of development impairment in premature infants, using computerized sampling and analysis of motor behavior in premature infants.

To that end: 1. we conduct a long-term study of 10 infants, ages 0-4 months, with continuous acquisition of movement data. 2. We start a study with Pre-term infants

Methods

1st Phase: 10 infants, ages 42, 52 weeks PMA, are video recorded (2D, 3D Kinect).
2nd Phase: 60 premature infants, ages 34, 42, 46, 52 weeks PMA, are video recorded (2D, 3D Kinect).

We use Kinect® sensor, Prime Sense (a). An in-house driver and software were written (b), using Microsoft Kinect SDK. We recorded both color images (Fig. 2(a)) and depth field (Fig. 2(b)). Both spatial and temporal synchronization was performed. Due to filming angles, a depth-rectification was also implemented (Fig. 2(c)).
Automatic analysis of kinematics of spontaneous motor patterns was conducted by a novel tracking algorithm based on the digital output of 3D Kinect. An in-house semi-automatic tracking algorithm was written in Matlab. We marked the required end-points, left/right arms, left/right legs and nose. Marking were performed in 10 automatically identified relevant frames. For each end-point a patch of size 20x20 was taken (Fig. 3(a,b)). In each consecutive frame the most correlated patch in the environment was found in the color image (Fig. 3(c)). The highest point in the depth field in the surrounding environment was chosen, signifying the hands, feet and nose. (Fig.3(d)). Forward and backward tracking was performed to optimize the utilization of the user-marked data.

Results

Preliminary results of 1st phase show accurate analysis of movements' kinematics.

In the 2nd phase, Neurodevelopment impairments are assessed by observation of infant's spontaneous movements according to specific characteristics. These characteristics have been shown to have clinical correlations

a. Movements parameters - Full 4D data of limbs and head

Movement synchronization - can be described as temporal correlation between limbs movements. Floppy or less active arms – can be described according to gross movement duration of the arms vs legs. Persistent asymmetry – can be described according to similarity between movement statistics. Poor repertoire writhing general movements - can be described as low spatial variability and no fluency of gross movements at the age of 40 wPMA. Absent or abnormal fidgety general movements - can be described as low spatial and temporal variability of delicate movements of the limbs’ distal parts, at the age of 52 wPMA. For the definition of ATNR, feeding movements and head lag, a more detailed tracking of head movements is required, hence these will be described in the near future.
Figure 4: examples of certain clinical computational correlates - early neuromotor signs of developmental impairment and the mathematical approach.

b. Hierarchy of parameters
Kinematic parameters: Statistics of position, velocities, accelerations and the correlations between them
Movement units: Durations, number, correlation

Figure 4: 2D projections of the limbs traces and Tangential velocity of the four limbs as a function of time for a 30 sec episode. Movement units are marked by yellow.

Temporal parameters: Predictability, smoothness

Conclusions
We employ a novel method for motion capture based on a combination of 3D video recording by Kinect® sensor, (Prime Sense) and a tracking algorithm. No markers are required on the infant's body for the accurate tracking of movements. This novel method enables us to capture movements and serially analyze kinematics of infants' movements, using an in-house semi-automatic tracking algorithm written in Matlab for the purpose of this study.
Motion capture systems are a very accurate method for the diagnosis of abnormal movement patterns. We develop an inexpensive, easy-to-operate system that can be used widely even in the community (i.e. public health clinics) and improve the screening and early diagnosis of neuromotor deficits in infants.

References


Karmel BZ et al., 2010, Early medical and behavioral characteristics of NICU infants later classified with ASD *Pediatrics* 126, 457-467


Movsas TZ & Paneth N 2012. The Effect of Gestational Age on Symptom Severity in Children with Autism Spectrum Disorder *J Autism Dev Disord*

Nordhove SM et al 2012 Early Intervention Improves Behavioral Outcomes for Preterm Infants: Randomized Controlled Trial. *Pediatrics*; 129; e9. DOI: 10.1542/peds.2011-0248


Perpetuated Crimes of Human Atrocity. Modifiable or Just Predictable?

Goldberg G.

Australian Colleges of Clinical, Forensic and Neuropsychology, (Australia) e-mail: gretagoldberg@psychelpsydny.com

Abstract

Whatever theoretical or research paradigms we may chose, objective answers and urgently needed solutions still continue to elude us, as violence in the world grows ever more extreme and breeds more violence. Treatment and prevention paradigms that reconceptualize the recurring victim/perpetrator dyad as a genomic imprint of mirror neuron networks, may be more effective than theories that perpetuate a polarized splitting of the dyad.

Keywords: dissociation, atrocity, violence, perpetuation, genomic imprinting, epigenetics, neuroplasticity, neuro-ecological, psycho-evolutionary, modifiability, dyadic trauma

Introduction

Modifiability Paradigms:

The recurring Middle East crisis had not yet re-erupted in June 2013 when I delivered my thesis on the Non-modifiability of Human Atrocity at the Jerusalem Brain Conference. I had also attended the post-conference workshop on Mediated Learning, where the mood of scientific discussion of efficacy and potential in Instrumental Enrichment seemed buoyant with all the post war optimism of Reuven Feuerstein and Viktor Frankel combined.

Effectiveness in mediated learning and in psychotherapy both rest on the practitioners' empathic commitment to the dyadic aspect of their work. Though such different dyads as mediator/learner, therapist/client and victim/perpetrator have no logical connection, they do share a synergistic perspective insofar as mirror neuron networks may be said to account for the long lasting Indelible Dyadic Imprint as in: the engaged reciprocity of mediated learning; the transference of psychotherapy; and the re-iterated violence between victim and perpetrator.

The following theoretical paper has bypassed old research controversies on repression vs amnesic memory, re-enactment, and second generation resilience vs vulnerability; to focus instead on integrating new research findings from the broader paradigms of Epigenetics, Neuroplasticity and Neuro-ecology. It draws on victim as well as perpetrator studies to show the similar effects of prolonged exposure to extreme threat, with neurobiological and neurocognitive changes and significant transgenerational effects that may be similar for both parties.

Epigenetics and Neuroplasticity Paradigms:

For both victim and perpetrator the dissociated (freeze) experience of extreme dyadic trauma wires mirror neuronal connections of hatred and fear that are amplified and transmitted within a high dissociation phenotype in trauma affected families or regional groups. In this complexity model of multigenerational transmission, the dissociated freeze experience of extreme threat, whether actual or vicarious, is wired in the individual and cultural brains of all parties exposed to the trauma reminders. High Dissociation is defined as genomic imprinting offear/freeze response actualized into phenotype through recurring trauma experiences including the developmental dyadic trauma imposed by emotionally impaired survivor parenting, whereby the infant brain is wired with experiences of interpersonal threat rather than empathic attunement. Unresolved Complex PTSD is thought to predispose to dissociated pathogenic parenting in both victim and perpetrator families and early exposure to dyadic trauma (eg in child abuse) is known to disrupt development of neural and genetic structure and functioning thereby potentiating stress vulnerability and impaired empathy in the primary attachment bond across generations in trauma affected groups.
This overarching proximal process of genomic imprinting is said to perpetuate multi generational transmission of a high dissociation phenotype in certain families, cultures and regional groups.

One of many examples of such regions is the Middle East where, since “Har Megiddon” (Kings viii, 29) and into modern times, recurring violence and dyadic trauma continues to reflect the biological priority of survival by destruction, with its shifting victim/perpetrator axis between Arab and Jew. By now both traumatized groups share an extreme susceptibility to the heightened emotional reactivity and distorted worldview that predisposes violence; and to the dissociated confusion that transforms all information into politics and propaganda intended to further escalate the violence. In this theoretical model centuries of exposure to interpersonal threat is said to be amplified by high dissociation phenotypes on the one hand and by cultural remembrance rituals on the other, reactivating vicarious trauma memories in each new generation. Fear and insecurity become embedded deeper into the concrete of culture, religion and politics, resistant to forgetting the neurologically already primed by past trauma, the amygdala-driven impulse to re-enact polarized v/p roles and to re-experience high arousal, becomes spontaneous, indiscriminate and without conscious control for either party in the conflict. Trauma addiction research suggests there may also be a primed low cortisol need to re-experience the excited arousal of chronic re-traumatization and victimization particularly in such regional groups. In Complex PTSD the neuro-chemical effect of the stress response releases massive secretions of neuro-hormones at the time of trauma, leading to long term potentiation and re-activation of traumatic memories that ultimately become transmittable, heritable and cultural, perpetuating violence to breed more violence in trauma affected families and in regional conflicts.

Functional MRI studies relevant to the concept of the dyadic trauma imprint differentiate between PTSD where (low) Dissociation is an innate adaptive regulator limiting conscious fear by increased prefrontal activity; and Complex PTSD, where prolonged Dyadic threat amplifies (high) Dissociation of non-conscious fear by increased activity in limbic networks. What gets passed on in the generational (and cultural) transmission of Complex PTSD is the predisposition to dysregulated arousal and high dissociation together with the cortical imbalance, and the distorted worldview with its mirror neuron splitting of blame and denial in the victim/perpetrator dyad. Re-conceptualizing these split roles as being one potentially synergetic network may open up new dyadic treatment models based on emerging dyadic fMRI research using Interactive Social Imaging and treatments like Dyadic Developmental Psychotherapy.

Early life exposure to traumatic stress inhibits a child’s neural development. Common denominators like attachment disorders and symptoms of complex PTSD have been reported in some offspring of both victim and offender. Cross culturally German Psychiatrist Radebold studied both German and Jewish second generation Holocaust survivors and found that both the German and the Jewish offspring showed similar level symptoms of Complex PTSD and disorders of attachment.

Psycho-evolution Paradigm

Authors like David Biale observe that the history of Jewish Passivity and Powerlessness may represent an opposite and non-violent legacy of the Holocaust. This idea of (chosen) exclusivity perpetuates the unilateral victimized role, a common distortion in all the literature on trauma and abuse. By contrast the concept of a Dyadic Trauma Imprint seeks to integrate rather than split the opposing yet synergetic roles of victim/perpetrator. Biale’s hypothesis of Jewish passivity can be seen as a parallel form of adaptation to the survival of extreme recurring threat, illustrating the evolutionary principle of Reciprocal Altruism, which postulates that the fittest organism is the one who avoids active fighting altogether.

In the face of recurring threat, the adaptive extremes of passivity/powerlessness on the one hand and violent human atrocity on the other hand can both be seen as dysregulated high dissociation responses to the ancient and perhaps inescapable threat of Perpetuated Human Atrocity... Whether Modifiable or Predictable, it just may not ever go away, despite the best and latest from pharmacology, psychotherapy, and even Feuerstein’s Mediated Learning model for healing.

Neuro-Ecological and Complexity paradigms for Prevention:

The Dyadic Trauma Imprint is a neuro-ecological concept which borrows from the research about high dissociation and high arousal in Post Traumatic Stress. It proposes the unpopular hypothesis that victim and perpetrator of extreme violence may be inextricably linked by their shared exposure to the catastrophic stress inherent in their shared experience.

The hypothesis aims to differentiate those conscious forms of conflict that are mostly causal and resolvable; from the “strange antagonistic attractors” inherent in extreme, dissociated violence, reflecting victim/perpetrator patterns of denial and blame that are predictably self perpetuating and not resolvable, and therefore too complex to be controlled or understood within traditionally linear paradigms.

Mathematical complexity models, visually computerised, illustrate that such “predictability sets” and self “perpetuating patterns” exist within any complex system. Both aspects need to be accounted for in
prevention research if we are ever to reduce the incidence of violence. Cohen argues that these two approaches of dynamics and causality, are not mutually exclusive or incompatible as earlier statisticians and philosophers have thought.

Viewed from the “internal topography” perspective, researchers and therapists have tended to bifurcate rather than integrate the victim/perpetrator polarity and have failed to see that the commonalities of prior stress exposure predict impairments of high arousability and high dissociation suggesting that both roles may become neurobiologically imprinted for each party during some acts of extreme violence. Existing research needs to be integrated so that future studies can draw on findings from “victims” research (e.g. C PTSD studies on permanent neurochemical and neurocognitive impairments in holocaust or combat survivors), as well as similar findings from “perpetrator” research (e.g. repeat offenders impaired frontal lobe dysfunction and dysregulated affect in transmitting of family violence and sexual abuse, multigenerationally).

Viewed from the “external topography” perspective of trauma’s cultural ecology, research on extreme violence has been hampered by the inherent complexity of multicultural and transgenerational variables and their interactive dynamics, making empirical studies difficult but not impossible to design. Part of the difficulty with studying such complex variables is that our memory and perception of the violent trauma becomes fragmented and subjectively skewed by multiplier agents examples of which can be found at every level of society.

Amongst researchers and clinicians we can observe that some idealise victims’ vulnerabilities, and others stigmatise survivors as untreatable borderlines or normalise the perpetrators as being “ordinary men”. Amongst some families we can observe that guilt-denying perpetrators may spawn generations of addicts and abusers who perpetuate the violence towards others and themselves. Amongst some professional gurus and institutional cults we observe repeat offender teachers, priests and judges exploiting victims who have lesser powers. Amongst world war generals and politicians, we can observe how easily fear and hatred of the perpetrator can be manipulated in the service of the military/industrial complex and intentionally confused with grief, by the use such powerful mottos, as “Lest we forget”.

Amongst some of the world’s most struggling nations, we can observe scarce resources wasted on historically continuous violence in regions like the Balkans, Cambodia and the Middle East. And the penultimate examples of dissociated violence is the Post-modern Virtual War since 911 in which remote-precision digital destruction is pitted against the suiciding human bomb, programmed in infancy to dissociate from fear and embrace glory. This link between infant dissociation and extreme dyadic trauma has been identified in the research literature (129) as a neurodevelopmental imprint capable of generationally transmitting the CPTSD symptoms of heightened arousal and heightened dissociation from parent to offspring within certain cultural groups.

Whatever theoretical or research paradigms we use, objective answers and urgently needed solutions continue to elude us, as violence in the world grows ever more extreme and breeds more violence. Treatment and prevention paradigms that reconceptualize the recurring victim/perpetrator dyad as a genomic imprint of mirror neuron networks, may be more effective than theories that perpetuate a polarized splitting of the dyad.

References
35. Dulac, C. Molecular and neural basis of murine innate social behaviour. The Dulac Laboratory Harvard.


and perpetrator’s willingness to apologize. *Journal of Experimental Social Psychology.*
84. Main, M. & Hesse, E. (1992). Disorganised/disoriented infant behaviour in the strange situation, lapses in the monitoring of reasoning and discourse during the parent’s Adult Attachment Interview, and dissociative states: In support of Liotti’s hypothesis.


Homunculus of vision inside the brain: neuro-design of the functional organization

Kirvelis D.

Kazimieras Simonavičius University, Vilnius, LITHUANIA

Summary

Hypothetical homunculus of vision neuro-design architecture and functional organization schemes are presented. The functional organization and neuronal layered structures of the visual analyzer on cognitive psychology and neurology visual perception-imagination is constructed. The interpretation of visual perception, morphological structure of visual systems of animals, neuron-physiological, psychological and psycho-physiological data in the light of the theoretical solutions of image recognition, visual perception processes simulation enable active analysis by synthesis (A-by-S) or closed-loop coding-decoding (CL-CD) converged neuro-information processing technologies.

Keywords. homunculus, visual cortex, neural layers, sensory screens

Introduction

The idea of the neocortical brain homunculus as a pictorial representation of the anatomical divisions of the primary motor cortex and the primary somatosensory cortex was created by W. Penfield. However retinotopic maps as a particular case of topographic organization on the visual cortex (Area Streata, V1, 17 Brodmann) was observed by ophthalmologists and neurologists much earlier. The assumption here is that there is a ‘little man’ or homunculus inside the brain looking at the internal and external world of the man. Nowadays psychophysical David Mart homunculus of vision developed as movie window-screen in the neuronal scale. Another homunculus or ‘internal viewer’ interpretation is related to infinite regress of internal viewer’s concept. It correlates with Noam Chomsky concept that human beings use rules acting on representations or as the Minimalist Program (algorithmic) theory. Yasushi Miyashita approach of brain-vision require not only forward or bottom-up flow of information, but additionally top-down mental information flow for the brain imaginary operation, which activate backward projection. The theory of organized and living systems homunculus of vision in the brain interpret convergence mentioned concepts, as specific functional organization of neuro-informational brain technologies of closed-loop coding-decoding (CL-CD) or analysis by synthesis (A-by-S) (Kirvelis, 1970-2008).

Materials and methods

Conceptual integration and interpretation diverse knowledge of visual perception, anatomic and neuro-morphological structure of visual systems of animals and humans neuro-physiological, psychological and psycho-physiological data in the light of a number of the theoretical solutions of image recognition and visual processes simulation enable design the tabloid scheme for virtual design of the neuro-informational system of the brain-vision (Fig. 1). Tachistoscopical measurements of the dynamic visual images perception and introspective analysis of the subjective visual sensations, perceptions, reminiscences and other outlives were used.

Results

Neuronal sensory screens. The A-by-S concept suggests that there may be two parallel “sensoric” screens as the essence homunculus of vision in the stria Genuarri of Area Streata of (V1, 17 Brodmann) neocortex exist:

1. The sensory neuronal screen SS, which receives the reflection of the environment from peripheral receptors and translates it into the subjectively experienced scene;
2. The adjacent reconstruction/synthesis neuronal sensoric screen RS, which reproduces the image retrieved from memory representing the hypothesis about the object identity. (Fig. 2)
The activities of neocortex are as follows: focused attention, prediction with analysis of visual scenes and synthesis, predictive mental images. In the projection zone of visual cortex Area Streate or VI in IVβ (Brodman) or IVβ (Hassler) a “sensory” neuronal screen (SS) and “reconstruction” neuronal screen (RS) in IVα (Brodman) or IIIβ (Hassler) “web-round-cells” (Бериташвили) are supposed to exist.

**Sensory neocortex of vision as homunculus or A-by-S subsystem.** The functioning of visual homunculus as analyzer consists of following intertwined operations (Fig. 3): analysis of visual scenes projected onto SS; quasi-holographic “tracing” of images; preliminary recognition; quasi-holographic image reconstruction from memory onto RS; comparison of images projected onto SS with images reconstructed onto RS; and correction of preliminary recognition. The CL-CD procedure of analysis-by-synthesis corresponds to visual procedures on mental images. It is supposed that the image “tracing” and reverse image reconstruction are based on quasiholographic, CHAOS principles of brain neuronal organization and are periodic CL-CD procedures. It is proposed that the neuronal structure implementing the quasi-holographic analysis-by-synthesis ought to possess at least ten functional layered complexes: (1) the receptor layer where the retinal image is projected; (2) layer of local filtering; (3) local Hermite-Laguerre like analyzer and (4) local Hermite-Laguerre like synthesizer with (5) comparator between them. These structures are looped by quasi-holographic memory layered complexes $Q^1$ and $Q^{−1}$ (6, 7) with (8) CHAOS memory neural structure controlled by systemic perceptron-like classificator (9) in-between them. The memory traces are extracted by means of the topological transformations structure (10) controlled by signals from the comparator. Tachistoscopic experiments revealed that the duration of one such hypothesis-testing of cognitive mental imaging cycle of the human visual analyzers is 8-10 ms.

![Fig. 1. Conceptually integrated scheme of the neuro-anatomic organization visual analyzer](image1)

![Fig. 2. Neuronal organization of the sensorics screens in the stria Genuarri of Area Streata](image2)
Conclusions

1. Homunculus of vision as “internal viewer” is the complex organized neuro-informational structure of the visual neocortex that as analysis-by-synthesis generates infinite regress of internal viewers.
2. Visual sensation is activation of the two paralleled neuro-layers of the special “web round cells” neurons in the stria Genuarri of Area Streata.

References

Causometry, lech lecha challenge and cognitive modifiability*

Kronik A.

Institute of Causometry LifeLook.Net, North Bethesda, USA

Summary

Causometry captures one’s life vision, a cognitive-motivational structure of one’s psychological past, present and future. How does one use his/her past to move into the future? Should one’s life vision remain the same or be open to change? Does one benefit from being open to such cognitive modifiability? During the course of computer-assisted psychotherapy, significant changes in revised causograms were found, which allow me to outline seven steps to build a bridge from psychological past to the future. It is reasonable to hypothesize: the corpus callosum could be responsible for processing information between psychological past and future.

