The CORRELATES of Brain Function and HYPNOSIS

Brain, Hypnosis, and EMDR

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Main Topics

- **1-Neurobiology of Hypnosis:** Brain and Counscious relationship, Brain Imaging Studies, Blue Brain Project
- **2-Theories of Hypnosis**
- **3-Hypnosis in Clinical Practice;**

Hypnotherapy in a Clinical Setting to EnhanceTherapeutic Compliance, Using EMDR

HOW THE BRAIN WORKS IN HYPNOSIS

- **Arousal System: 'Brain and Sleep'**

  A key component of the arousal system is the Supra Ciasmatic Nucleous (SCN). It's a tiny part of the hypothalamus area in the brain

  The SCN contains the body's biological control clock

  Circadian rhythms: SCN Neurons show activity levels that rise and fall within a 24 hour period

Clock Genes: First The clock genes set the biological clock, then express themselves by fluctuating activity and driving rhythmic changes

Hypnotic suggestions and Cortical activities are related to volunteer control which affects the SCN Center

During REM sleep (with dreams) Acetylcholine Neurotransmitter (Ach) activities increase. The Ach activities are related to learning and cognition

During Slow Wave Sleep (without dreams) Noradrenalin and Serotonin levels decrease. These are related to basic brain activities

Brain and Energy consumption

- It's only 2% of the total body weight,
- It receives 15% of the body's cardiac output,
- It utilizes 25% of total body glucose and oxygen. (Clark,Sokolof 1999)
- In the past neurologists mistakenly said 'The brain is a silent organ'
- Famous Neuroscientist Mesulam said: «It works 5% consciously 95% unconsciously»

Computational Functions of the Brain

- Neuroscientists and computer scientists are now working together,
- Brain Computer Interface (BCI),
- Blue Brain Project,
- Genetic Engineering Techniques,

The Hypothesis of the Somatic Marker (Damasio 1994)

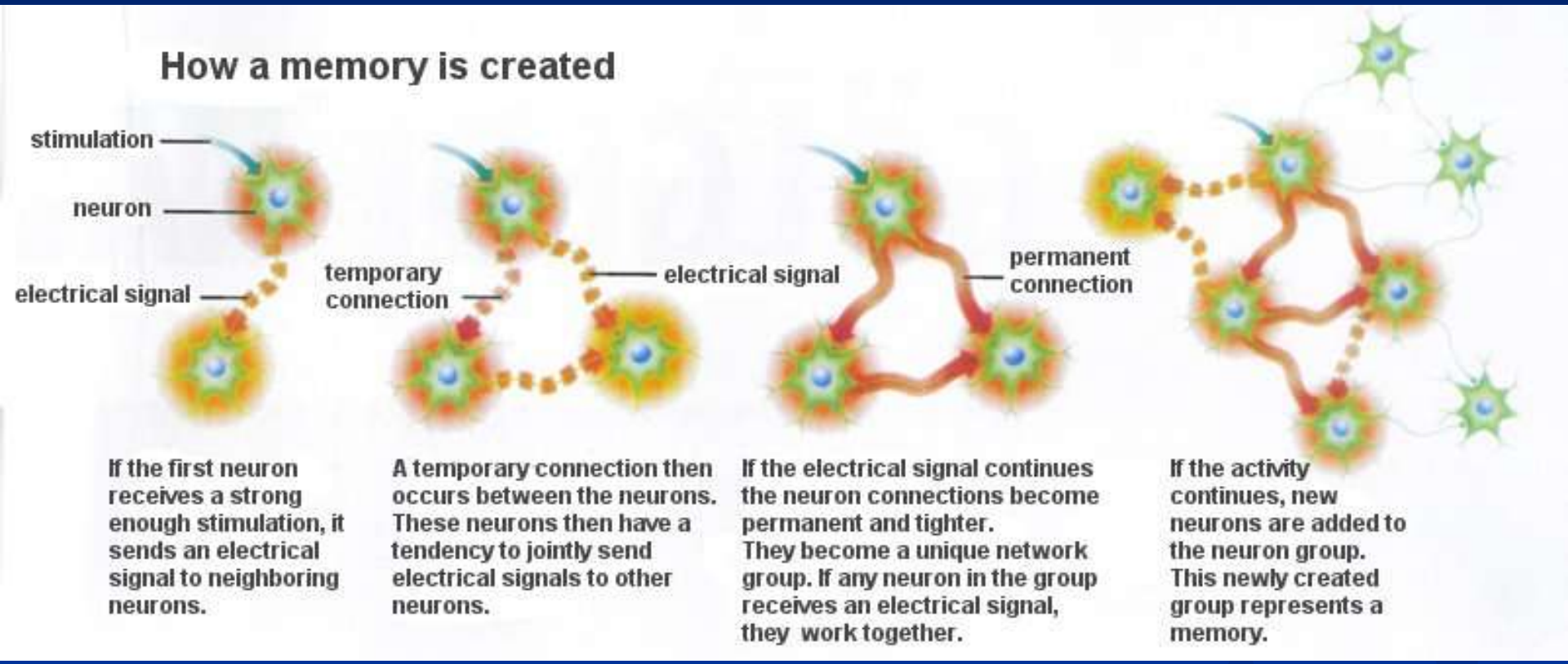
- Every body organ is represented in the brain by chemical systems
- Organ functions like rhythm and sensitivity are represented in the brain in a configuration very similar to a computer
- This configuration is explained by the 'network model theory'