Introduction

My first co-authored article in 1973 was about Lev Vygotsky, his ideas of psychological tools and the mediated nature of the higher mental processes [Tkachenko & Kronik, 1973]. Since that time, in tandem with many other colleagues, I developed a few such tools and we have used and introduced a constructivist definition of human mind/psyche [Golovakha & Kronik, 1989], which is slightly edited today as a mode of man’s orientation in the world and man’s regulation of his relations with the world, which is being constantly created and updated owing to high plasticity of man’s nervous system. Indeed, the idea of neuroplasticity is an essential element of this definition.

One of the psychological tools, developed by our group, was the psychological software program LifeLook® [Kronik, Pajitnov, & Levin, 1991/2013]. Within the next 20 minutes, I will give you a glimpse of the results of the utilization of this tool in psychotherapy. It will be only a glimpse of the decades-long study, research and applications. Let’s start from the explanation of the very first word in the title of this presentation.

Methods

Causometry is the method for analyzing the personal image of time as an amalgamation of one’s significant life events and various goals and causal relationships between the events, i.e., a multi-layer time composition of the memories of one’s past, the experiences of one’s present, and the expectations of one’s future [Kronik & Akhmerov, 2003/2008]. The primary concept of the underlying theory is that the human experience of time depends on the way significant life events are perceived to be connected one to the other [Golovakha & Kronik, 1984/2008]. A causogram is a graphic representation of the events and their interconnections in a form of a digraph (directional graph). You can see an example of a causogram in Figure 1 (the first version of Nate’s causogram).

Fifteen small rectangles indicate fifteen events in the life of one of my coauthors, Nathaniel Orlowek, a devoted Jewish educator, who is in Israel now for his own challenge. Blue lines indicate Nate’s thoughts about motivational connections between his past events (realized connections), green line indicate connection between his possible future events (potential connection), and red lines connect past events with future events (actual or topical connections). This graph was only the first version of his causogram on January 17, 2011. Figure 2 shows the 11th version of his causogram and related causometric indices more than two years later (May 13, 2013), after our several non-formal sessions using LifeLook® - a causometry software program. This tool was named by Nate “the causometry machine” and to continue: the causogram is like a GPS in one’s life journey.

* Presented at the Conference on Neuroplasticity and Cognitive Modifiability (Jerusalem, June 4, 2013). The presenter thanks Katya Kronik for her help with Fig. 3 and Nate Orlowek for his editorial help and contribution of the results of his self-analysis. Preparation of this presentation was supported by Virtual Structures Research, Inc.

© 2013 Kronik A.
Table below the revised causogram shows indices which indicate different features of the causogram or, more psychologically speaking, different cognitive-motivational structural characteristics of one’s life vision. The first four indices are the Motivational Intensity of psychological past, present, future, and life as a whole. We will discuss them later. Another index indicates a Sense of Reality and means the following: the more connections an event has, the higher its location on the causogram. The weighted sum of connections indicates the Motivational Status of the event, i.e., the real significance of this event in one’s life. The hierarchy of all events by their motivational status may be more or less close to their hierarchy by subjective, direct, verbal, conscious ranking of importance of these events in one’s life, and the correlation of these two hierarchies is the index of Total Sense of Reality. More indices could be discussed later. Now, let’s go to the second word in the title of this presentation.

Lech lecha, a classic call in the Torah, could be translated into modern English as Go to your true self. Most of today’s clients, I think, come to psychotherapists’ offices exactly in search of true self. At least, so it seems to have been in my American experience in 2001-2008 with 34 outpatients: 25 men and 9 women, ages 13-83. On average, 34 weekly individual sessions were conducted, including the LifeLook® program as a supplementary tool. Lech lecha or “search for true self” means a search for a unique life path, and the causometry machine LifeLook is a good tool for such a search in the process of Metabolic Time-Oriented Computer-Assisted Psychotherapy or M-TOCAP as abbreviated. By metabolic I mean so-called psychic metabolism – the constant change and renewal of our mind or our psyche or our nishama, depending of the language you prefer [Kronik, 2008].

This approach includes many therapeutic techniques: correcting the life schedule in those who feel that their lives will be cut short, training to replace pessimistic (darkening) thinking with a positive view of the future, awareness of “super” significant events in those individuals with feelings of emptiness about the present, acknowledging good experiences in the past as means toward claiming a fuller future, life-craft lessons, etc. [Kronik, Akhmerov, & Speckhard, 1999]. The above mentioned know-hows are, essentially, the techniques for a cognitive modification of one’s life vision and it’s why I am here with you today.

Figure 1. The first version of Nate’s causogram
Figure 2. The eleventh version of Nate’s causogram and related causometric indices

Figure 3. A hypothetical causometric brain
Results

As the result of some small revisions, new versions of causograms evolve with new updated psycho-biographical causometric indices on different stages of psychotherapy (see Table 1).

The stage A could be named Insight & Strengthening Sense of Reality. The index of Sense of Reality (correlation of motivational status with subjective importance of the events) is much higher in the second version of the causogram. In a few sessions, a person becomes wiser, more accurate in his or her assessment of life priorities, and in differentiation between more significant and less significant events.

The stage B is about the change of temporal mode from past-focused to present-focused. Motivational Intensity of present rises significantly, the previously mostly bluish causogram becomes more reddish (with more actual connection), and the bridge between past and future is much wider now.

In the stage C this bridge becomes longer: new long-term perspectives evolve - with new expectations from one’s future and new resources from one’s past. As a result, the index of Strategic thinking in present is almost three times higher now.

<table>
<thead>
<tr>
<th>Stages</th>
<th>Modifications</th>
<th>Number of revisions of one’s causogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Strengthen sense of reality: from smart to wise</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sense of reality, 42 → 58**</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Change temporal mode: from past-focused to present-focused</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Motivational intensity of present, 32 → 42*</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Shift strategic thinking: from short-term to long-term</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Strategic thinking in present, 3 → 8**</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Renew desire to plan: from retire to restart</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Goal-directedness in present, 20 → 36**</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Grow rationally: from Homo sapiens to Homo sapiens sapiens</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Rationality in present, 68 → 78*</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Soften view on past: from rigid to flexible</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Rigidity in view of past, 89 → 80*</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Appreciate the past: from distresses to lessons</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Appreciation of past, 67 → 79*</td>
<td></td>
</tr>
</tbody>
</table>

Note. Level of significance by Student’s t-test: * p < 0.05; ** p < 0.01.

The stage D is marked by a rise of the index of Goal-Directedness in present. So, the life on the bridge between past and future becomes more goal-oriented, less spontaneous.

The stage E is noticeable by the increase of the index of Rationality in present. Personal life plans are more grounded and the bridge of the present is more reliable. Now, the much wiser, more present-focused and more goal-oriented person is ready also for a new look into the past.

The stage F is marked by the decrease of Rigidity in view of past and the last, stage G - by the increase of the index of Appreciation of past. As a result, the psychological past is transformed from the perceived or real distress into the valuable lesson.

Conclusions

So, based on my clinical experience and research, steps to build a bridge from psychological past to the future require some cognitive-motivational modifications for the move from being smart to wise, from past-focused to present-focused, from short-term to long-term thinking, from Homo sapiens to Homo sapiens sapiens, from rigid to flexible, and from distresses to lessons.

It’s time to discuss the hypothesis about connections of psychological time with left/right brain hemispheres. Research by other scientists [Bragina & Dobrokhotova, 1981; Moskvin & Moskvina, 2008] revealed that different hemispheres are responsible for processing information mostly about the already known past or mostly about the unknown future, although the data is not the same for the right-handers and left-handers. And which part of the brain is responsible for processing information about psychological present, about the “red”, actual connections between past and future? The corpus callosum, I guess, is responsible for such a task of bridging psychological past and future together. Figure 3 illustrates the hypothesis. It shows a hypothetical
causometric brain with cognitive-motivational connections between life events in psychological past (blue lines), present (red), and future (green).

Let me finish presentation by the story of my unfinished task. In 1990, an EEG research was initiated by me for a study of psychological time [Gavrilov & Kronik, 1991; Gavrilov, 1992]. This research started in Moscow, at the Institute of Psychology of the Russian Academy of Sciences, but for some reasons was interrupted. Only a few years ago, I learned that also in 1990, Milan Kundera, a well-known Czech writer, wrote in his novel, Immortality: “I long for an experiment that would examine, by means of electrodes attached to the human head, exactly how much of one’s life a person devotes to the present, how much to the memories, and how much to the future. This would let us know who a man really is in relation to his time. What human time really is.” [Kundera, 1991, pp. 332-333]. So far, many dreams still the dreams and I hope that our conference will renew many of our bridges from the past to the future.

References
The Social Mediation of Classroom Behaviour

Moss G.

Behaviour Management Ltd., Cheltenham, UK

Social Mediation is inspired by Feuerstein’s theory of Cognitive Mediation, and the concept of teaching those skills which are absent because of disrupted childhood experiences. In this case the focus is on social behaviour, in particular within the regular school classroom. In the role of social mediator the teacher addresses the students’ cognitive and emotional state as well as the surface behaviour. Social Mediation is an approach to behaviour education that teachers apply to the whole class while delivering the regular curriculum.

According to recent teacher reports increasing numbers of school children are openly hostile and defiant in their lessons, unwilling to conform to the traditional expectations of student behaviour.[1] The perception of these teachers, comparing the student behaviour they face with their own social norms, is that these students must have some form of emotional disturbance, and that these are increasing in frequency. [2] Traditional approaches to discipline do not seem effective in many such classrooms. How are we to deal with this ‘cultural rupture’ between those who teach and those who are meant to learn?

While much of this disruptive classroom behaviour might on the surface seem typical of the emotionally disturbed child, the fact is that for many students its aetiology is more a deficit of social learning rather than some behavioural dysfunction. The reason for this is that within the space of a generation the nature of childhood, as experienced by many young people in the developed world, has changed significantly. Within the UK a combination of social, cultural, technological and legal changes has transformed adult-child roles and relationships, often to create more challenging students and less assertive teachers. [3] Under these changed circumstances many children do not acquire the mindset that appreciates the legitimate role of the teacher, neither do they practise the behavioural routines that allow for pedagogic complexity, nor develop the impulse control to manage upsetting emotions in the face of adversity. Traditional ‘behaviourist’ approaches to the classroom may therefore not succeed in modifying those neurocognitive processes that engender such antisocial behaviour in increasing numbers of students.

Our approach to dealing with this ‘cultural rupture’ between those who teach and those who are meant to learn is based on Feuerstein’s theory of mediated learning experiences as applied to cognitive development. [4] We apply similar concepts to the acquisition of interpersonal skills. As in cognitive mediation, our aim is to provide mediated learning experiences that will create a bridge between what children have so far learned, in this case about social roles and relationships, and what they need to achieve next in order to be more successful in the varied social contexts of classroom learning.

Typically in the past, classroom behaviour management has focused on managing students’ external behaviour by modifying the social environment alone. However the behaviour that attracts so much of a teacher’s attention is just the observable part of a person’s psychological state. What lies beneath the surface, those cognitive processes and emotional reactions, provides the impetus and the fuel for that behaviour. Social Mediation therefore also focuses on the students’ cognitive and emotional self-management. In role as social mediators, teachers do more than teach behaviour as a set of rules. They coach these behaviours in all circumstances in a child’s life at school, to help the student develop a repertoire of behaviour skills, and acquire a practical set of moral values.

Social mediation aims to modify children’s thoughts and feelings about the teacher-pupil role and relationship, from negative to positive, by taking teaching opportunities as they arise in lessons – not in a way that is separated from the ongoing teaching-learning process but incidentally, as an integral part of it. This means that the teacher is mediating from the initial instructional phase of the lesson, during the operational on-task phase, all the way through to the review and evaluation phase, whatever the academic curriculum of the lesson may be.

At each phase there is likely to be a change of “learning behaviour” required of the student – from listening to talking, from reading to writing, from remaining in place to moving about the room, and so on. At each point the teacher must explain the required behaviour with unusual clarity, for example, the task might be

“How many examples of mammals can you find in section 6 of your workbook? Make a note of them and write them down in your jotter.”

However this instruction only explains the task. It does not clarify the behaviour required to undertake it. So the teacher adds -
“This activity allows you to apply your new knowledge of mammalian attributes, and to use that to be able to discriminate from non-mammals. You will work with your partner. Remember when working in pairs to use a partner voice. You need your jotter, workbook, and a pen that works. Remain in your place during this activity; if you need any help or have any questions, raise your hand, wait for me to come to you. You have ten minutes to complete the task.”

She then checks for understanding not just of how to perform a particular behaviour but also of the reasons for that behaviour, ensuring that students realise it is not because of some arbitrary requirement imposed by adults, but because there is a valid pedagogical reason for it. “So, why do we need to be using partner voices right now?” At each phase of the lesson the teacher also takes the opportunity to recognise the emotional self-management required at times of students when learning new skills or tackling difficult tasks. “Well done Matt for sticking at that job and finishing it. I know it was fiddly to do but you stayed focused and never gave up even though some bits were really tricky. Good work.”

Through the process of social mediation teachers seek to promote internally guided actions and to promote intrinsic motivation for responsible behaviour. When students believe that a certain way of behaving in a situation is appropriate and they feel good about doing it, then we may say they are intrinsically motivated to perform that behaviour. Their thoughts, feelings and actions are all in agreement. However, some of our students will possess little internal motivation initially to learn and apply learning behaviours. They are already well skilled at claiming attention by disruptive means, at avoiding tasks by prevarication, at responding to their own immediate impulse for self-gratification rather than to the needs of the group, and so on. These behaviours readily achieve pay-off for the student. The behaviour gets them what they want. It works for them – so why change?

The social mediation of behaviour must therefore pay attention to both the external social factors and the internal psychological factors that influence behaviour. In social mediation the teacher takes on the role of “behaviour coach”, not only instructing, but also modelling, encouraging, explaining, correcting and then instructing all over again. [5] The teacher is not just coaching the observable social behaviour through clear explanation and ongoing supportive and corrective feedback as that behaviour is in use. The teacher is also, and more subtly, developing the child’s intrinsic motivation, by helping the child reflect at times upon his thinking and feeling state.

So the goal of social mediation is the deliberate and careful process of transmitting appropriate and effective social values through a teaching and coaching process. It happens in ‘real time’ as the lesson progresses –

“The appropriate behaviour for this situation right now is…”
“Well done this table, good sharing of ideas…”
“Jack, that behaviour is not acceptable in this classroom…..”

When required it goes beneath the surface behaviour and reflects on the child’s immediate emotional and cognitive processing –

“I appreciate you don’t want to do this, but right now I need you to…..”
“Thank you Jodie for stopping painting and listening to me. I can see you were doing something really interesting but you still stopped to pay attention. Well done…”
“Ayshea, I realise you feel angry about this but it’s not ok for you to…..”

Social learning is also happening ‘through’ a human mediator i.e. the teacher, as opposed to ‘direct’ learning in an abstract context. While the teacher is aware of what appropriate behaviour needs to be used, she is also aware of the psychological state of the student right now, and mediates accordingly. “The mediator controls what is learned, how it is perceived, and what meaning is abstracted in the learner’s mind from the learning experience. The mediator often attempts to change the learner’s psychological state, the nature of the stimuli, and even herself in order to produce a learning experience.” [6]

If children today perceive the world in quite different terms than they did a decade or so ago, then our expectations of responsible behaviour can often be at variance with theirs. When mind sets are challenged, emotions will be stirred. The demand upon the teacher is then to create a learning environment that creates the psychological conditions for constructive learning. In this respect, social mediation makes considerable demands of the teacher’s own personal resources. Schools are charged with the responsibility of making decisions about what is proper behaviour and what is not. While those decisions will be influenced by the moral codes of society in general, it remains the responsibility of schools to articulate them and to teach them. In that respect there is nothing “post-modernist” about social mediation. It does not say all behaviours are equally valid!

The social mediation of behaviour teaches moral values through real-life mediated experiences that work i.e. that bring gratification. The mediated classroom environment ensures, initially, that pro-social behaviour gains extrinsic reward. By repeated use the child internalises these functions, while the teacher’s
ongoing feedback shapes and modifies the child’s cognitive and emotional appraisal of the classroom environment. Thus authentic social mediation involves the development of values and the refinement of the behavioural skill in performing social acts - sometimes through justifying reasons which may contradict the child’s previous experiences and mind set. “The goal of teaching behaviour is not to have compliant students who dutifully sit quietly and follow their teacher’s directions. It is to teach students to manage their own behaviour so that learning can take place – to make positive choices about how they behave, whether or not a teacher is watching.” [7]

References
Smart Skirting Board: Snoezelen System in Alzheimer

Moutinho G.M.¹, Fernandes V.², Marujo J.P.³

¹Instituto Superior de Ciências da Saúde Egas Moniz, CiiEM – Centro de Investigação Interdisciplinar Egas Moniz, Almada, Portugal; ²Residência S. Pedro, Malveira, Portugal; ³Unitranspessoal: Núcleo Epistemológico de Investigação em Gerontologia e Psicologia Transpessoal, Lisbon, Portugal

Summary

Alzheimer’s disease is the most common cause of dementia in old people. We used the Smart Skirting Board® (SSB®) that integrates, among other things, a Snoezelen system, a laser system, music, video and aromas for multisensory and cognitive stimulation. The SSB® allows a non-pharmacological intervention, and the brain stimulation is achieved, improving the elderly person’s attention span, memory, mood, verbal skills and concentration and helping them to relax and offering an atmosphere of security and mental and physical relaxation. Based on a study that was conducted, the smart skirting board as a therapeutic tool, contributed significantly to the improvement of the quality of life of the elderly with psychomotor deficits and particularly those showing signs of Alzheimer’s.

Introduction

Dementia is one of the biggest public health issues in this century. According to the results of the “European Collaboration on Dementia – Eurocode” Project conducted by Alzheimer Europe there are currently 7.3 million European citizens suffering from one or various forms of dementia [1]. One in every 20 people over the age of 65 has Alzheimer’s disease (AD), the most common cause of dementia [2]. Experts predict that this number double in Western Europe and treble in Eastern Europe by 2040 [3]. Every year, 1.4 million European citizens develop dementia, which means that every seven seconds a new case is diagnosed. In Portugal there are 160 000 people with dementia [4], of which 90 000 have AD [5] diagnosed. But the real number of people affected by dementia is much larger than these statistics suggest.

Due to the increasing number of early diagnoses of people with dementia, there is a growing demand for treatments, different from the conventional, that may improve cognitive functions, apart from a possible delay of the disease. Consequently, there is a need for non-pharmacological interventions such as the SSB® – a gerontodesign [6] and gerontotechnology artifact – integrating a Snoezelen system, a laser system, music, video and aromas for multisensory and cognitive stimulation. Through the Snoezelen system along with other systems introduced into the skirting board, brain stimulation is achieved, improving the elderly person’s attention span, memory, mood, verbal skills and concentration and helping them to relax and offering an atmosphere of security and mental and physical relaxation.

Materials and Methods

Forty-five patients with AD with ages between 75 and 95 years old were submitted to this study. The diagnosis of probable AD was established following the neurological criteria.

For this study we used the SSB® with a Snoezelen system, an incorporated laser system, music, video and aromas (figure 1).

Along with the smart skirting board, we create a new set of tests to stimulate the cognition: Mini Exam for Gerontotranscendence and Psychomotricity Evaluation (ME-AGP); Mini Evaluation Exam Oculo-manual (ME-OME); Mini Battery Game Development and Cognitive Stimulation (MB-JDEC). Each person did 20 sessions of 20-30 min. All the data were registered in specific software that was developed to this study.

The subjects or their caregivers gave informed consent to the procedure.
Figure 1
Results

The SSB® was created with the following objectives: 1 - To facilitate the mobility and safety of elderly people who may (or may not) be in a wheelchair and who reveal (or not) depressive disorders or dementia; 2 - Provide safety and well being to the elderly with cognitive deficits, particularly those suffering with Alzheimer's; 3 - Encourage cognitive modifiability through the cognitive and multisensory stimulation of elderly with dementia; 4 – To stimulate cognitive and spiritual functions through meditation and hypnosis.

At the end of this preliminary study we verified that all the elderly people showed a big improvement. We verified that the SSB® stimulating the senses, it helps reconnect the dementia patient to the world they left behind; by providing an enjoyable experience, it helps to reduce antisocial behavior and provides an environment that encourages meaningful relationships among staff and patients, promoting relaxation, and reducing psychological stress and staff burnout. Other benefits include relaxed patients, increased sense of happiness and interest, reduced sadness and fear, an increase in sociability and level of interest, and a decrease in disruptive behaviors and levels of anxiety.

Conclusions

Based on a study that was conducted, the SSB® as a therapeutic tool, contributed significantly to the improvement of the quality of life of the elderly with psychomotor deficits and particularly those showing signs of Alzheimer's.

Our exploratory and qualitative research in elderly patients with Alzheimer's revealed a significant improvement in long-term memory. Elderly patients with other diseases such as arthritis, anxiety, depression, etc., revealed a significant improvement in their affective and psychomotor skills.

References

Reversal of cognitive disabilities by treatment with growth hormone

Nyberg F.

Department of Pharmaceutical Biosciences, Uppsala University, P.O. Box 591, S-751 24 Sweden; E-mail: fred.nyberg@farmbio.uu.se

Summary

It is obvious that brain is modifiable when subjected to long-term exposure to certain trauma and stress but also to abusing drugs. Chronic exposure to most drugs of abuse seems to induce a decline in cognitive functions. However, it also appears evident that the treatment with cognitive enhancers, such as growth hormone (GH), may reverse some of the disabilities observed after exposure to abusing drugs but also to cognitive impairment induced by type-1 diabetes. This report describes some recent findings in our laboratory regarding reversal of cognitive dysfunctions by recombinant human GH in experimental animals but also in human. The hormone seems to induce its effects by interaction through a mechanism involving excitatory amino acids.

Introduction

During the past decades an increasing number of studies clearly demonstrates that growth hormone (GH) and its mediator insulin-like growth factor-I (IGF-1) may exert profound effects on the central nervous system (CNS). GH replacement therapy is found to improve psychological capabilities and thereby increase life quality in GH deficient patients. Beneficial effects of GH on certain functions, including memory, mental alertness, and working capacity, have thus been described (Burman et al., 1996; Nyberg, 2000; Arwert et al., 2006; Åberg, 2006). In experimental animals stimulation of the GH/IGF-1 axis is shown to enhance cognitive capabilities. Further, studies exploring the mechanisms underlying these effects are found to involve glutamate transmission through the NMDA receptor complex (Le Grevés et al., 2002). Earlier studies have shown that chronic opiates and even alcoholism may inhibit neurogenesis and trigger apoptosis, which leads to impaired cognitive capabilities in both humans and other mammals (Eisch et al., 2000). The ability of GH to promote neuroprotection (Nyberg, 2000) was indicative of a possible use of the hormone in attempts to reverse drug-induced damage to the brain. In a recent study GH was suggested to act as a neuroprotective factor that preserves cellular viability and inhibits apoptotic cell death (Alba-Betancourt et al., 2013). Also, the hormone was shown to regulate the human neuronal stem cell regenerative activity (Pathipati et al., 2011). This article will summarize our current research on effects of GH replacement in experimental animals as well as human subjects previously exposed to drugs leading to cognitive impairments.

Impaired cognition induced by addictive drugs

In recent years studies have demonstrated that abusing alcohol, amphetamine, cocaine, and opiates may induce a variety of adverse effects on the central nervous system (CNS). Among the harmful effects of these drugs on brain function are those contributing to accelerated obsolescence. These putative aging effects, which include inhibition of neurogenesis and enhanced apoptosis reveal a dark side of drug addiction and it is obvious that forthcoming research is necessary to clarify the nature of these harmful effects (Carvalho, 2009). A particular attention should be focused on the observation that chronic drug users display pronounced impairment in brain areas associated with executive and memory function (Ersche et al., 2006). Therefore, we have directed studies on hormones like GH and IGF-1, which may counteract and repair these damages.

The ability of growth hormone to cross the blood-brain or blood-CSF barrier

Considering the molecular weight of GH (approximately 22 kdalton), the hormone should hardly penetrate the blood-brain barrier (BBB). However, there are several lines of evidence giving support for the ability of the hormone to cross the barrier. First, several studies have shown that patients deficient of GH display a significant improvement in many aspects of their mental health when subjected to GH replacement therapy
The Jerusalem International Conference on Neural Plasticity and Cognitive Modifiability (June 2-5, 2013, Jerusalem, Israel)

(Nyberg & Burman, 1996). Secondly, GH has been demonstrated to affect the cerebrospinal fluid (CSF) levels of various neuropeptides, amino acids and monoamine metabolites (Johansson et al., 1995; Burman et al., 1996; Nyberg, 2000). Furthermore, a positive correlation between the dose of exogenous GH and the levels of the hormone recorded in the CSF (Burman et al., 1996) has been demonstrated. GH may reach its responsive sites in the brain by circumventing the BBB through the hypothalamic median eminence but a receptor-mediated mechanism via choroid plexus has also been suggested (Coculesco, 1999). The hormone may actively or passively pass the BBB and GH has also been shown to significantly diffuse into the CNS (Pan et al., 2005).

The ability of growth hormone to improve cognition

A potential role of the GH/IGF-1 axis in memory acquisition and cognitive functions has been demonstrated in many studies (Nyberg and Hallberg, 2013). GH replacement in adult GHD patients has indicated that both GH and IGF-1 may enhance both long-term and working memory (Awert et al., 2006; Faletti et al., 2006). Replacement therapy with GH in GHD patients during six months was found to improve both the long-term memory and the working memory (Awert et al., 2006). Also in experimental animals GH replacement is shown to induce cognitive improvements (Le Grevés et al., 2006). All these effects by the hormone seemed to involve glutamine transmission (Le Grevés et al., 2002; Nyberg and Hallberg, 2013).

Reversal of drug induced cognitive disabilities by growth hormone

In cellular experiments it has been shown that GH may counteract and reverse morphine-induced damage in cells derived from prenatal mouse hippocampus (Svensson et al., 2008). A very recent study demonstrated that the hormone may reverse certain anabolic androgenic steroid-induced effects in rats (Grönbladh et al., 2013). We also noted that the hormone could reverse cognitive impairments in diabetic mice (Enhämre-Brolin et al., 2013). In a clinical study we recorded impairments in the GH/IGF-1 axis in patients with chronic pain who are exposed to opioid treatment. A case study of one of these patients, a clear decline in cognitive capacity was found. However, a notable improvement in certain cognitive domains, such as visuospatial performance, in parallel with increased hippocampal activity as documented by MRI was observed after 6 months of GH therapy (Nyberg and Hallberg, 2013; Rhodin et al., 2013).

Conclusions

Data reviewed in this article suggest a potential role of the GH/IGF axis for the purpose of neuroprotection but also for the repairment of damages to the brain affecting cognitive functions. It open for new strategies suggesting GH as a useful agent for the management of a variety of disorders connected with cognitive disabilities, e.g. these resulting from CNS trauma or from brain damages induced by abusing drugs.

Acknowledgements

This work was supported by grants from The Swedish Research Council (Grant 9459).

References

Aberg D. Role of the growth hormone/insulin-like growth factor 1 axis in neurogenesis. Endocr Dev. 2010;17:63-76. Review.


Important structural components influencing brain cognitivity: cortical folding, micro- and submicrostructures, liquid crystal smectics in the interstitial tissue

Koha R.

Kallavere Hospital, Estonia; Rein.Koha.001@mail.ee

Key Words: cortical neurons, the interstitial cerebral cortex, Smectic A Liquid crystals, superconductivity.

Introduction

The important structural components of cerebral cortex are:

1. Cortical neurons
   Submicroscopic studies\(^1\) have shown that dendrites and gemmules resemble ultra shortwave radio antennas\(^2,3\). An especially thorough study of these has been provided by Sarkisov\(^4\).
   Based on the above research, it can be concluded that extending into the subpial space, dendrites and gemmules increase the surface area of cerebral cortex, thus enhancing the possibility of direct reception of information from the outside (telepathy).\(^2\)

2. Glial cells
   Glial cells abound in brain microarrays. As cells of connective tissue, they maintain the interstitial structure of cerebral cortex and regulate metabolism\(^4\). The surface area of cerebral and cerebellar cortices is increased by folding, with microfractals further increasing this area, especially in the case of cerebellar cortex\(^1\).
   Although the surface area of cerebral cortex has been researched at the macroscopic level, there is currently no readily available data on brain's microfractality and the participation of intercellular substance in cortical energetics of the brain. Therefore the aim of the current paper is investigation of the microfractality of cerebral cortex.

Material and method

The surface area of the cerebral cortex of 10 cadavers was investigated. The main reasons for death were polytraumas - 7 cases out of 10, in one case only brain injury, in one case septic shock, and in one case post-traumatic fat embolism syndrome. In one case, cerebral edema had developed which led to the death of the patient in a later period (20 days post trauma). In all cases, random biopsy samples (4-5) were taken from the surface of the cerebral cortex. The microarrays were stained with hematoxylin-eosin using the standard method\(^5\). The microfractality of the surface area of the cerebral cortex was calculated according to the formula \(S=2Tx a/ x l\), where \(T=1.5 \text{ cm}\) and \(a/l = 2.9805 \). The surface area calculations were based on the values of cortical area microfractals' surface area.

Results and discussion

Three types of microfractality were distinguishable in the cortical area. Vide microphotos 1 -3. Types of microfractals of the cerebral cortex: 1. hubbly, 2. pyramidal, and 3. molecular layers.
Microphoto 2 depicts pyramidal layers with microfractals; microphoto 4 – measures of the pyramidal layer; 5 – molecular layers; 6 – hubbly surface of the cerebral cortex with surface area measures.

Such fractality of cortical area clearly demonstrates the importance of cerebral and cerebellar surface area in guaranteeing the efficiency of cortical processes. Inclusion of microfractality in calculations of cortical surface area increased the result by 60%, as compared to standard calculations that take into account only usual fractality of cortical area. In addition, it seemed that efficiency depended not only on the surface area, but also on the nature of cortical fractals, of which three types were identified.

The parallel structures formed due to the cerebral cortex being compressed against the skull were similar to those caused by traumatically induced fractures described in a previous publication. Mechanical stress-induced changes in cerebral interstitial tissue (Vide Microphoto 7.), but Glial cells membranes is intact (Vide Microfoto 7a) were analogous to mechanical stress-induced changes in osseous and cartilage tissues.
The existence of smectic A liquid crystals was confirmed by polarisation microscopy: cerebral and cerebellar interstitial tissues were anisotropic, similarly to osseous and cartilage tissues where liquid crystal smectic A structure prevails. Microphoto 8 shows how polarised light waves that are perpendicular to the microarray are not transmitted through the analyser, which indicates crystalline or solid phase. After rotating the analyser by 15 degrees, clockwise or anticlockwise, a clear microphoto of the cortical glial cells was obtained (Vide Microphoto 9). It is known that a characteristic feature of smectic A liquid crystals is superconductivity. Recent studies have confirmed superconductivity even at room temperature. In brain processes superconductivity increases the intensity of electrical impulses while minimizing energy consumption; thus enhancing brain activity including cognition.

Reference
Implications of neuroplasticity in neuroethics

Serrão S.1, Jácomo A.2

1Bioethics Institute (IB) of the Catholic University of Portugal (PORTUGAL).
2Bioethics Institute (IB) of the Catholic University of Portugal (PORTUGAL).
spserraodaniel@gmail.com, abferreira@porto.ucp.pt

Abstract

The core of neuroscientific research includes two major sections: therapy and enhancement. Faced with such scenario, neuroethics has on these two different fields ethical challenges that push beyond the reach of bioethics—which also explores issues such as predicting disease and dealing with unintended consequences of research—by probing concepts like free will, personal responsibility and decision-making.

Advances in research in the field of neuroplasticity neuroethics open a new field that is not included either in therapy or in enhancement field. Neuroplasticity is the condition of both fields.

In our communication, we propose two strategies: assertiveness and preventive insights. Both require a new theory of the spirit in which the distinction between “mind” and “brain” takes on a new dimension. Implications of these two strategies for neuroethics will be discussed.

Keywords: Neuroplasticity; enhancement; therapy; autonomy; assertiveness; prevention.

The brain has a special status in human life, since it is distinct from other organs. As a unique organ, it has attracted a special cluster of sciences termed “neurosciences”.

The greatest purpose of Neurosciences is to understand how the functional nervous system behaves. In achieving this goal, neuroscientists face two types of challenges: to understand how neuronal circuits support adaptive behaviour while realizing neuronal functionality, and, consequently, to prevent and treat the brain’s malfunctions.

However, we must be aware that a paradigm shift is required to understand the essence of human nature when intervening in the structure and activity of the brain, as it raises important ethical and social concerns. "For many of us it may be scary to learn about the real origins of our thoughts, emotions and personalities and the factors that make us distinctively human. Undoubtedly, a successful simulation of the brain would have a deep impact on our deepest felt convictions – in particular our concepts of personhood, free will and personal responsibility, the way we see ourselves as persons, personally responsible for our actions” (HBP, 2012).

In such circumstances, it is essential to undertake a constant update of the ethical framework, which will enable us to carry out a new form of evaluation of what is actually being done, leading to innovative guidelines for regulation and promotion of new neurotechnologies.

Faithful to the spirit that guides Bioethics, William Safire explained the distinctiveness of neuroethics, compared to bioethics more generally, by explaining that neuroscience “deals with our consciousness, our sense of self … our personalities and behaviour. And these are the characteristics that brain science will soon be able to change in significant ways” (MARCUS, 2004). In the light of the above, we propose a model based on three elements: Principles, Virtues and Fundamental Interests.

At the basis of neuroethics are all the problems, challenges and consequences that arise from the need to eliminate or at least alleviate the suffering caused by brain disorders. Part of the shift reflects the deepening neuroscience expertise of many neuroethicists and the migration of neuroscientists to the field of neuroethics (FARAH, 2012).

These challenges accompanies great uncertainty about the benefits and risks of these technologies, their novelty, and the lack of comprehensive understanding of how the brain works (LEVY, 2007). Due to such novelty, a new bioethical approach involves a clear articulation between the three above mentioned vectors.

The traditional bioethical thought has therefore become inadequate at a time when a new assessment is being made of neuroscience. The trade-off between principalism, virtualism and casuism is insufficient to reveal the essential character of the neurobiological foundations.

The special status of the brain, coupled with techno-scientific advances in the field of neurosciences, provides Bioethics with a set of possibilities that can radically change the way its founding principles are interpreted.
Examples of this change are the operational consequences of the beneficiary and precautionary principle. The real agenda of this change lies in the present uncertainty surrounding the true understanding of the effects of certain neurotherapies. Hopes are high, but the effects of these interventions are still unknown.

Regarding the element of Fundamental Interests, The Nuffield Council on Bioethics has identified five major concerns that must be considered in relation to the new neurotechnologies:

1. Protection of safety, taking into account the risks that are associated with the expected benefits.
2. Promotion of autonomy. The neurological interventions affect essential autonomy. Neuroethics also performs the function of supporting people’s ability to make decisions while preserving their identity.
3. Protection of privacy. Data protection covers the entire ethical framework for scientific research. In the case of neuroscientific techniques, some devices may collect sensitive personal data.
4. Promotion of equity in terms of access to innovative products and social stigma and discrimination.
5. Promoting public understanding and trust in the new neurotechnologies (NOVEL NEUROTECHNOLOGIES, 2013).

Describing the types of behaviours and approaches that are required to protect and promote fundamental personal interests, the Nuffield Council on Bioethics report highlights three virtues that are especially relevant for guiding activities in a wide range of configurations and applications of new neurotechnologies:

- Innovation - expressed through technological advancement, identifying ways to provide greater access to therapies.
- Humility - expressed in the recognition of the current knowledge limits and ability to use technology to alleviate the damage caused by brain disorders.
- Responsibility - expressed in the consistency of research and clinical practice, avoiding communication overstatements about their potential uses.

These virtues should be exemplified in the professional practices of all involved in the therapeutic process and promotion of new neurotechnologies.

I. Neuroplasticity: between therapy and enhancement.

We must begin by saying that neuroplasticity in itself is not a bioethical issue, although it may affect more functions than those concerning the neuronal system.

Neuroplasticity is the recognized ability of the brain to change its structure and production of neuromodulators, due to external stimuli. The bioethical issue, not based on natural stimulation, but techno-scientific intervention, has a dual intent: therapy and enhancement. In principle, these goals are attained on the basis of common bioethical challenges related to scientific research and safeguarded in the Additional Protocol to the Convention on Human Rights and Biomedicine concerning biomedical research, especially in Articles 6, 7 and 8.

Despite this common basis, these two types of intervention have quite different bioethical implications: the size and dimension of therapy and improvement.

a) Neuroplasticity and therapy.

From the standpoint of therapeutic approaches, the neurological potentiation is characterized by being a functional intervention at the same time based on a structural design of neuronal function consequently causing large changes in patients’ quality of life. These interventions entail a broad spectrum underlying ethical issues concerning principles such as Autonomy, Beneficence and Dignity. This is the current debate in the field of neurological intervention: to intervene in the functioning of the brain, we operate in an organ that has functions of coordination and is regulated by the Self.

In a state of latent vulnerability resulting from a neurological problem such as Alzheimer's or Parkinson’s disease, any therapeutic intervention must take into account the issue of informed consent. In this type of disease it is always difficult to know to what extent we are faced with a patient with a minimum capacity to consent, although that patient is aware and generally reacts badly to any information, which might undermine his/her autonomy. At the same time, there are deeper implications that point to the principle of beneficence. Advances in neurotherapies do call into question the distinction between the principle of Beneficence and Non-maleficence. In other therapeutic areas, we can more easily distinguish the difference between the two principles, following the doctrine of Beauchamp and Childress.
In the case of neurotherapies, this distinction is attenuated to the point where intervention in a given functionality can have radical consequences in the field of autonomy. One paradigmatic case is functional surgery: no tissue is destroyed or removed, a cell stimulator being placed on each side of the brain, activated by a battery under the skin on the chest, which will provide electrical stimuli. This stimulation alters the functioning of the core and enables control of symptoms. Despite this, there are two serious ethical questions, which involve patients’ autonomy. The first is relating with the discussion regarding the value many of us place on being able to behave in ways that reflect our understandings of who we are, and the negative impacts of brain disease or injury upon this. The relevant ethical concerns here relate to the role of therapeutic neurotechnologies in restoring – or possibly disrupting – an individual’s capacity to exercise their autonomy and identity as a result of intervening in the brain. The second is connected to the importance of respecting patients’ and research participants’ opportunities for self-determination through informed consent in the conduct of research, experimental treatment or treatment.

b) Neuroplasticity and enhancement.

The revolution in neuroscience begins with the concept of "enhancement". “The most familiar example of psychological enhancement by direct manipulation of brain function is the use of prescription stimulants by healthy individuals. Thanks to extensive media coverage, from “Desperate Housewives” to network news shows, the public has become aware that stimulants such as methylphenidate and amphetamine can be used to enhance concentration and productivity” (FARAH, 2012).

In addition to the therapeutic approaches, neuroscience is developing options such as cognitive biotechnological breeding and neuronal performance. This is one of the real consequences of neuronal neuroplasticity.

This development comprises a set of perspectives that make it a true revolution. Never before in this area has knowledge intertwined and built a project integrator between medicine, engineering, pharmacology, biomedicine and nanotechnology. We are suddenly seeing many advances in non-medical applications of neuroscience. No longer is neuroscience confined to the research laboratory or the medical clinic. It is now finding applications in the home, office, school, courtroom, marketplace, and battlefield.

The central question concerns the growing ability to alter brain function in order to improve the mental processes of normal individuals, beyond the traditional role of treating the sick person’s mental dysfunction.

Neurocognitive improvement cannot be understood without an assessment of what may be achievable along the lines of development in neuroscientific research.

The main issue is not to prohibit or limit an area of knowledge that is new to everyone, but to put ethical boundaries that are safe, fair and morally acceptable in perspective.

The ability to change brain functioning requires an analysis of the risks and benefits not only for the individual but for the future of humanity. Seen in this light, society cannot be alienated, since that would prevent it from intervening in the scientific debate.

Closely related to neuroplasticity is neurotechnology, which covers a wide range of methods and forms of development. These methods consist essentially of exogenous brain-machine interfaces that allow direct interaction in both directions between the neural tissue and electronic conductors, or between the deployment of devices and transcranial magnetic stimulation.

Although not as fascinating as the exogenous interfaces, psychopharmacology carries relevant neuroethical implications. The ability to achieve specific psychological changes not only interferes with neurochemical changes in behaviour and function, but also in the organizations own endogenous neuronal functioning, based on the assumptions of neuromodulation. A new generation of drugs has targeted features aimed at a new level of cognition and emotion.

If we could accept that there are no major ethical issues concerning therapeutic psychopharmacology, the same cannot be said in the field of "enhancement". The most paradigmatic case is the use of drugs to combat the prevalence of attention deficit hyperactivity disorder (ADHD), particularly in children and young people. The use of these drugs in these cases is now generally accepted. However, the same is not true in the case of the use of these drugs by students who do not have ADHD but who use them as study aids, associated with memory potentiation.

The potential for improving neurocognitive function in healthy individuals offers both exciting promise and frightening possibilities, which therefore require a discussion regarding bioethical development.

II. Neuroplasticity and the new theory of mind: a proposal.

The challenge in presenting a neuroethical proposal is, as we said before, the lack of a consistent explanation as to how the human brain displays the ability to understand and represent objects.
To the effort of explaining sensory cognitive awareness is added the difficulty of explaining self-consciousness or reflective consciousness (SCHMIDT, 2013).

Obviously, there are many proposals for explaining this relationship, but no author appears satisfied with the proposed explanation of the mind that it represents. “No theory - whether based on neural correlates of consciousness, information processing, intentionality, phenomenology, higher-order representation, theoretical modelling, neural models workspaces, sensorimotor contingency theories, introspection of "lived experiences," embodied cognition" or other views - is yet sufficient (BOYD, 2012). This is a pioneer adventure. A final neuroethical challenge for the 21st century will be to assimilate neuroscience’s increasingly complete physical explanation of human behaviour without lapsing into nihilism (FARAH, 2012).

The history of neurosciences shows that only very rarely is neuroscientific research divorced from social reality. Thinkers such as Galen and Descartes described the brain as a pneumatic/hydraulic system, relying on the "new-fangled" plumbing systems dominant during their lifetimes. Galen, for example, believed that the liver generated "spirits" or gases that flowed to the brain, where they then formed "animal spirits" that flowed throughout the nervous system. Descartes compared the ingenious mechanical homunculi, or automata, constructed by the 17th century craftsmen with the living subhuman machines produced by nature (WEINER, 1991).

By the twentieth century, according to the spirit of the Industrial Age, neurophysiologists were describing the intricate network of the brain as “an enchanted loom”. Now, computational comparisons abound - such as the curious comparison of the "cerebral cortex with an internet network." These comparisons are nothing more than a simplification to help us understand very complex ideas, but they also represent concepts that are built on sophisticated brain theories.

It is clear that neuroscientists are not all in agreement in relation to research evolution.

For instance, some molecular neurobiologists argue that truth lies in the molecular constituents of the nervous system. Obviously, this is a reductionist agenda, full of philosophical and technological considerations, often highlighted by the media. But is this reductionist confidence justified? Or will other higher levels be important in explaining that the brain and mind cannot be reduced in this way? Interactionist Neuroscientists (JAEGHER, 2013), strongly believe in a different agenda - a struggle for a more modern, eclectic approach to neuroscience that explores interactions with social sciences.

In the light of the above, what follows is a brief overview of the most significant theories or attempts to explain self-consciousness or reflective consciousness.

Wolf Singer looks at the self as a unit of time rather than space. In consequence, the "anatomic correlate" should not be required in brain structure but in brain functionality, which ensures neuronal synchronization. Taking into account the extraordinary structural and functional complexity of the brain, and the mechanisms of self-organization, the focus should be placed on overall brain function that persists in time, from birth to death, and creates the illusion of self (SINGER, 2007).

Joseph LeDoux, starting from the premise that functionality depends on the brain’s synaptic connections, considers that the self is an emanation or emergence of synchronized synaptic activity. From our point of view, this statement is acceptable if is connected with the cognitive sensory awareness outlook, but is just a hypothetical perspective in respect to self (LeDoux, 2003).

Jean Pierre Changeux, in his book "L'Homme de Vérité" (CHANGEUX, 2002), takes a concept that subsequently developed with Stanislas Dehaene. (DEHAENAE, 1998): self-consciousness as "workspace" neurons. Although a variety of processor areas project into the interconnected set of neurons composing the global workspace, at any given time only a subset of inputs effectively accesses it. “We postulate that this gating is implemented by descending modulatory projections from workspace neurons to more peripheral processor neurons"(DEHAENAE, 1998).

Without going into details, thalamocortical connections, depending on sensory stimuli from outside, would create a network of neurons and synapses which become stable as memory procedures. Each new stimulus is confronted with the existing network that can reject or modify it. This pre-representation would be the neuronal workspace. The constant activity of such a network would create the illusion of self-consciousness as “control center” of the autonomy of the self. As we can recognize, J.P Changeux’s thesis offers a good explanation of cognition, but does not meet the requirement of a scientific explanation of the self-awareness.

Christof Koch, today’s most imaginative neuroscientist, recalling his years of work with Francis Crick, insists that to address the question of Self we need a theory that explains “how” and “why" the physical world is able to generate a "phenomenal experience". His theory starts with the Information Theory that he defines as the process of reducing uncertainty, and concludes with the concept of integrated information that introduces an accurate measurement of the extent of consciousness, PHI, which quantifies the reduction of uncertainty. Creatures with a high PHI, whether animal or human, are more able to adapt to the world around them and to find the best solutions. This theory is abstract and lacks any biological or structural correlation.

The difficulty of supporting an ethical analysis of any intervention in the brain is connected with the absence of a good theory about the brain-mind relationship. For this reason, neuroethicists must work with
global and general bioethical notions. Accepting that the brain’s major function is to express cognitive awareness, neuroethics will use this platform to perform an analysis of individual and social ethics.

On the basis of ethical analysis the researcher assumes ethical responsibility, because he intends act on the brain structures for a particular purpose. This action connects with social ethics inasmuch as it requires an evaluation of these activities for the expected results to society benefit. It is an ethical casuistry more than an ethic of philosophical reflection.

Judy Illes sums up as follows: "The new breed of so-called neuroethicists must lead the way in drawing from bioethics, genetics and other disciplines to meet the unique challenges that are raised by the opportunity to study and probe the brain. To succeed, neuroethicists must keep up with the pulse of neuroscience, and pursue an ethically coherent agenda based on the needs of the neuroscience community and its interface with society” (ILLES, 2007, S59).

The proximate cause for the lack of a consensual theory of mind is rooted in two reasons: 1) The overall present state of neuroscience research; 2) The lack of overall knowledge of the consequences of interventions in neuronal activity in the process of the emergence of thought.

Given this context for sustainable bioethical debate, we propose a strategy for linking assertiveness (primarily related to the "state of the art" and the current knowledge of neuroscience) and predictability (related to the chances of the future, based on the agenda of the investigative process.) The point of contact between these two vectors is reached by the precautionary principle and a prudent attitude in decision-making, and suggests the need of a new theory of mind development.

Obviously, assertiveness and predictability must require evidence of the absence of risk before all research involving humans or treatment is employed. This perception could be sufficient in some research involving humans. The problem that we could find in neurosciences is that the precautionary principle might be too restrictive where there is also a duty to promote research and find effective treatments.

At the same time, arguing for inaction or to set disproportionately high regulatory hurdles for innovation is itself ethically problematic: in the face of clear suffering and unmet need, the precautionary principle runs the risk of stifling the development of new neurotechnologies.

This neurotechnologies may help to shed light on the balance of precautionary principle, recommending a less restrictive standard of performance, one which is mitigated by the recognition that some risks, and some uncertainty about risks, may be accepted where technologies could make a significant contribution both to individual patients and to the public good. But, uncertainty does not imply misconduct or unsustainable research or therapeutic approach, far from it. It requires a special attention to the patient’s and research partners, offer them independent counselling, before consent is given, to provide an opportunity to fully explore the implications and uncertainties.

Therefore, researches on neuroethical field, should developed a professional guidelines framework to ensure patients and volunteers autonomy. This guidelines framework only could be possible if professional bodies work together to establish publicly accessible registers to collect and link data on experiences or therapies procedures. While neurotechnology can be enabling, (LYNCH, 2009), it can also limit individual freedom. State uses of neurotechnology feature the most blatant opportunities for coercion, but even individually chosen lifestyle applications of neuroscience can exert indirect pressure on people.

As we assert above, the essential difference between therapy and improvement or enhancement, have as consequence a distinctive ethical approach. Although formerly there is a potentially for neurotechnologies outside health care, very well used by industries and markets.

The neuroethical approach should be, again, characterised by frank dialogue between all the neurosciences agents involved to monitor proposals for research to ensure, not to forbid, but to foster and ensure value and excellence. This goal implies designating neuro-enhancement as medical device; regardless of the purpose for with they are promoted.

We are aware, of course, that many of these proposals just been good intentions into practical action, if they didn’t take account the social impacts of distorting their potential. Researchers, Policy makers, Industries, and Universities should consider their corresponding responsibilities carefully when seeking social impact, investment or promoting neurotechnologies.

References

The Influence of Exposure to Nationality Concepts on Stereotypes among Jews and Arabs in Israel

Shamoa-Nir L.1, Razpurker-Apfeld I.2

1 Department of Behavioral Sciences, Zefat Academic College, (Israel)
2 Department of Behavioral Sciences, Zefat Academic College, (Israel)
e-mail: lipaznir@zahav.net.il

Abstract

This study examined the influence of visually priming nationality concepts (e.g. Mezuzah, yarmulke or veil) on stereotypes among Jews and Arabs in Israel. The participants (N=186) were exposed to national (religious) and neutral concepts and then filled questionnaires concerning stereotypes and prejudice about individuals of the opposing group. The findings show that priming had a differential effect on Jews and Arabs. While Jews were not affected by priming, some groups of Arabs showed priming effects. Since the stereotypes of Arabs toward Jews were differently affected by priming, as a function of the Arabs' religion, Arabs should not be considered as a coherent group. Research implications and further experiments are also discussed.

Keywords: Priming, Stereotypes, Nationality concepts.

Introduction

The purpose of this article was to examine the influence of national/religious stimuli on cognitive responses in a multicultural reality existing in the Israeli society. Given the multicultural and politically conflict context of the Israeli society, this study focuses on one of the prominent conflicts, namely, the conflict between Jews and Arabs. Most psychological theories of religion assume that national and religious conflicts usually involve negative attitudes such as stereotypes and prejudice. Moreover, researchers agree that these negative attitudes, concerning a certain group, are based on an image about what people in that group are like and this image can often be wrong (Stephan & Stephan, 1996).

The mental representation, called a stereotype, is a cognitive structure that contains the perceiver’s knowledge, beliefs and expectations about a human group (Stephan & Stephan, 1996). Stereotypes serve a variety of functions such as providing explanations for behavior, justifying the subordination of minority groups, and including expectations for social interaction (Stephan & Stephan, 1996). Therefore, negative stereotypes often lead to prejudice as indicated by a number of studies (Eagly & Mladinic, 1989; Stangor, Sullivan, & Ford, 1991; Stephan, Ageyev, Coates-Shrider, Stephan, & Abalakina, 1994). Negative stereotypes are likely to lead to avoidance of out-group members, provide negative trait attributions to explain their behavior, and contribute to discrimination against them. For example, exposure to African-American patients activates negative stereotypes held by white doctors, and in turn affects their evaluation and interaction with them (Stone & Moskowitz, 2011). One of the cognitive processes which may affect people's attitudes and stereotypes is priming.

Priming refers to an increased sensitivity to certain stimuli due to prior exposure to them or to other stimuli associated with them. Supraliminal or subliminal exposure to stimuli may have explicit or implicit effects on performance. For example, being exposed to words related to ‘old age’ slows the speed of walking (Bargh, Chen & Burrows, 1996). Being exposed to words related to ‘professor’ improves general knowledge (Dijksterhuis & van Knippenberg, 1998). Studies have found that priming of religious concepts induces prosocial behaviors (Ahmed & Salas, 2008; Pichon, Boccato & Srogliu, 2007), but also modifies prejudice against individuals of other religions (for review, Hunsberger & Jackson, 2005) - both reduction and empowering effects (Johnson, Rowatt & LaBouff, 2010). It seems, therefore, that priming of religious concepts, evokes relevant schema which are reflected in the attitudes, stereotypes and behavior. In the present study Jews and Arabs were primed by words related to their different nationalities. It was examined whether this would have an effect on the participants' stereotypes towards members of the opposing group.
Method

1.1. Participants

Jewish (N=88) and Arab (N=98) students from the Zefat Academic College participated in this experiment.

1.2. Procedure and tools

The experiment was conducted in small groups. First the participants completed one of the three types of the word search puzzle and then filled the questionnaires. Personal details (sex, religiosity, age) were also collected.

The word search puzzle served as the priming task. This task has been used in previous studies (Bargh, Gollwitzer, Lee-Chai, Barndollor & Trotschel, 2001; Pichon et al., 2007). In this study a Hebrew version was prepared. Participants were randomly assigned to priming of Jewish concepts, Arabic concepts or neutral priming. Each puzzle consisted of 3 critical words and 4 filler-neutral words. The task was to find and mark the 7 target words specified in a list.

To assess the stereotypes of Jews toward Muslims and vice versa, questionnaires, developed by Stephan et al. (1994) and have also a Hebrew version (Tur-Kaspa & Shwarzwold, 2003), were employed. Participants had to indicate how favorable each of 13 traits seemed to be, using a 10-point scale. All participants had to indicate how favorable it was to be, for example, ignorant. This questionnaire resulted in a satisfactory Cronbach alpha (for Jews .848, for Muslims .791, for Christians .768 and for Druze .744). In addition, Participants had to estimate the percentage of Jews or Arabs that in their opinion possessed each of the 13 traits, using a 10-point scale, representing 10% increments from 0% to 100%. An Arab, for example, had to estimate the percentage of Jews that were ignorant.

Percentage estimate was multiplied by favorability rating for each trait per participant. Higher values of the stereotype indices reflect more negative stereotypes. The 13 stereotype indices were submitted to a factor analysis. Principle component analysis with orthogonal rotation of Varimax with Kaiser normalization resulted in a 2-factor solution. The "antagonistic" factor captured the ignorant, aggressive, unintelligent, clannish, unrestrained and dishonest traits, which had loadings over .6 and accounted for 23% of the total common variance and had a satisfactory internal consistency of .765. The "unpleasant" factor was based upon the unfriendly, unreliable, disrespectful and unclean traits that had loadings higher than .6, accounted for 22% of the common variance and had an internal consistency of .798. Finally, for each participant two factor scores were extracted using a regression method. Higher values on these scores indicate more negative stereotypes.

1.3. Results

Planned comparisons tested separately whether priming concepts had a different effect on the Jews' attitudes toward Arabs and on the Arabs' attitudes toward Jews. First, the data of 88 Jews were submitted to a multivariate analysis of variance, in which the type of priming was an independent variable, and the combined measure for stereotypical perception was the dependent variable. Jews were not affected by priming (F < 1). Additional analyses confirmed that the participant's sex neither had a main effect nor interacted with the priming variable [Hotelling's Trace = .038, F (2,78) = 1.49, p > .231; Hotelling's Trace = .058, F (4,154) = 1.111, p > .352, respectively] and that religiosity did not affect the attitudes of Jews (F < 1).

Next, the data of 98 Arabs were submitted to a MANOVA. The effect of priming on the attitudes of Arabs toward Jews was assessed. This analysis showed no effect of priming when the Arabs were considered as a group (F < 1). It was further examined whether priming effects may have been obscured by the religion of the participants. MANOVA in which religion and type of priming served as independent variables, showed that the only significant finding was of the interaction between these variables [Hotelling's Trace = .263, F (8,172) = 2.827, p < .007], indicating that stereotypes of Arabs toward Jews were differently affected by priming, as a function of the Arabs' religion.

The breakdown of this interaction revealed that there were no priming effects for Druze [Hotelling’s Trace = .318, F (4,26) = 1.035, p > .407], while Christians were differently affected by the type of prime [Hotelling’s Trace = 1.019, F (4,28) = 3.568, p < .019], and Muslims showed a tendency to be affected by priming [Hotelling’s Trace = 0.165, F (4,110) = 2.274, p < .067]. The separate univariate tests, performed for Christians, revealed that there was a significant priming effect for the “unpleasantness” factor [F (2,16) = 7.269, p < .007]. A post-hoc Duncan analysis indicated that Christians stereotypically perceived Jews as less unpleasant when primed by nationality concepts than when primed by neutral concepts (p < .05). As for the “antagonism” factor, there was no priming effect for Christians (F < 1; when primed by neutral concepts mean factor score = -.77, when primed by Arabic concepts -.27, when primed by Jewish concepts .46).

Analyses performed for Muslims did not show significant priming effects for any of the separate factors [F (2,57) = 1.578, p > .1; F (2,57) = 2.186, p > .139, for the "antagonism" and "unpleasantness" factors,
respectively]. Thus, the interaction between type of priming and religion is explained by different influences of the priming concepts on participants from different religions: while Druze attitudes toward Jews were not affected, the effects of different priming concepts on the attitudes of Christians and Muslims had different trends, as seen in Fig. 1.

![Graph showing the mean factor scores for different priming conditions among three Arab groups in Israel](image)

**Fig. 1:** Stereotypically perceiving Jews as unpleasant as a function of different priming conditions among three Arab groups in Israel. Higher values on the mean factor scores indicate more negative stereotypes toward Jews.

**Discussion**

The purpose of this study was to examine the influence of national-religious stimuli on cognitive responses in an Israeli context. Thus, we compared the attitudes of Arabs (Muslims, Druze and Christians) and Jews after they were primed by religious concepts. The findings show that Arabs' attitudes towards Jews were differently affected by priming, as a function of their religion. The interaction between type of priming and religion showed that while Druze attitudes toward Jews were not affected by the type of priming, the attitudes of Christians and Muslims had different trends, pronounced mainly in the "unpleasantness" factor of the stereotype scale. It seems that the Arab participants are not a coherent group, and indeed it was argued before that these three different religious groups which exist in the Arab group in the Israeli society, have a complex identity (Smooha, 2001) and differ in their moral dilemmas (Orland-Barak, Kheir-Farraj & Becher, 2013).

Furthermore, Christians stereotypically perceived Jews as less unpleasant when primed by nationality concepts compared to neutral concept priming. It is possible that the Christians as a unique minority group in Israel (even among the Arabs) are less threatened and thus national concepts moderate their negative attitudes towards Jews. Threat perception may be considered as a moderator variable, which may explain the attitudes of Christians, but also as a mediator in the case of the attitudes of Druze and Muslims. We suggest this variable should be investigated in future studies. Our primary interest is in understanding factors that might be associated with prejudice of Jews toward specific religious groups of Arabs and vice versa. Drawing on previous research and theory, our next study will focus on four factors that seem to be potentially related to prejudice toward religious groups and immigrants: realistic threats, symbolic threats, intergroup anxiety, and negative stereotyping.

Empirical investigation on stereotypes has led to the consensus that the repeated use of stereotypes creates a psychological system in which the goals that promote stereotyping itself recede from consciousness so that stereotyping becomes implicit. Research shows that this is true even when an individual has no conscious negative feelings toward the group (Greenwald & Banaji, 1995). Thus, if stereotypes may cause negative behaviors towards others and can be both, conscious and subconscious, it is possible that also in the cultural diversity existing in Israel, Jews and Arabs consciously attempt to suppress their use of stereotypes. This may be the explanation why the Jews in this research were not affected by priming.
The findings show how a brief prior exposure to certain words can alter attitudes, at least momentarily. In this study we used supraliminal priming. It should be examined whether stereotypes would be differently affected when participants are consciously presented with religious stimuli or subliminally exposed to them. For instance, will subliminal priming affect the majority group? It is possible that the results of the Jewish majority group in the current study reflect a social desirability bias – they want to be viewed favorably by others, and therefore do not allow themselves to be affected by the priming manipulation.

This research has shown that exposure to national or religious stimuli activates positive attitudes within a specific minority group in a culturally diverse reality, suggesting the influence of the minority group’s adaptation to the environmental context. As for the other religious groups, it is unclear whether the existence of national and religious stimuli causes negative or positive effects. Since cognitive modifiability is possible using a few minute visual exposure to religious concepts, it may be reflected in internal neurophysiologic structures as well. This finding encourages an applied contribution of implementing controlled exposure to religious content in intervention programs.

References


A case study of Alzheimer patient: brain plasticity & functioning- preservation of lifeline via KEG Cards (Keys to Emotional Growth)

Avinor E.1*, Silman J.2

1* (University of Haifa & Psychotherapist in hospital Bnai Zion, Haifa, Israel)
2 (KEG Cards, Haifa, Israel) – info@KEGcards.net

* email: eleanav@research.haifa.ac.il

Summary

This paper reports on the techniques and processes that are effective in helping the Alzheimer patient and his caretakers understand motivations, visions, and blocks in order to maintain life-line memories. Included are an explanation of KEG Cards (Keys to Emotional Growth) and the theoretical background behind them; they are an effective instrument in helping the patient and his caretakers preserve memories of events and people. Projective identification artwork cards guide the patient in retrieving memories from the past. Integrative examples of use implementing KEG Cards and positive psychology together with CBT are presented, demonstrating the interweaving of the patient's memories and emotions; in the patients, the long term memories still exist but the retrieval is blocked; these memories are aroused even though the short term memory neurons have been destroyed. This work is done by integrating thoughts, feelings and actions with the help of whole brain activities.

Keywords: Alzheimer; life-line; coaching of Alzheimer patient; KEG Projective Cards; Positive Psychology; Memory Retrieval; Memory Preservation; Memory Maintenance; Long Term Memory; Short Term Memory; integrative psychology

Introduction

Oh, The Places You Will Go With Alzheimer's (by Dr. Eleanor Avinor copyright@2013)

You'll never know
How far you can go
Only if you try
You'll find it so.
Use feelings to connect
The past with today
Choose pictures, talk, walk
And get on your way.
Leave the worry for another day.

Alzheimer's is the most common dementia impacting millions of people world-wide, a disease that is becoming more and more prevalent as a generation of baby bloomers (boomers) continues to grow older; this disease and other forms of dementia are expected to soar even higher in the coming decades. They rob the mind and memory of all content. One suggested way of helping the brain function better is a combination of physical activity, nutrition, and a bio-chemical solution which has not yet been discovered; all this, together with cognitive and whole brain activities. As of today, no real solution has been found. Our pilot study and case report are one of the tentative solutions to help preserve brain areas critical for thinking and memory and enhancing brain plasticity of Alzheimer patients. Various methods may help boost success in helping these patients and slowing cognitive decline in people in the early stages. Our suggestion here is a combination of many activities and changes in life style together with working with KEG Cards.

Alzheimer's was first described by Dr. Alzheimer in the early 1900's. Scientists are still trying to understand and pin-point its causes. One accepted suggestion is age, because in the early 1900's the average life expectancy in western civilization was 47, whereas today people live well into their 80's and 90's and even reach their early 100's. This longer life span increases the risk for Alzheimer's disease. Fifteen percent of people over
age 65 suffer from it, and forty percent of people over 85 are diagnosed as having Alzheimer's. However, many researchers believe that we can develop strategies to delay the onset. Lifestyle factors such as healthy nutrition, physical activity, less stress and cognitive activities may contribute to the delaying onset of Alzheimer's.

Many new questions are raised about the brain changes involved in Alzheimer's and the extent to which they could be targeted by future prevention methods and therapies: bio-chemical, physical, nutritional, educational and cognitive interventions. The drugs in use today do not stop the relentless downward spiral and progress of the disease and the accompanying deterioration. In the future, drugs that target beta-amyloid buildup, together with education, physical and cognitive activity, may provide a better answer.

An essential part of the educational and cognitive activity may be achieved by linking cognitions and emotions. This includes preserving and recalling memories from the distant past. This recall may be triggered by using good questions that can spark a meaningful conversation full of significant triggers of memories; smells, music, objects, pictures and artwork may have the power to summon memories from deep within. Capturing memories may trigger an emotional response which can effectively help manage the behavior of someone with Alzheimer's. Appealing to memories of when he/she was young and photos from the past together with projective art can open a portal to the past where family members can relive the past together, generating a feeling of warmth and comfort and belongingness, which are so important to the mentally and emotionally isolated and confused patient. The brain changes via its experiences. The process by which an individual recovers from brain damage whether it is caused by a trauma or by bio-chemical changes and plaque, is based on the fact that neurons that are fired together create a connection together; they become wired. A memory is our ability to reconstruct all the fragments into one whole, beginning with one fragment; this fragment of memory is a point of activity on the brain which could be a picture, a taste, a sound of a voice, music, smell, touch, sight. All of these triggers together are active at the same time and associate together to create the memory and the related feelings. The neurons fire together when one aspect is stimulated. A key part of the memory process is when neurons fire together (axons send energy and dendrites receive the energy and when these two neurons associate again and again, in other words connect at the synapse, the memory is recreated. For example, when you walk in the street and walk by a cake shop and smell a cinnamon bun, the smell of the bun reminds you of your mother baking on a Friday afternoon. This causes you to feel warm and homely and a feeling of belonging floods you. You then remember your mother's perfume, her hug, all the family sitting together at dinner and the music playing in the background. You think of the songs the family sang together and remember the comfortable feeling of the warm cozy chairs. All these connections were triggered by the smell of the bun which created the memory via association fragments. This is the process by which the cards work: when the individual chooses a card that evokes an emotion, this is the first fragment in the above process of memory retrieval.

New research is looking at changes in the brain and researching biochemical solutions to Alzheimer's. This new research looks at the neuroplasticity of the brain. Neuroplasticity may be defined as the natural tendency of the brain to shift directions in response to intrinsic and extrinsic influences. This case study is an example of how positive psychotherapeutic and cognitive work can impact brain plasticity in a positive direction at any age. Regarding the potential of the Alzheimer patient and how we can maximize this potential, the work of Flynn (1984, 1987) speaks about massive gains in human intelligence that have been found across time and these gains are referred to as the Flynn affect. Neuroscience research demonstrates the potential for improving brain plasticity (Goh & Park, 2009) and this can give Alzheimer caregivers hope regarding their loved ones.

As early as 1971, in Diamond et al., the role of environmental enrichment in enhancing brain plasticity was seen. Malkasian and Diamond (1971) and Uylings et al. (1978) showed that when rats were housed in one large cage instead of small isolated ones and given many objects to play with, their brains were significantly different from the brains of the rats in a controlled group. The controlled group rats had no special stimuli and no special objects to play with while they were in separate cages with no social interactions either among themselves or with the researchers. Diamond held her rats that were in the treatment group and petted them, making them feel loved and connected (this reminds us of the research with monkeys that Harlow conducted relating to bonding with the warm soft mothers). The brains of the rats that were socially and object stimulated had a six percent thicker cerebral cortex and dendrites that were longer and had more complex branching, spines, and synapses. Such differences are associated with higher intelligence.

The result of Diamond speaking to her rats daily and holding them in order to keep them alive longer is a use of positive psychology in neuroscience research. The outcome was an increase in longevity, which was reflected in the positive impact on neuroplasticity (Diamond et al., 1984). Social and object stimulation was seen to improve brain anatomy again and again in rats. She believed that the same changes could also be induced in humans. She also discussed the importance of evoking and stimulating emotions and their expression in order to increase connections between the cerebral cortex and the limbic system. Another important aspect of this research is that the appeal to the emotions, evoking emotions and stimulating them, activates the amygdala, the hypothalamus and the hippocampus.

It is shown that positive neuroplasticity is aroused when positive emotions together with cognitive and emotional stimuli are an integral part of the Alzheimer patient's daily life. These ideas are expressed in Begley's

Gene research, research regarding the greater activation of the hippocampus (a part of the brain critical for memory), elevated levels of beta-amyloid (a protein that builds up in the brain's blood and spinal fluid of Alzheimer patients) and research of brain plaque are all being studied today to find ways of dealing with and combating the negative effects of dementia. Together with these physical aspects there are mental cognitive studies being conducted and methods being examined; among these are KEG Cards.

**Materials and Methods**

2.1 **Description of Projective Identification KEG Cards**

One aim of the cards is to help the individual identify and retrieve old memories, old scripts and old decisions that are either not retrievable today or disorganized, even though they were accessible in the past. The Alzheimer patient can then access the old memories and the old scripts, which will enhance his life. KEG Cards could be effective with any population. The importance of the cards is that they go straight to the core issues and enable access to early memories and other past memories through the emotions. Working with KEG Cards helps the individual use both brain hemispheres: the left hemisphere is said to control speech, writing, numbers and language; the right hemisphere is activated in spatial tasks, musical tasks, emotional activities, face recognition, arts and crafts and other creative activities. The brain processes sensory information and conscious thought and planning in the cerebral cortex which is the layer that surrounds both hemispheres. Using KEG Cards activates the two hemispheres and the cerebral cortex. Moreover, the hippocampus is activated in short term memory activities and is thought to be where short term memories become long term memories. KEG Cards incorporate thoughts, feelings, physical sensations and behaviors, thus activating the whole brain. There is a theory that this may help preserve memory and is used in RAPP (Retraining Alzheimer Patients Positively; Avinor, 2009) programs to slow down the deterioration of Alzheimer patients.

The cards have original artwork pictures on one side which arouse thoughts and feelings and on the back side are the guiding questions that help the Alzheimer patient to be in touch with his thoughts, feelings, physical sensations and behaviors. The guiding questions are based on CBT (Cognitive Behavior Therapy), Redecision Therapy, Gestalt, TA (Transactional Analysis), NLP (Neurolinguistic Programming), Guided Imagery, Energy Psychology, Body and Soul Work, Mindfulness and Dynamic Psychology. The caregivers and family members use the answers of the patient in order to promote better access and more triggers to early events and people in the Alzheimer patient's life. This is how the fragments are connected to create a memory.

The Alzheimer/ dementia patient loses his sense of self, and these pictures on the cards together with the questions can help the individual regain some of his sense of self. When a particular scene or picture is chosen, all aspects of the scene are not perceived simultaneously; research suggests that color is perceived first, followed by orientation, and only after that is motion perceived. There are multiple visual micro-consciousnesses which are asynchronous with respect to each other (Zeki & Bartels, 1998). Research also shows that a sense of being a single self may emerge from the multiplicity of consciousness. This happens when the multiple tracks of self-directed experience which are produced by the brain are sufficiently representationally coherent. This coherence includes verbal self-description and the affective sense of self, which are created by the feelings. KEG cards may act to create this coherence between the two hemispheres of the brain, the left hemisphere which deals with the cognitions and verbal descriptions of the self, and the right hemisphere which deals with the affective sense of self. These studies are presented and explained by Margaret Wilkinson (2006) in her book “Coming into Mind” which analyzes the mind-brain relationship from a Jungian clinical perspective. The ideas that she presents and explains can demonstrate why KEG cards aid in helping the confused Alzheimer / dementia individual be in contact with his “self”.

The cards are also the means for externalizing and projecting values, beliefs, thoughts and feelings and to trigger more thought processes and analysis by the Alzheimer patient. For example: card no 1.13 (drawing in nature) was explained by a client as a tree demonstrating values. He said that the relationship between a man and his values is the same as the relationship between a tree and its roots. The tree could fall in a storm if its roots are not strong enough, and the man could fall in a difficult crisis in his life if his values are not strong enough. Just as the roots of a tree nurture the tree and strengthen it, functioning as a strong basis for the tree, in the same way the values of a man nurture him, strengthen him and function as a connection to reality. This client then spoke about his own values and how they fail to support him in crises.

Work with KEG Cards could be done individually or in small groups. They are seen to be effective with all ages and are most effective with early stage Alzheimer patients to aid them to be in touch with their underlying feelings, thus enhancing their cognitive abilities, access to emotional memories and connecting memory fragments and recreating memories.
The caregivers and family members use exercises according to which the patient is asked to choose cards as an answer to a question. Large size cards (A4) and medium size cards (A6) may both be used, because the size can express the dementia patient's intensity of emotions and the card size is chosen according to what feels good to the patient. Using the cards could help an individual progress towards accessing his emotional and cognitive memories.

1.2 Methods - Process of how to use KEG Cards

In the process of working with KEG Cards the patient chooses a card which symbolizes for him the issue that is being discussed (such as important events or people in his life, blocks, secrets, good or bad feelings in a specific situation, an attitude held by the individual or by somebody else towards him, a perceived injustice etc.).

Truth is in the eye of the beholder; therefore, all answers are correct and there is no right or wrong choice. The patient explains what the cards he chose represent and symbolize for him. The choice of the cards and their explanation is true at a particular point in time and in a particular context according to the ego-state that he is in. It may change from exercise to exercise and according to the mood of the patient and the stage of his Alzheimer's. It is possible to work with the cards in a small group or with individuals. The cards may be used as a part of self introspection, behavioral coaching, therapy sessions in early Alzheimer's and social activities. This is because the guiding questions have different levels of generalization. The exercises presented here are suggestions and may be changed according to need and circumstances.

An example of an introductory exercise for the patient is:

- Choose a card or cards that symbolize or represent for you how you feel today, how you feel about your Alzheimer's and represent your Alzheimer's .
- Present the cards and explain why you chose the cards you chose. What were you feeling? What were you thinking? Does it remind you of a smell or of music, a song, a dance? Does it touch any of your senses?

The caregiver asks the questions on the back side of the pictures that the patient has chosen, or another possibility- the patient looks at the questions on back of the cards and selects the questions he wants to answer. Then the information is discussed and analyzed. Additional alternative questions for choosing KEG Cards:

- The patient is asked to choose artwork picture cards that represent or symbolize various aspects of dilemmas and/or life events which influence his daily life.
- What is the best decision you made in your life? What helped you make this decision? Choose a picture or pictures that symbolize your choice.

Before working with the KEG Cards the Alzheimer/dementia patient ranks his feelings on a scale from 1 to 5, 1 being feeling very good.

Prior to working with the cards, the Alzheimer/dementia patient feels like the following diagram.

After working with the KEG Cards the Alzheimer/dementia patient ranks his feelings again on a scale from 1 to 5, 1 = feeling very good and 5 = feeling the same as before.
1.3 Case Study Description

The information reported in this paper is based on work with an Alzheimer patient who is an 86 years old man, today and was diagnosed 10 years before. From the beginning of his diagnose he worked daily with projective Identification Cards in addition to other cognitive activities. Today he is functioning with some deterioration: confused but functioning.

His life-line exercises include:

- Every day he is asked to describe what happened to him in the past, what he is planning in the present and how he sees the future.
- In the description he includes family members, friends and events.

The life-line exercises include: laying the pictures he chose on the floor, describing his life as a physical line drawn with his finger or walked as a line on the floor, a picture in a notebook or items he can lay on the floor.

The techniques used are: drawings, paintings, photographs, collages, guided imagery, music, books read, family stories and history.

During the session, there is conversation together with physical activity and chronological organization of events with the focus on the positive.

There is made a connection between the two hemispheres of the brain - through guided imagery and physical activities which connect between thoughts, feelings, behavior and physical sensations.

The main principles of working with this patient with the KEG therapy cards are:

- Research shows that learning changes the brain.
- The brain is “plastic” : it make new cellular connections and strengthens existing ones as we gain and integrate information and skills.
- There is constant learning: Creation of new associations via Positive Feedback
- Personal individual tutoring for creation of physical and emotional connections at the same time.
- Training in Cognitive Flexibility is applied by the use of different levels of generalizations & specification.
- Dividing a complex task into doable component parts (Ex.: Dividing the life-line task into smaller events and specific people).
- Chunking tasks into categories (Ex.: birthdays on life-line, family members on life-line, …)
- Practice with Guided imagery: reinforce the doing -“Imagine you are doing the task. Go through each step in your mind; tell me what you are doing and what it feels like”.
- Clarification of boundaries: consistent maintenance – when he wants to leave a task in the middle, we show him on the clock that we still have another few minutes to work with the cards and we don't stop earlier than planned. There is order in time and place and we work according to it, and we reflect it to him again and again in a consistent manner.
Joining and Positive feedback is achieved by: therapeutic conversations, life-line exercises with Projective Identification cards, memory games, taking responsibility.

The body remembers: There is constant stimulus of old associations and creation of new ones (physically, emotionally and mentally).

In the sessions there is repetition of sequencing and ranking in every context. Ex.: what is more important, bigger, more powerful, smaller. (When looking at people around comparing sizes, colors and ages of people).

During the conversations cognitive processes are discussed: such as, cause and effect & correction of distortions in thinking processes.

For example:

Patient:    “Because I was alone I was sad”.
Care Giver:  “What is the connection between being sad and being alone?
Aren’t you ever happy when you are alone? Can’t you do something that makes you happy when you are alone?”

There is categorization of everything in the patient's life. Examples:
1. food
2. clothes appropriate for going to bed or going to a party or appropriate for the weather.
3. watching a movie, watching the news - “Who are the good guys and who are the bad guys?”

There is analyses of every activity in patient’s life.

Ex. Looking at a movie: Why did something happen? How could it have been prevented? What was the result? What was the process? Would you have done the same thing and why?

- There are constant demands from him to weigh possibilities and to make decisions; every conversation is intertwined with the question: “What would you have wanted to happen?” or “What do you want to happen?”
- He is not allowed to evade the issue with: “I do not know” or “It is complicated” or “You decide”.
- Working with dilemmas:
  Wherever possible he has to solve problems, choose options and decide the solution to a dilemma. Instead of doing things for him, he is asked to do for himself anything that he is able to.
  Example: Where to go, what to do, what to eat, what to wear, ...

- Conversations include dilemmas such as: What will happen if you do A and what will happen if you do B, which is better and he must decide.
- By-passing defense mechanisms and going straight to the core issues using KEG Therapy Card pictures and CBT (Cognitive Behavior Therapy), TA (Transactional Analysis), Re-Redecision Therapy
- To sum up, the therapy cards may be used to practice memory, sequencing, cause and effect, categorization, exemplification, classification and combines thoughts, feelings, physical sensations and behaviors.

Questions and thoughts about maintaining Life-Line Memory in the Elderly as a result of working with this patient, with KEG Cards and whole brain activities:

- It is impossible to say what exactly supported the patient’s functioning ability.
- Was it the medication?
- Was it the guided imagery?
- Was it the therapy cards and guided conversations?
- Was it a combination of all of the above?
- More evidence based research is recommended.

1.4 Examples of using KEG Cards with Alzheimer patients

When the individual is asked to create his life line using KEG Card pictures, he chooses different pictures every time to represent different events and different people in his life. For example:

Picture 1.11 which shows 3 heads of people in a grey background and said: "These are people from my past who I don't remember but I know that they were once close to me.”

Another picture he chose is a picture 1.53 which is a pyramid of many people. He said: "These are all the people that come and go here; all the time – people that I don't know.” Then he spoke about the fact that he is losing his memory and doesn't remember all the people in his life, but he does remember his wife and then he
chose picture 1.18 and said: "This is my wife. I remember her. She is young and beautiful. Then he turned to his
wife who was visiting with him and working with him and said: You are not my wife. She is".

So we can see here that there is a positive effect of working with the cards but it doesn't erase the
characteristics of Alzheimer's. Another picture that he chose that day for his life-line was 1.41, a picture of an
individual with a burden on his back and said that the sack on his back is his Alzheimer's and it is heavy for him
to carry.

The last picture that he chose for his life-line that day was 1.17, a picture which shows the head of
somebody with big open eyes, looking. He said: This is how visitors sometimes look at me. This shows that even
though his cognition is decreasing, his emotional reactions and understanding is still functioning.

After we finished with the life-line, when asked to choose a picture that represents how he feels today,
he chose 1.51 that shows two figures talking and one has a heart on the shirt. He said: "This is you and me. I
have a heart on my shirt, because I LOVE YOU."

Results - Costs and Benefits of working with KEG Cards with Alzheimer
Patients

The cost of working with KEG Cards with Alzheimer patients is that it takes a lot of time and patience
and you have to be consistent in order for the patient to remember past work and connect it to his own life. If
family members do not do it by themselves then care-takers have to dedicate time to this activity.

The benefits outweigh the costs because the patient is creating new neural pathways in the brain to long
term memories and remembers more and more both from the past and the connections to the present. The patient
feels a sense of success instead of just depression that he is losing his faculties. He feels that it is not all lost and
that there is hope and there is hope that he can retain some memories.

Among the benefits of working with KEG Cards are that they could help the Alz/Dementia patient:

- Be in touch with feelings
- Organize his memories
- Make a connection between the present and the past
- Give him a sense of belonging
- Make new associations
- Make new connections with past events
- Give him a sense of success
- Give him pictures instead of words
- Give him motions and mobility and dancing instead of words

Conclusions

The life-line goal of KEG Cards is to connect the people, events, and life of the past that still exist in the
Alzheimer/dementia patient with the people, events and life of the present, which threaten to slip away.

Whole brain techniques and processes how to help the elderly adult understand his/her motivations,
visions and blocks in order to improve cognition and memory are used.

To sum up, active emotional, physical, and cognitive training interventions that were demonstrated in
this case study, added to the quality of life and preservation of memory and cognition of this subject.

References


Diamond, M.C., Johnson, R. N., and Ingham, C. (1971). Brain Plasticity Induced by Environment and


York: The Free Press.


Correction the Motor Control System of the People Suffered with Cerebral Palsy

Skorbun S.D.

VASIA,ltd, Moscow, Troitsk, Russia

Summary

The main factors, which block normalization of motor activity at cerebral palsy, have been identified. The method have been developed for forming the system of moving control of the central nervous system, which permit to minimize the influence of these factors and to solve the set of essential problems: reduces or removal of spasticity and receiving of possibility of free moving, mitigates hyperkinesias, and normalizes the muscle tone.

Introducing

To the infantile cerebral paralysis (CP) they attribute abnormalities of moving activity due to affection of the brain as in mother belly or after birth in the age to 2 years. Just a brain, rather than spinal cord, peripheral nerves or musculoskeletal system.

Usually when we speak about people, which suffer from CP how their state is characterized? " He can not to walk, to stay, to jump, to rise a leg and so on." This state is explained by spasticity, or hyperkinesis, or atony, which prevents one from controlling one's movements.

The methods for solving the problems for peoples with CP are suggested mainly by medicine. Thus, in order to solve the problem of spasticity, the common practice is to cut the nerves (dorsal rhizotomy) and tendons, to inject the Botox to the spastic muscles, or to plaster the legs... In addition they use an exercise therapy, manual therapy, dolphin therapy, different methods like of Bobat, Vojta, Adel suit …

It is worth to note, that such abundance of different methods, which often are in contradiction (for instance Botox and plastering), shows that there is absence in understanding of what it is necessary to do and why, what a result will be. Guarantied minimal, and forecasted maximal.

Let us to model the spasticity. Imagine that your feet are plastered, or simply put on your downhill ski boots - this gives the same effect. With your boots laced tight, your foot is completely immobilized and blocked from moving activity, just as at spasticity. However, I am sure you would be able of walking, and jumping, and running, although all that would be very uncomfortable for you.

The reason due to which the person with CP cannot to walk or to solve other movements task not only because of their tiptoes, is not in spasticity, not in hiperkinesis, this is only some factors making it difficult but in quite a different cause. There are plenty of examples demonstrating this: children with CP walk and run on the tiptoes, or resupinate feet, or on the inner or outer edges of their feet.

To solve the problem, it is necessary to identify just the reason, due to which they have motor malfunction.

When the child is born, what he is able to? Nothing. A newborn cannot fix his head, turn from side to side, sit, stand, etc. That is when a human is born, he does not know how to control his body, how to move, and how to use most of his physical functions that are intended for controlling the body.

The system of a human body is a sort of a biological mechanism, which has been formed by the birth of a baby. However, this mechanism does not work completely since a newborn human infant initially cannot operate this system in full. This mechanism has no driver but has a pupil who will grow into a driver in the future.

In this context, we assert that the problem of development of children with CP and those without CP is the same.

The key point in the CP-related problems is education aimed at creating a motor control system, which is absent at the birth of both the babies with CP and those without CP disorder.

Forming the system of moving control is occurred as a result of learning in the process of solving of moving tasks. And it can be define as a whole set of the solutions of tasks, which a person encountered in his life. And which he optimized and remembered.
The system of moving control in a norm is created by genetically predetermined self-learning in the process of adaptation to the environment requirements. This process is violated in case of cerebral palsy. At CP there are abnormal factors, which influence on learning: an injured central nervous system, receptor system which sends anomalous signals, distorted reflexes. Influence of these factors give rise to such solutions of moving tasks, which form moving control system, which are different from the solutions, which correspond to a norm. And it is clear. The person, which all his life have a ski boots on the legs, if he learn something, will to walk, run, jump in absolutely different manner in comparison to person, who use jogging shoes or walk barefooted.

Structuring of a brain during learning

If the person make moving or actions – what occurs at this time in his central nervous system? Let us imaging this on an example of walking. Of course it is very simplified model, but it permits to make important conclusions.

Let us take a video camera and record the process of walking. This video record will consist of a set of separate photo pictures. The whole set of these pictures describes the process of changing the position of the body from one position to another.

Suppose now that we have a special (fantastic as of now) video camera, which is capable of taking video of the nervous system during the process of walking. Each frame of this video film is an instantaneous snapshot of the active part of the entire nervous system during the implementation of this movement. Speaking about active part, I mean the neurons through which nervous pulses are propagated at a given instant and the neurons that are linked to them at that moment.

Thus, we would have two images for each moment of time, one displaying the body and another displaying the active part of the nervous system. Each separate image of our special videocam would show us a certain pattern of neurons linked in some way with each other. All these neurons, through which streams of the forming this pattern nervous impulses are propagated, unambiguously determine the angles between the bones connected by the joints at this time moment, as well as the velocities, the directions of their displacements, and the tension of the muscles (tendons) connecting the bones of the skeletal system. This resembles the picture of a city in the night, when we look at it from a high view point. We see the illuminated streets of the neurons and the lights of the moving cars of nervous pulses.

Examining the step motion, we will see a sequence of changing patterns corresponding to a given task. This sequence starts with a basic pattern, when one lifts his leg, and ends with another pattern, when one lands his foot. Then one makes the next step, and the set of common pictures of a body and the set of images of neuron patterns is repeated.

At birth, a human infant does not have such sequences of neuron patterns, which ensure the solution of the motion tasks (or a program generating these sequences). Later, these patterns are formed during education, and a person can reproduce the same set of the patterns in order to repeat iteratively the same action. The libraries of the patterns are formed in the people with CP just in the same way. However, the problem lies in the fact that the probable set of the patterns, which could be used by the people with CP for solving a motion task, is significantly reduced and distorted by the artificial changes in the degrees of freedom, in the range of the motion of the joints, and the changes in the unconditional reflexes due to brain injuring.

All the said above clearly suggests: if we wish to solve the problem of motion activity for the people with ICP, we should solve two problems: (a) to be able to develop the sequences of the neural patterns that correspond to the norm and (b) to recover (or to approach the norm) the sequences of neural patterns.

Evidently, if the training results in the formation of neural structures in the CNS, it should be expected that the process of creating such structures is a highly demanding task. This process should be accompanied by the fulfillment of a series of quite strict conditions excluding random chance in the formation of these structures.

It is also evident that no drugs and no surgery are able to form this set of the patterns in the human brain.

The real problem of rehabilitation of persons with CP is not a proper brain injuring, which have as consequence a distortion of moving activity, but lack of a methodical course of learning of moving from "A" to "Z". The learning, which creates the system of moving control as a neurons structure pattern in a brain.

Conditions, which are necessary for successful learning

Thus, what are the necessary and sufficient conditions to the information during the process of education, in order for the brain determines what the information that must be remembered is?

The first condition: we may only learn a subject that is treated by a brain as vitally important by some criteria. Therefore, the task that we intend to teach anybody should be endowed with a status of being important (sufficiently important to make its solution a single thing a person thinks of).
I would determine this feature in the following way: a vitally important thing is that one a person will unavoidably have to do, regardless of whether one likes it or not. This principle is implemented by the pressure exerted from the living environment and directed at forcing a person to solve this task.

If the living environment does not require from a person the skills one should acquire, then, even if there is a potential possibility of gaining this knowledge, it is quite probable that these skills will not be actually acquired. This is often the case in the practice.

The second condition, which is key for the education too, is that, in addition to being vitally important, the task should also be repeated many times. Or, to put it in other words, the multiple repetition of this task confirms its importance, since its repetition significantly affects the quality of life.

The third condition is that the multiple repetition of the task should span over many days, during which a person encounters this challenge.

And the fourth condition. It directly follows from the fact that we are searching for the most efficient solution. Every time we should consciously control the performance of the task and to compare the made attempt to the previous attempts for selecting the optimal solution.

Simultaneous fulfillment of these four conditions allows to a brain to find and memorize the optimal sequence of the neuron patterns that determine the solution of the motion task among the available set of the probable solutions, and to use this selected set at a level of automatic performance.

The fact that these conditions are practically impossible to be met simultaneously in the case of cerebral palsy, which distorts the set of the probable neural patterns, from which the solution of the motion task is compiled, is the main cause of failure in the training and creating the motion control system corresponding to the norm. And in reality they are not succeeding to rich a necessary quantity of conscious fulfillment of the given task for its optimization and remembering of its solution.

Results

Our method for forming of motor control system minimizes the factors impeding the fulfillment of conditions 1-4 and provides by many times faster education for basic motor skills (stereotypes), thus enabling further self-education, which is characteristic for normal condition.

This is achieved by replacing the multiple repetition of the motor task, which is necessary for optimizing and memorizing the solution, by a few repetitions of the optimal solution executed with maximum muscle tension, modulated by low-amplitude vibration [1]. As a result, a low-amplitude movement, which is dynamically similar to the macromotion, is repeated several hundred times within 10-30 s (condition 2). Such a short execution time of the motor task allows the people to concentrate his consciousness on the exercise (conditions 1 and 4) and after repetition during 4-6 days this movement task will be write in memory.

We have developed a complex of exercises for executing basic movements both for the groups of the joints and for the whole body. This allows the set of the neural patterns existing in one's memory, which are used for making the optimal decision, to approach to the norm and to reduce the degree of abnormality of these patterns.
The figure illustrates the execution of one of these exercises. In this exercise, the task is to put one's foot on a bar of the wall-mounted gym ladder. The execution of this exercise is hampered by the action of a vibrating tape fastened to a leg. The vibration frequency is 18–20 Hz and the amplitude is 5–8 mm. The tape tension varies within the interval that allows one to both carry out the forward motion and to pull the leg back. This permits a person to execute all the phases of relaxation and strain, which are typical for the normal macroscopic motion, and to carry out several repetitions of the macroscopic movement itself.

A person also successively executes the other basic motion tasks for this leg. After repetition of this complex of exercises during a few days, the patient becomes able to make deliberate voluntary movements by a leg; these exercises reduce or eliminate spasticity, normalize the tonus, reduce the hyperkineses, record into the memory of the patient the standard for these exercises movements. The exercises on the basic movements for the other parts of the body and the whole body are executed in the similar way.

Conclusions

The conditions required for storing solutions motor task in memory are determined.
1) The solution is optimized and memorized only if the person treats the task as vital; 2) the task should arise repeatedly and should be solved under the control of the person's consciousness; 3) the person should face the task during many days; 4) every time the solution should be appraised consciously.

We developed a method of an accelerated teaching of the human with cerebral palsy by a basic movement tasks. The method is applicable for any initial level of physical activity even in case when human cannot make any voluntary movement because of spasticity.

References

A retrospective of the
“Journey out of the land of the In-Between”
The trials and triumphs of reclaiming brain function, a life, marriage and sense of self after right anterior frontal lobe brain injury

Trotman P., House T.

Accredited mental health Social Worker, private practitioner

Retrospective 1

In March 1990 my husband, Tony, suffered a near fatal cycling accident in which he sustained a fractured skull at the base of brain resulting in right frontal lobe brain injury. This is my account of our shared journey of reclaiming our lives and, of what I did to help Tony regain brain function. It will be told from the viewpoint of what it was like to be the wife of a brain injured man and how I struggled to find ways for us to overcome this life shattering event.

Throwing down the gauntlet: to accept and drink from the chalice of a different life

It was 7th June 1990 – 10 weeks after the accident. Tony had had two lots of neurosurgery, the first to seal off the brain at the base of skull (behind the nose) as the skull fracture had resulted in the brain being in contact with contaminated nasal fluid. Further surgery was required when two cerebral abscesses developed resulting in scarring to the right frontal lobe.

Except for when he was in a medically induced coma (first week after the accident) Tony was ‘alert’ in that he could engage in a conversation and was aware of his surroundings. He was however still in a state of post traumatic amnesia with its associated confusion. During this phase of his treatment he had resisted efforts to get him to eat which prolonged the use of the nasal gastric tube. He was scheduled to have the tube implanted in his stomach the following week. In the weeks since the accident he had lost 20kgs dropping to just 54kgs. The tops of his thighs were so thin I could touch fingers around them!

The neuro-surgeon had just left the room. I was standing at the end of the bed which meant Tony could both see and hear me. He was lying on his back with his hands behind his head. I found myself saying, whilst tears gently ran down my cheeks:” Tony you know that the doctors, everyone in this ward and your mother and I have done everything we can to help you recover. You now have to decide if you want to live as a disabled man. We don’t know yet exactly what your disabilities will be so if you choose not to live as a disabled man I will be very sad however I will respect your decision. The time has come for you to decide if you want to live”.

He replied with a somewhat defiant tone: “Is that so!” to which I responded “Yes it’s now up to you”. The next day he started eating! He had decided to live. This challenge set the stage for what was to become a 23 year journey of recovery and reclaiming our lives within the constraints of living with and as a person with right frontal lobe brain injury.

Not losing sight of Tony the person

Within days of the accident, even when in an induced coma, there was still evidence of the Tony ‘within’ despite his injuries and the battery of life support systems which encased him. Very early on I made the decision to not let his predicament cause me to lose sight of him as a person, and as my husband. This challenged me to find ways to communicate and to stay connected. Mostly I continued to use language common within our interactions and to expect him to do some work of communicating. I was determined not to fall into the trap of treating him like a child just because he was not, at that time, able to function fully as an adult. Late May his night nurse, who only had responsibility for his care, discovered that Tony was a computer scientist.
Initially, in an attempt to engage with Tony he outlined a problem he was having with his computer. Tony immediately gave him advice on how to fix it. With successive shifts the nurse was able, with Tony’s guidance, to fix the computer problem. To this day Tony can describe the problem. The nurse in telling me this story commented: “he is the most alert confused person I’ve ever nursed” – strong signs of pre-accident Tony!

The more I practiced this approach the more Tony used me as his guide out of the mists of post traumatic amnesia. I helped him discern how to engage with doctors and other treating staff so that they were able to assist him as sometimes he could be un-co-operative. For example: neurological observations. He became so committed to actively responding to the process and the cognitive awareness questions asked as part of the prompts he actually told the nurses the next question and its answer. If nothing else it showed his short term memory had not been impaired!

**Context: Brain and other injuries:** What we were aware of on discharge from rehabilitation

- Three areas of scarring on the right anterior frontal lobe – no information on how this would impact on functioning.
- Loss of sight in all but the nasal field of the right eye
- Loss of hearing in the right ear
- Loss of sensation – right cheek, chin and lips
- Loss of sense of smell

**Physical and medical environment post discharge from rehabilitation:** At the time ‘home’ was a small 1700 people community 260kms east of Darwin Australia. Darwin is Australia’s northern-most city. Despite being known as a capital city it was also considered to be ‘remote’ because of the huge distances to other larger southern cities. In 1990 Darwin had a population of approximately 100,000 people. The nearest neurologist was over 3,000kms to the south (3.5 hours flying time) and there were few rehabilitation options with a rehabilitation specialist not being appointed to the main hospital until early 1994 (four years after the accident). We had returned to live in our community after Tony had completed his inpatient rehabilitation program and a short return to work program in Sydney. The community, Jabiru, is located within a world heritage listed national park: Kakadu. Our decision to return to live in Jabiru shaped much of the rehabilitation goals. For example: his long cane training for visually impaired people included how to navigate uneven natural pathways as well as moving safely and independently through the city/urban environment.

In the early nineties MRI’s were not commonly available in Australia and we were not provided with any information on likely neurological deficits related to right frontal lobe brain injury.

**Tripping over/slamming into the neurological deficits**

At no time during the secondary and tertiary rehabilitation process were we provided with any information on the likely changes/deficits in neurological functioning especially what I later learnt to be Executive Functioning. I only learnt that this was the formal name/concept for what we had lived with for over 20 years when researching this presentation. Tony’s cognitive ability had clearly not been impaired as evidenced in his ability to return, some six months after the accident, to his work as a computer scientist with a major environmental research institute. This was formally confirmed in 1992 when he had a neuro-psychology assessment related to the compensation claim.

In the first decade after the accident we repeatedly tripped over/slammed into different neurological deficits. The first and most profound was the huge reduction in Tony’s capacity to experience and express emotional affect. On reflection this became evident within weeks of returning home six months after the accident though my ability to fully grasp what I was observing was impaired by Tony’s need for sleep: up to 16 hours a day. Pre-accident our relationship was marked by a high level of emotional engagement so that loss was profound and enduring causing me to experience the deepest of emotional and spiritual angst. At times it was so intense I thought I would go mad or die of heartache before I/we found our way out of the swamp and fog that had engulfed us.

Always it was the everyday things that highlighted the deficits such as asking Tony to go to the nearby shop to purchase some fettuccini. I had asked him to do this when I realised we did not have enough for our dinner party and the guests were due to arrive shortly. Tony duly went to the shop and came back empty-handed saying “they had plenty of spaghetti but no fettuccini”! He had been unable to think laterally or sequentially ie ‘we need pasta, it doesn’t really matter what kind just as long as we have enough to feed our guests’. Each time this happened it was as if a stake had been thrust into my heart fuelling my sense of frustration and loss and challenging me to be creative in my responses so that I did not succumb to despair or attack Tony for his incompetence.

It soon became apparent that he had difficulty multi-tasking or of switching between tasks. In the early stages, when this happened he would become most agitated, and if I persisted, he would go into a ‘melt-down’: stop functioning all together.
We repeatedly ran into what I called the ‘brick wall of fatigue’ as to function effectively Tony had to remember to take time to think about what he needed to think about or do. That this is part of automatic brain functioning yet pivotal to key aspects of thinking such as planning, decision making, and initiation of action its absence meant that Tony functioned like an intelligent robot. He could follow precise instructions set within a highly structured environment but had lost his capacity to systematically process information as the first step in initiating behaviour. When he was fatigued the loss became most evident and most debilitating.

Slowing, over the ensuing years, I started to make sense of the deficits and in time I even began to name them and was able to articulate their impact. This naming and articulating didn’t change the situation however it went a long way towards making sense of what I was experiencing and formed the basis of creating strategies to deal with each deficit as it arose.

**Groping through the smog**

Each day, for the first two years post our return to Jabiru was like trying to find my way through thick smog. I likened it to smog because there were lots of foreign, even toxic particles. One such toxic particle was the attempts, starting in the rehabilitation centre, to cast me as Tony’s carer. Even the discharge summary referred to me as a social worker who had the capacity to be an effective carer. I railed against this descriptor as it removed any mutuality from our relationship forever shackling me to a disable man with no place for my needs or recognition of the benefits for Tony of living within a relationship which required him to invest something of himself.

I refused to accept that our lives should be shaped by the conceptual framework of Tony being ‘disabled’. Whenever I thought of this I conjured up the vision of a disabled yacht wallowing in an endless ocean at the mercy of waves, storms and currents. Tony may have lost major elements of his capacity to function at pre-accident levels but he was far from disabled. Less or differently able yes! From this viewpoint we had two challenges:

1. To explore/discover ways to minimise, even overcome the limiting impacts of firstly the physical deficits, then later the neurological.
2. To take up the challenge of discovering and refining those abilities he had retained.

Those two elements marked the way forward however in the early stages that pathway was shrouded in the mists of ignorance (of brain functioning), extreme grief and emotional and spiritual exhaustion. Fifteen months after the accident I started to cry. I cried most of the day every day for six months.

Amid the grief and fatigue was a growing sense of suffocation. Tony, in using me as his ‘guide’ clung to me like a small child. I literally could not move without him being close by. It didn’t help that our dog, an apricot poodle called Sugar Plum, separated from us for months while Tony was in hospital, would not let me out of her sight. When I went to the toilet they were both there! If, when walking down our hallway I changed my mind and turned around I would trip over both of them. In July 1991 (16 months after the accident and long after Tony had resumed full time work) I threw down another gauntlet: Tony had to ‘go and find himself’. One day, in utter frustration I tearfully explained to him that if he was to fully recover he had to do the work of rediscovering himself as a man: that I could not help or even accompany him on this journey. It was time he ‘faced the world alone’. I pointed him in the direction of the local travel agent with the strong suggestion that he choose to go somewhere in Australia, so he could get home easily if necessary. I made no attempt to help him work out where, when, or how he would go only that he ‘had to go’ and soon. Even at this point my sense of being suffocated started to abate.

Another toxic element of the smog was people’s tendency to expect me to speak for Tony. Example: standing outside our church after the service the minister’s wife came up to us, Tony was standing not half a metre from me. The minister’s wife asked me: “how’s Tony”. When this occurred I had to quell a strong desire to rudely challenge their dismissal of Tony as a person able to speak for himself. I resented having to use precious emotional energy dealing with these inane and disrespectful comments. That they came from people I thought should have known better heightened my irritation.

**Rebuilding our lives: getting our heads around Executive Function**

Over time I identified five broad areas of deficits in functioning: insight and mindfulness; initiation and follow-through; sequential and consequential thinking; problem solving and task switching/tracking. That identification formed the conceptual basis for planning and implementing strategies to initially minimise, and later, overcome those deficits. All this was done through experiential learning as readers will recall we had not been provided with any information about these aspects of brain functioning and in those days we did not have the benefit of the internet. The more we were able to name and describe each element of brain functioning, or
more correctly, the loss/impairment of function the better positioned we were to devise strategies to counter its negative impacts.

**Insight and mindfulness**: From my perspective one’s capacity for insight and mindfulness (being present in the here and now) is fundamental to our ability to function in other aspects of our lives. I see “insight” as the amalgam of a number of important elements including awareness, perception and discernment. I worked from the principle that without the ability to be aware of one’s environment, to perceive different elements of it and to ascertain the significance of those different elements one’s capacity to function is severely impaired. Tony and I had endless discussions as we grappled with being able to understand and gain insight into the problems confronting us. Those discussions became the foundation upon which we began to rebuild our lives, as individuals and as a couple. It is perhaps not coincidental that in our pre-accident lives the word ‘perspicacious’ was commonly used to the extent it became a bit of a joke between us – especially when one of us pointed out something the other may have missed or chosen to overlook. The more we honed our shared perspicacity the more we were able to grapple with and triumph over the challenges that confronted us.

**What worked?**

You will recall that from the outset I refused to be scripted as Tony’s carer. This meant that I had expectations that it was reasonable, indeed imperative, for him to have household responsibilities and to participate in the rebuilding our lives and relationship. This meant that I had to resist any temptation to ‘do it for him’ especially in the early stages as he struggled to learn new skills around sensory losses. I also had to remind myself that household mishaps, such as putting something red in a white wash, or burning the saucepan, were normal and not a manifestation of his brain injury. My Social Work training helped as a core Social Work value is a person’s right to be self-determining. I drew on decades of assisting disempowered clients to reclaim themselves and their place in society by being ‘self-determining’. If it was good enough for me to do this with clients then it was beholden on me not to fall into the trap of ‘stepping into the breach’ for my husband!

Key Social Work therapeutic approaches provided a conceptual framework for my thinking and action. For example: Solution Focussed Therapy requires the articulation of clarifying, partialising the problem and ascertaining what has worked in similar situations as the basis for exploring possible solutions to the problem. Similarly goal/task oriented approaches requires that one remains focussed on achieving the goal and completing goal oriented tasks rather than analyse the problem’s aetiology. This latter approach is most helpful when assisting people to gain a sense of empowerment over their lives or specific aspects of their circumstances.

One of my biggest challenges was managing my own emotional reactions, especially resentment at having to ‘do all the thinking’. By actively implementing strategies which allowed me to express those emotions rather than have them build up, then overwhelm me, I was able to reduce resentment and frustration levels. This freed up emotional energies which I could then devote to dealing with our challenges and to ‘just living’.

**What kept me sane?**

In Australia there was a TV advertisement which depicted a man jumping for joy over a particular make of car. Its caption was ‘Oh what a feeling’. When I arranged for Tony to be fitted with a hearing aid which enabled him to pick up sound on his deaf side I felt liberated. When, early 1991 he received training in the use of the long white cane that sense of liberation increased. No longer, when walking together did I have to guide him around obstacles, point out uneven surfaces or steer him away from running into other people. He could ‘see for himself’. This also helped us to have confidence in attending public functions such as outdoor events or going on public transport. On one occasion we were in Hong Kong at the time of the Moon Festival being held in Victoria Park in the evening. At the entrance there were vendors selling florescent ropes. Without my prompting Tony purchased one then placed it around the bottom of his long cane. As we walked around, Tony holding the cane in front, the ‘crowd parted’ to let us through. I think we must have been the only couple there that evening that was not jostled.

*It’s crying time! In the months when I cried every day I slowly found ways to ‘break through the pain’. It would have been easy to try to block it out as there were enough distractions. Something inside told me not to block it: an inner voice that urged me to embrace the pain in the implicit knowledge that it was part of the healing journey. Embrace it I did and healing journey it might have been but I would not wish such pain on my worst enemy.*

*Succour from unexpected sources: One day I was at the supermarket. I was surprised when one of the regular workers stopped what she was doing, came up to me, and, looking me squarely in the eye said: “I can see you are having a tough time of it”. To this day my eyes still well up with tears when I recall that moment - one of so very few occasions when people acknowledged me and my pain. It was in stark contrast to other comments
such as: “why are you unhappy, you got your husband back didn’t you” (made by one of Tony’s colleague who was known to be a very caring man). I chose not to feel resentment towards them as in truth they could have only known of my/our struggle by living with us. The issues and deficits were not apparent in the highly structured workplace.

**Waking up Rip Van Winkle – thank God for Testosterone:** Our local Doctor had suggested we try a Testosterone implant to increase Tony’s interest in sex. He was given an implant which lasted 6 months. I had Tony back – if only in terms of his heightened and sustained energy levels. Tony finally had time and energy to spend together. I called this getting ‘zapped’ and it has since remained a cornerstone of our daily lives. Tony has learnt to pick the physiological signs of when he needs it replaced and has long since taken responsibility for having this done without my prompting.

**Friends, telephones and 5 star hotels:** I maintained a sense of emotional and spiritual connection with others via the telephone. They became my lifeline in those long nights when Tony slept – an inert mass in the middle of our marital bed. Those connections helped to keep me sane and from slipping into despair. It is not possible to recount in a space such as this the wonders of good friends – people who by just being themselves help one to remain connected to the wider world and through that to one’s place in it. That one quarterly phone bill was $1,200 seemed a small price to pay for my sanity. The bill arrived in an A4 envelope – a harbinger of what was inside.

As we lived in a small community we would use trips to Darwin as opportunities for R&R (rest and recreation). I would drive up to the entrance on one of Darwin’s 5 star hotels; hand over the car keys then walk inside to be greeted in our room by a welcome bowl of fruit or champagne and cheese, a gift from management. It was SO nice not to have to worry about parking our vehicle as the accident had rendered me the sole driver in the family. When it came time to leave I would ring the Bell Captain to request the vehicle be brought up to the entrance. Our luggage would be loaded in readiness for me to drive off. Room service and a deep spa bath were added salve to a wearied spirit.

**Holding on to hope by living today well and believing in tomorrow:** Two previous personal tragedies had taught me that ‘life was for living’ and that this was achieved by living each day well. In adulthood this philosophy coupled with the adage that ‘we cannot control what happens to us but we can control how we respond to life’s events” had become pivotal to how I dealt with the ravages life dished up. So… to avoid seeing myself as a hypocrite I had to set about practicing what I preached. In truth it was not hard as to lose hope and belief in life is to die in spirit. I was dammed if I was going to stay idle while I shrivelled up inside. It is amazing how one can find sustenance and courage in such seemingly trite ideas!

**The empathic connection: Resurrecting the man and his humanity**

From the very outset there were signs that Tony had not lost the capacity for empathic connection. He may not have been able to experience or express emotions for himself but he was still well able to read and understand other people’s expressions of emotion. I soon realised two things: that love and empathy are not expressions of emotions but are the very essence of our humanity. Tony’s love for me was palpable as was his response to my woundedness.

**Forget stoicism:** From my mid-teens I have vowed not to rant, rave and throw things as did my mother. For almost 20 years I had learnt and practice ways of expressing myself which were measured and respectful. Now I was faced with the reality that Tony had lost the capacity to tune into the nuances of our communication and my emotional state. The only way I could get through to him was to be fully ‘in his face’. There was no place for stoical acceptance of our circumstances.

Intuitively I pouted like a 5 year old or did not attempt to hide the tears. Twice in the last twenty three years I have allowed myself the freedom to smash some crockery though the first time I did this both my mother-in-law and the dog ran for cover!! There is nothing like the sound of crashing crockery to get through a neurological fog. One thing that kept us connected, despite Tony’s loss of emotional affect, was our willingness to share our pain: me to express it and Tony to comfort me.

**The shell is cracked open:** About three years ago there was an incident in which I realised that I had just witnessed Tony expressing an emotion – irritation. I realised this when I started to respond by saying: “well if you can be irritated so can I’. We had intuitively lived in ways that resulted in Tony’s brain regaining functioning. That is why we chose to come to Jerusalem to tell our story. It marks the completion of our journey out of the land of the In-Between.
Retrospective 2: House T,

Hello. I am the guy who rode a pushbike into the back of a parked truck. I sustained serious brain injury in the right frontal lobe as a result and assorted complications arose during my hospitalisation. My accident happened in late March 1990. During my time in hospital I had been “conscious” except when it was medically prudent that I not be.

This presentation contains my recollections of what it was like as my wife and I struggled to regain as much of our pre-accident life as was possible in the years following the accident.

Where was I when the lights came on?

My first fully conscious memories after the accident are from early June 1990, some ten weeks after the accident. It was with a doctor and his telling me I had improved and that then tube in my nose going to my stomach could come out. He suggested I might remove it myself. I didn’t and so it was removed for me. (The tube had been inserted to provide me with food because I had been refusing to eat. It had also been a focus of frustration for the medical staff because I had been removing that tube several times a day almost from the day it was fitted.)

I spent another week or ten days in hospital and was then transferred to in-patient rehabilitation for some four weeks are so. I appeared to be going from strength to strength. I was doing well with the assorted physical and mental exercises and assessments I was given, and interacting well with staff and my family. I was sleeping a lot but that was to be expected. It seemed to me and to my wife Pam that I was well on the road to full recovery from the brain injury. This was reinforced by the fact we were given no indication of the possible repercussions of those brain injuries. The only indication we were given was the generic statement: “he has had major brain injury so some things will be different”.

You can imagine I was feeling good in myself and really looking forward to getting back to normal life. I was returning to my pre-accident job working as an Information Technology Officer. My wife and I knew there would be challenges – I was deaf in one ear and could see in only half of one eye – but we could handle. It was going to be fine.

It wasn’t.

The Fog as context

It became obvious to my wife that things were not good when we tried to return to normal living. I was aware of the problem when I saw the anguish and despair my wife demonstrated as we crashed into yet another deficit stemming from the brain injury. My wife coined the term “The Fog” to describe what I was like. It is a good term because it gives a good visual depiction of what was happening.

Imagine being in a really thick fog. So thick that if you extend your arms out in front of you, your fingers start to fade into the surrounding grey mists. In those conditions you can do nothing. Even if you know you are in familiar territory you can do nothing because you have no point of reference. Not sense of contact with your surroundings. No context. If someone/something emerges from the mists then you can interact with it – be involved – until that someone/something recedes back into the gloom. Then, you can try to follow perhaps, or just do nothing again.

That was me. That was the person my wife saw and with whom she was trying to live a “normal” life. And to make things worse my wife was the only person in the position to see this “me”. The thing was in a structured environment I did well. My last days in hospital, my weeks in rehabilitation had been fine. Why? Because their structure was such that people had to interact with me. That was fine. I could do that really well. Likewise my return to work went well because a large proportion of my job was responding to requests - by phone, in person, by email – to deal with some IT issue that had arisen. That was ideal for me. Specific tasks handed to me with people coming back to me to see how it was going. It was that “me” that the local people we knew saw on a day to day basis. Many of those local people were good friends but they had no idea of the “other me” my wife was having to grapple with.

Away from a structured environment I had no sense of connection with my surrounds – no sense of context. No sense of the need to do things. I could do tasks I was assigned but only to the letter of the task. I did not see that doing task A would mean that tasks B and C needed to be done. No. If I was given task A to do, I would do task A – no more. I had lost the habits of the brain seeing/making connections beyond the immediate focus.

As well as this form of inertia I had very little stamina and was sleeping fourteen to sixteen hours a day. I would sleep at night, have breakfast, go to work, and then come home and sleep. My wife would wake me for dinner and we would share a little time together and then I would sleep.
For my wife our circumstances were driving her to despair. Things had to change. If not it would destroy one or both of us.

Ways out of the fog

In fact I did have one point of reference in this fog: my wife Pamela. I had implicit faith in her. That faith was deeper than the thought patterns lost in the accident. It was intrinsic. This meant I trusted her judgement absolutely.

As she realised things were not right with me she set about changing how we did things. We agreed that I worked much better in a framework, a structure of defined actions and agreed outcomes. So we created routines that I was expected to follow to achieve clearly defined outcomes. Certain household duties became mine to do – washing up after dinner; being responsible for the basic car maintenance (checking oils, fuel, tyre pressures and dealing with them as required). We both realised I was forgetting to do some tasks that were not immediate so I got into the habit of always carrying a pen and notebook. I would make a note of any task that I needed to do soon but not now. I realised after a number of months that I was still making those notes and getting the tasks done, but I was never referring to the notes again.

We found ways of using frameworks that we knew were working to broaden and strengthen that sense of connection. A good example is welcoming phone calls at the weekend from co-workers who were at work on the weekend and who were having IT problems. My wife got into the habit of answering the phone at the weekend by saying “Jabiru Computing Hotline”. Often there would be an embarrassed giggle at the other end of the phone.

Things were improving but the framework still had to be applied. I was not generating my own. I was responding to my wife as though I had imprinted on her (the way newly hatched chicks imprint) and when I was at a loss for things to do I would look for and follow her. This was driving her to distraction so she declared she had to go somewhere and “find herself”. The result was the Broome Saga. Broome is a coastal pearling/fishing town over 1000 kilometres away from Jabiru where we lived. I arranged a return trip to Broome – I arranged. Why Broome? I had never been there; I knew no one there; I had no pre-existing framework there. I had to create the connections there for this to succeed. It involved a bus trip to Broome, 10 days or so in a quality hotel, and a plane trip back. While I was there anything I wanted/needed to do I had to arrange.

It was a major step forward. I was forced to relearn the brain processes required to control my own life and a minute by minute, day by day basis. I still had a long way to go but I had started to redevelop those brain habits that keep you moving through life. I had started to have a real sense of my own context – a sense of self. I still look back on that time in Broome with fond memories.

The Broome Saga is also a good example of another tactic my wife and I applied to move forward out of the fog. We did not impose automatic limits on what we should attempt to do. We did not say “okay your disabled so you can’t do ……..”. Our approach was to reach further. We would see something we would like to do and see if we could arrange a safe way to so it. Examples:

- White water rafting in Bali.
- Bush walking to Jim Jim Falls in Kakadu National Park.

Something we considered then rejected was paragliding. The organisers could not provide a helmet large enough for me.

The other major development that help me out of the fog was “getting zapped”. We discovered hormone implants and the way they can significantly increase one’s energy levels – physical, mental, social energy levels. After the first implant my sleeping patterns returned to something resembling normal. I was mentally more responsive, physically more active.

Finally we were making serious progress.

Life Beyond the Fog: re-establishing connectivity

The fog finally lifted with the decision to stop taking anticonvulsant medication. I had fitted when I was an inpatient, the last time occurring while I was in the rehab hospital. It was only when we asked the question “how do we know when I can stop taking these drugs?” that our general practitioner actually considered that as a possibility. So, after some fifteen years I was weaned off anticonvulsants. As a result I my thought processes were clearer, cleaner, and noticeably faster. The fog had lifted.

The process of reconnecting with my surroundings has been an ongoing activity since the early 1990s. I guess the starting point for that has been to get people to see beyond the disabilities. That has been fairly easy for new acquaintances: I simply do not detail my disabilities or their origins until it becomes necessary. It has been harder for people who knew me before the accident and my approach has been simply to demonstrate that “I’m still here!”: a little damaged physically, a little different emotionally but it IS still me.
It has helped to push the limitations the accident had imposed and not simply accepting them: looking for new ways of doing things if the old ways are no longer practical or safe. The lessons from “The Broome Saga” were very important: re-establishing the brain habits associated with being responsible for one’s self, for planning and initiating actions, and responding to feedback.

The big thing: remembering to think about thinking. Not just focusing on the immediate but seeing the interconnections of things around me. That is being aware of and connected to my context, my surroundings.

**What helped me persevere?**

- The strong, deep connection with my wife Pamela. That connection was the solid foundation point from which I could rebuild my connection with the rest of my world.
- Friends and family. They normalised my injuries – accepted them. Things like knowing I was deaf in the right ear so they would arrange seating so that they were on my left, or so that any external noise source was on my right.
- Humour – black and otherwise. My wife often refers to me as “her dearly beloved” then she explains that she calls me that because I was nearly “her dearly departed”.
- Self-forgiveness. Stepping free of the sense of guilt for the pain/despair I had put my wife and my mother through.
- A genuine appreciation of being alive, of having not only survived but of having recovered well. For some time after my accident when someone asks “How are you?” I would respond, in all honesty, “Alive and well”.
- Creating and taking opportunities for growth. Opportunities like attending this conference in Jerusalem to tell our story.
Are you living on AUTOPILOT, too? Or are you mastering your memory and mood states?

Prüm U.M.1

1 University of Innsbruck, Department of Psychology and Sport Science, Prof. Barbara Juen, Innsbruck, (Austria, Europe)
e-mail: ulrikemaria@t-online.de

Abstract

The immense, vital importance of memory to our daily lives is the main focus of this publication. Especially clinical studies and those employing experimentally induced moods found evidence that explicit and implicit (unconscious) memory systems of long-term memory (LTM)3,4 may be significantly affected by mood states (mood-congruent memory effect1; memory bias). Different, positive and negative, levels of memory performance, have implications for experimental research, clinical practice and for researchers. A case study of an adult client with posttraumatic stress disorder (PTSD) describes how subconscious repressed traumatic memories and moods from the past, suddenly and intrusively emerged (“flashed back”) into consciousness. The following psychotherapeutic interventions were able to bring about positive changes (memory and mood repair).

- In the conclusion the findings and issues of the case study are briefly discussed. The questions remain, to what extent negative subconscious memory processes are cognitive modifiable and accessible to different therapy approaches for the treatment of PTSD and how to make positive results sustainable? Finally, it might be of interest to explore how far mood states could affect explicit and implicit memory performance?

Keywords: explicit/implicit memory systems of long-term memory, memory bias, consciousness, mood-congruence, mood repair, PTSD, psychotherapeutic interventions, neuroplasticity

Introduction

A lot of worthful researchers’ work has been done, referring to dynamic memory systems of long-term memory and influences of mood states on memory performance.

1.1. Memory systems of Long-term memory (LTM)1,2,3, 4

In 1985 Graf and Schacter1 introduced the concept of implicit versus explicit memory. Two years later Schacter2 stated that “Implicit memory is revealed when previous experiences facilitate performance on a task that does not require conscious or intentional recollection of these experiences”. This form of memory is contrasted with explicit memory, which “is revealed when performance on a task requires conscious recollection of previous experiences.” (Schacter, 1987, p. 501).

Long-term memory (LTM) is typically divided up3,4 into five memory systems: 1. Procedural memory (implicit): stores motion automated processes. 2. Priming (implicit) involves the unconscious perception of all sensory stimuli, such as the leaf belongs to the tree, ice is cold, etc. 3. Perceptual memory (implicit and explicit) is considered as knowledge base of complex patterns, the use of intuition (insights of a genius) and identifies objects and structure of language or pieces of music, it therefore mediates visual and auditory information. 4. Semantic memory (explicit) includes the knowledge of facts, e.g. physics formulas, and of general information, this means who, what, why situations or people are acting. 5. In the episodic memory system (explicit) are stored personal experiences and information associated with time, place, feelings, where the memory was formed. – These five conscious and subconscious memory systems of LTM are very dynamic and changeable (cognitive modifiability/neuroplasticity).

One very important influence factor on memory performance are mood states.

1.2. Mood-congruence theory5

Especially clinical studies and those employing experimentally induced moods found evidence that explicit and implicit (subconscious) memory performance of long-term memory may be significantly affected by mood states and we have to consider a, positive or negative, memory bias. Blaney (1986) stated that “Mood-
congruent memory (MCM) is the tendency to recall information that is congruent with one’s mood. Therefore the mood-congruent memory effect states for example that anxious patients with posttraumatic stress disorder probably will better remember frightening than calming materials.

1.3. Repressed traumatic memories and “flashbacks”

A considerable number of clients in clinical practice are suffering from repressed traumatic memories and mood states that suddenly and intrusively emerge (“flash back”) into their consciousness before psychotherapeutic treatment. Increasingly psychotherapists and nursing staff are confronted with elderly people with anxiety or depressive disorders. Recently a radio station reported about an older lady with dementia who heard her nurse who spoke Russian, got scared, cried “The Russians are coming.” and fled from her German nursing home. In this case subconscious traumatic pictures and memories from the Second World War, have been recalled, which had become buried deep down for decades and suddenly just welled up (emerged) spontaneously into consciousness and there was re-experienced a feeling of panic and helplessness. That negative implicit memories came to the surface of consciousness, that were long lost in the life. “Flashbacks” might occur more frequently in the later decades of life. Current studies are reporting about posttraumatic stress disorders (PTSD) in elderly people. Around 5% of the elderly population (age ≥ 60 years) has a PTSD.

1.4. Psychotherapeutic Interventions - Memory and Mood repair

As above mentioned, explicit and implicit memory processes of long-term memory are very dynamic and changeable. These are the good news. Doidge describes in his book “The brain that changes itself.” the amazing changeability of the cognitive and motivational structures of our brain. This is possible for physically ill as well as for psychologically ill patients. For example the stroke victim who unable to feed or dress himself learned to move and talk again or a healing from past stressful or traumatic experiences.

In clinical practice the psychoanalyst Mark Solms has discovered that memories are “sometimes too hard to bear”. According to my experiences as a clinical psychotherapist memories are not erasable and just repressable (distorted memory, memory bias).

This enormous cognitive modifiability (changeability) of memory and mood states is offering various chances for several psychotherapeutic interventions (memory repair and mood “repair”), in cases when formerly subconscious memories could not be repressed any longer, too.

Material and Methods

Case study: male patient, 23 yrs. old, carpenter, with a posttraumatic stress disorder. The adult client experienced four months before psychotherapeutic treatment a severe car accident. Suddenly he was able to recall explicitly intrusive memories of this life-threatening event. These negative, formerly subconscious traumatic experiences from the past were now guiding the client’s behaviour. He showed symptoms of a PTSD according to the ICD-10-classification of the WHO: Flashbacks, sleeping problems, nightmares, panic states, heart disorders, sweating, trembling. In case of seeing a car, he was not able neither to take a seat nor to drive any car any more. – The beginning were stabilizing methods over a longer period of time, the psychotherapeutic interventions were lasting 12 months.

2.1. Cognitive Therapy of Beck

After stabilizing followed a cognitive re-framing of memories of experiences. One task was to imagine himself not longer as “victim” but as “survivor”.

2.2. Hypnotherapy

After stabilizing followed the creating of a inner distance. One task was to imagine himself to be at a safe distance to the car accident. The client “watched” a movie about his car accident (inner TV-screen-technique).

2.3. Mood repair

After stabilizing followed a mood repair, “the use of positive memories to improve sad mood”. One task was to discover respectively re-activate several resources.
Results

3.1. Cognitive Therapy

After 12 months of psychotherapy the adult client had more self-confidence, and drove again his car!

3.2. Hypnotherapy

One result was that the client had less flashbacks and experienced less nightmares.

3.3. Mood repair

12 months later the client showed significantly fewer depressive symptoms, felt more protected and lived in a new positive relationship.

Conclusions

The presented case study about a patient with a posttraumatic stress disorder is describing just one case and is meant as a more practical approach. A lot of worthwhile researchers’ work has been done on this topic, on the other hand some important questions are still not answered yet and are encouraging further research. It seems important to consider that not only test persons could have a memory bias, that it is the same case for researchers, who are “designing” their own theories, methods and findings. Individual memories, different positive and negative memory performance, have implications for experimental research respectively clinical practice, as well as for researchers, too. Which basic information from the considerable amount of papers respectively abstracts of various Scientific Conferences or from this journal you could recall explicitly now? It seems interesting to get further findings to what extent especially the subconscious memory processes, are guiding the individual behaviour (everyone has inside of him an autopilot) and how far suddenly recalled traumatic memories and mood states are cognitive modifiable and accessible to different therapeutic approaches for the treatment for example PTSD? How to make positive results sustainable? Furthermore it might be of interest to explore how far various mood states (depressive, panic disorders) could affect explicit and implicit (subconscious) memory processes (memory bias). Furthermore researchers could be engaged in exploring not only the implications of this topic for student populations, but also design more studies for different groups of people (e.g. clinical research) and different ages, too, to gain significant results. As above described (chapter 1.3.) “flashbacks” will occur more frequently in the later decades of life and are to be considered by the staff of nursing homes respectively clinical practice.

The use of other or innovative methods (for example nonverbal tests, pictures or photographs) could provide fascinating insights into the nature of explicit and implicit memory bias and consciousness. In the sense of Alexander Eben, a neuroscientist and neurosurgeon, the relationship between brain and consciousness is one of the most current, fascinating topics of modern brain research. In this context, I would like to quote by Albert Einstein: “The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.”

Comment

If you have any questions or ideas about possible research methods – a clinical study is planned to explore the relationship between implicit memory and mood states – please do not hesitate to send me an e-mail to the above mentioned address.

References


Investigating the maturational lag and deviation models as explanation for the pathways of childhood ADHD into adulthood

Burke A., Edge A.

Department of Psychology, University Of Johannesburg, (South Africa)
e-mail:aburke@uj.ac.za

Abstract

The aim of this study to attempt to find evidence that would support either the maturational lag or deviation models for ADHD in adulthood. The study consisted of two sub-studies, i.e. one based on MCMI profiles (n=52) and the other based on an EEG study (n=12) of adults with ADHD. In both instances the ADHD groups were compared to a control group. The findings of both studies found stronger evidence for the maturational deviation than the maturational lag approach. However, this does not nullify the maturational lag approach, as there is also evidence that would support this approach.

Keywords: Maturational lag, maturational deviation, ADHD, personality disorders, MCMI, qEEG.

Introduction

With the advent of the DSM-5 we have seen disorders being categorized according to shared aetiology. Attention Deficit Hyperactivity Disorder (ADHD) is now classified in the category of Neurodevelopmental Disorders, as opposed to the previous category, Disorders usually first diagnosed in infancy, childhood or adolescence. Based on available neuroscientific research, there seems to be some consensus that ADHD has a very strong neurological pathogenesis. What this pathogenesis is, is still open to debate, with two broad models, i.e. maturational lag and deviation, being the most prominent explanatory models.

The maturational lag model suggests there is a difference in the development of the ADHD brain when compared to a non-ADHD brain. The argument is that there is a lag in the epigenetic maturation of the cortex. This direction in thinking was initially based on observations that children with ADHD behave similarly to younger children who are more active, impulsive and exhibit a shorter attention span [1]. These observations are supported with the results of some EEG studies. From an EEG perspective, the maturational lag model suggests that an individual with ADHD should present with cortical activity that is similar to that witnessed in younger children [2], since an increase in slow wave activity (delta and theta) and decreased fast wave activity (alpha and beta) is typical in younger children [3]. A number of researchers [4-5] interpret their findings of increased slow wave activity in children and adolescents with ADHD during an eyes closed resting condition as evidence of a maturational lag.

The second neurodevelopmental model is that of the developmental deviation, also known as maturational deviance, which proposes that maturation is not necessarily lagging, but that it is not approaching normality or maturation, and that it is unlikely to do so at any stage during the lifespan. This model was built on EEG research where 90% of the ADHD sample presented with aberrances in their EEG activity [6]. Subsequently, the developmental deviation model of ADHD came into play, which suggests that ADHD results from abnormalities in CNS functioning. It further denotes that the EEGs of children and adolescents with ADHD symptoms are not considered normal in children of any age and that it is also not likely to mature in a normal fashion. Additional evidence for this model is provided by the adult ADHD (ADHD) studies which found that the presence of elevated slow wave activity, especially theta, persists into adulthood [7].

The second part of the argument put forward in this paper, is that of Personality Disorders (PD). The reason for introducing this into the argument is twofold, i.e. the shared symptomatology between ADHD (in adulthood) and some of the Cluster B PDs, as well as the possible shared aetiologies of these disorders [8]. If one adopts a neurobiological / neurocognitive approach to personality, then the overlap between temperament, personality and personality disorders becomes more evident. Furthermore, given the mounting evidence that ADHD can persist from childhood into adulthood, it also follows that there should be more focus on the relationship between personality and ADHD. Some authors maintain that is important to describe ADHD in adulthood in terms of general personality structures as it could contribute to a better conceptualization of the
disorder [9]. Furthermore, there are suggestions that there is evidence that indicates that developmental factors may contribute to ADHD in ways that are separate from the associated behavior problems. One could go further by saying that it is important to describe personality disorders (from a neurobiological perspective) in adults with ADHD, as this could aid in describing a possible shared etiology. Regarding the Cluster B personality disorders, two interesting pictures evolve when reviewing course and prognosis, and these may, arguably be classified as maturational lag or maturational deviation.

The developmental course of Antisocial Personality Disorder could arguably be best explained by means of the maturational lag theory as the roots of the disorder can be traced to early adolescence (i.e. Conduct Disorder) which then follows an unremitting course, with a variable outcome. There is some evidence that suggests that the symptoms decrease with age [10]. The fact that the symptoms may decrease with age, is somewhat suggestive of a delayed maturation process. A further indication of a maturational lag is the fact that there is excessive theta wave activity, while awake, which is akin to what is evident in children [11]. One explanation for this could be the temporal discounting paradigm which quantifies the ability to favor larger, delayed rewards over smaller, more immediate rewards. Temporal discounting matures with age, along with increased impulse control and self-regulation which seems to be associated with changes in activation of the ventromedial prefrontal cortex, anterior cingulate cortex, ventral striatum, insula, inferior temporal gyrus and posterior parietal cortex [12].

In contrast to this, in the case of both borderline and narcissistic personality disorders, these disorders are stable over time showing neither intensifying or decline in symptoms [10]. Unlike antisocial personality disorder, the DSM does not make provision for early identification of these disorders; however, some research does provide some evidence for the early identification of specifically borderline personality disorder [13]. Abnormal brainwave activity is only one of the many possible neurobiological factors in this disorder and other factors such as neurotransmitter systems, the endogenous opioid system [14] and various sub-cortical areas have been included as possible contributing causes to this disorder. Despite numerous studies that have been done, the neurobiology of borderline personality disorder still remains largely unclear [14], however, there are indications that many of the neurobiological processes, and symptoms, do not appear to improve over time, which would seem to imply maturational deviation, rather than maturational lag.

Methodology

Participants

In order to address the research goals the study utilized purposive sampling methods to identify the ADHD sample. All participants had to be older than 18 years of age and as far as the other including characteristics are concerned, the researchers had to utilize their judgement to identify and select individuals from a target population that qualify for participation in the study, based on the sample characteristics.

The recruitment of participants resulted in a group of 51 adults with ADHD and a group of 43 adults with no clear indications of a clinical disorder. From this pool a smaller sample was drawn for the EEG study, which consisted of 12 participants who met the operational criteria. The control group consisted of non-ADHD participants who were matched with the ADHD group in terms of age and gender.

Measurement instruments

Adult ADHD Self-Report Scale (ASRS). The ASRS is not a diagnostic tool but is used as a screening device to screen for signs and symptoms of adult ADHD. The Adult ADHD Self-Report Scale (ASRS) is a self-report 18 question questionnaire which screens adults for ADHD.

Millon Clinical Multi-axial Inventory-III. This test is primarily a self-report questionnaire that assesses a wide range of information about an adult’s personality and emotional adjustment.

Biopac MP Systems Hardware. This study employed the Biopac MP Systems Hardware for the assessment of cortical activity.

Procedure

All potential participants were required to complete the ASRS and MCMI for screening purposes. Based on the scores on these instruments they were allocated to different groups, or where they did not meet the criteria for any of the groups, were excluded from further studies. In the data acquisition phase subjects were fitted with an electrocap in accordance with the 10-20 International system of electrode placement. In order to tap the fronto-parietal attention network, electrodes were grouped into three areas: frontal (F3 and F4), frontal midline (Fz) and parietal (P3 and P4) sites (see Fig. 1.). EEG signal for all subjects was recorded under an eyes-closed and eyes open conditions. Six two second epochs were extracted for the eyes-closed condition and for each of the cortical sites investigated and for the four frequency bands: delta (1-4Hz); theta (4-8Hz); alpha (8-
13Hz); and Beta (13-20Hz). EEG data was Fast Fourier transformed (FFT) (Hanning window) and subsequently log transformed (In).

Figure 1: International 10-20 System of Electrode Placement (Adapted from [75])

Results

The significance of the differences between the 2 groups was determined by means of both a Mann-Whitney U and Fisher’s exact tests. The reason for the latter technique is that it creating an overall picture by calculating the number of elevated scores (for the purposes of this analysis >75 was used as the benchmark) that participants had on their individual profiles, and then to compare the two groups (See Table 1).

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Mann-Whitney U</th>
<th>Fisher’s exact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>p</td>
<td>Effect size</td>
</tr>
<tr>
<td>Histrionic</td>
<td>-1.79</td>
<td>0.07</td>
</tr>
<tr>
<td>Narcissistic</td>
<td>-0.88</td>
<td>0.38</td>
</tr>
<tr>
<td>Antisocial</td>
<td>-4.52</td>
<td><strong>0.00</strong></td>
</tr>
<tr>
<td>Borderline</td>
<td>-3.68</td>
<td><strong>0.00</strong></td>
</tr>
</tbody>
</table>

Where: *: p<0.05 and **: p<0.01

Only certain aspects, i.e. absolute mean power, of the EEG results are reported in this document. Of note is the decreased absolute delta, alpha and beta activity for the ADHD sample at parietal sites (See Table 2).
Table 2: Absolute Mean Power ($\mu V^2$) for the ADHD (n=10) and the non-ADHD (n=9) Groups

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>non-ADHD</th>
<th>Mann-Whitney U</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.0191</td>
<td>0.0210</td>
<td>35.5</td>
<td>-0.78</td>
<td>0.44</td>
</tr>
<tr>
<td>$\theta$</td>
<td>0.0549</td>
<td>0.0588</td>
<td>38.0</td>
<td>-0.57</td>
<td>0.60</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>0.0444</td>
<td>0.0476</td>
<td>34.5</td>
<td>-0.86</td>
<td>0.40</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.0171</td>
<td>0.0178</td>
<td>38.5</td>
<td>-0.54</td>
<td>0.59</td>
</tr>
<tr>
<td>Midline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.0106</td>
<td>0.0070</td>
<td>34.0</td>
<td>-0.91</td>
<td>0.40</td>
</tr>
<tr>
<td>$\theta$</td>
<td>0.0304</td>
<td>0.0241</td>
<td>35.0</td>
<td>-0.82</td>
<td>0.45</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>0.0234</td>
<td>0.0206</td>
<td>38.5</td>
<td>-0.53</td>
<td>0.60</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.0082</td>
<td>0.0074</td>
<td>39.5</td>
<td>-0.454</td>
<td>0.66</td>
</tr>
<tr>
<td>Parietal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.0171</td>
<td>0.0317</td>
<td>20.5</td>
<td>-2.01</td>
<td>0.04$^*$</td>
</tr>
<tr>
<td>$\theta$</td>
<td>0.0459</td>
<td>0.0696</td>
<td>20.5</td>
<td>-2.05</td>
<td>0.04$^*$</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>0.0358</td>
<td>0.0513</td>
<td>21.0</td>
<td>-1.96</td>
<td>0.05</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.0129</td>
<td>0.0211</td>
<td>19.5</td>
<td>-2.09</td>
<td>0.04$^*$</td>
</tr>
</tbody>
</table>

Where: $^*$: $p<0.05$

Conclusions

The results of the study indicated that the majority of the adults with ADHD did not show any significant signs of a Cluster B personality disorder, with the exception of Borderline Personality Disorder (which as discussed earlier would be the result of maturational deviation). The EEG results of this study indicate, in line with other studies of this nature [2][7], elevated slow wave activity and increased theta/beta and theta/alpha ratios, which is, arguably, not in line with the maturational lag’s assumption that cortical maturation will eventually ‘catch up’ [1]. This conclusion is further based on deviations in the EEG for the ADHD, compared to a normal group, are present in early-maturing (parietal area) and later-maturing (frontal and frontal midline area) sites. If maturational lag was to be considered, then the greatest differences between the two groups would have been limited to the frontal sites [15], and therefore the conclusion is drawn that the ADHD sample shows a more persistent deviation and disorganisation of wave activity.

Although it would seem as if this study supports the maturational deviation model, it must be stated emphatically that the results do not necessarily imply that the maturational lag theory is invalid. When assessing individual cases there is evidence (e.g. individuals with high Antisocial PD scores) for the maturational lag theory as well [16].

References


Author Index

Avinor E., 83
Bar-Yosef O., 35
Bignetti E., 19
Burke A., 23, 107

Carmon Y., 27
Carrick F.R., 11

Doepp M., 33
Edge A., 107

Falik L.H., 1
Fernandes V., 61
Feuerstein R., 1
Forkosh O., 35
Friedman H., 35

Goldberg G., 39
Gordon G., 35

Jácomo A., 73

Kirvelis D., 47
Koha R., 69
Kronik A., 51
Kruger T N., 23

Leisman G., 11

Margiotta U., 5
Marujo J.P., 61
Moss G., 57
Moutinho G.M., 61

Nyberg F., 65

Prüm U.M., 103

Razpurker-Apfeld I., 79

Schneidman E., 35
Serrão S., 73
Shamoa-Nir L., 79

Silman J., 83
Skorbun S.D., 91

Thum C., 33
Trotman P., 95

House T., 95