What is The Blue Brain Project?

- IBM's Blue Gene supercomputer allows a quantum leap in the level of detail at which the brain can be modeled.
- The time is right to begin assimilating the wealth of data to aid our understanding of brain function and dysfunction. *(Henry Markram 2006)*
- This data has been accumulated over the past century and we have to start building biologically accurate models of the brain
- The Blue Brain Project is based on a new **Artificial Intelligence concept.**

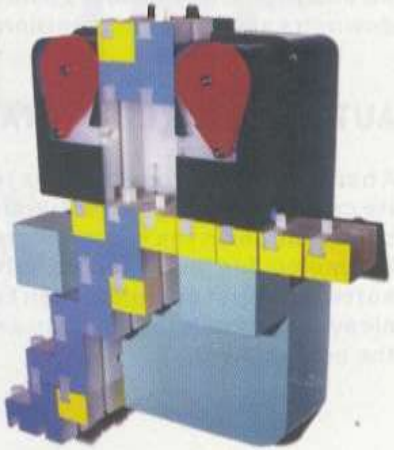
Blue Brain Project
The Data Manipulation Cascade

- Experiments
- Brain database
- Microcircuit database
- Neuron repair/create
- Neuron database
- Electrical capture
- Model neuron database
- Circuit builder
- Brain builder
- Environment builder
- Simulator Visualizer Analyzer
- Simulations

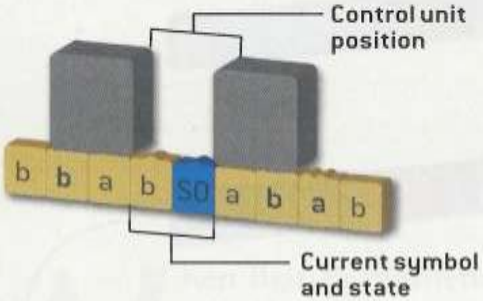

How a memory is created
stimulation
neuron
electrical signal
temporary connection
electrical signal
permanent connection
If the first neuron receives a strong enough stimulation, it sends an electrical signal to neighboring neurons.
A temporary connection then occurs between the neurons. These neurons then have a tendency to jointly send electrical signals to other neurons.
If the electrical signal continues the neuron connections become permanent and tighter. They become a unique network group. If any neuron in the group receives an electrical signal, they work together.
If the activity continues, new neurons are added to the neuron group. This newly created group represents a memory.

MOLECULAR TURING MACHINE MODEL

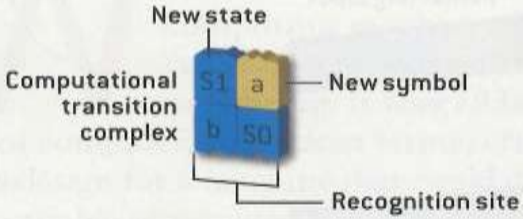
A Turing machine made of biomolecules would employ their natural ability to recognize symbols and to join molecular subunits together or cleave their bonds. A plastic model built by one of the authors (*right*) serves as a blueprint for such a system. Yellow "molecule" blocks carry the symbols. Blue software molecules indicate a machine state and define transition rules. Protrusions on the blocks physically differentiate them.



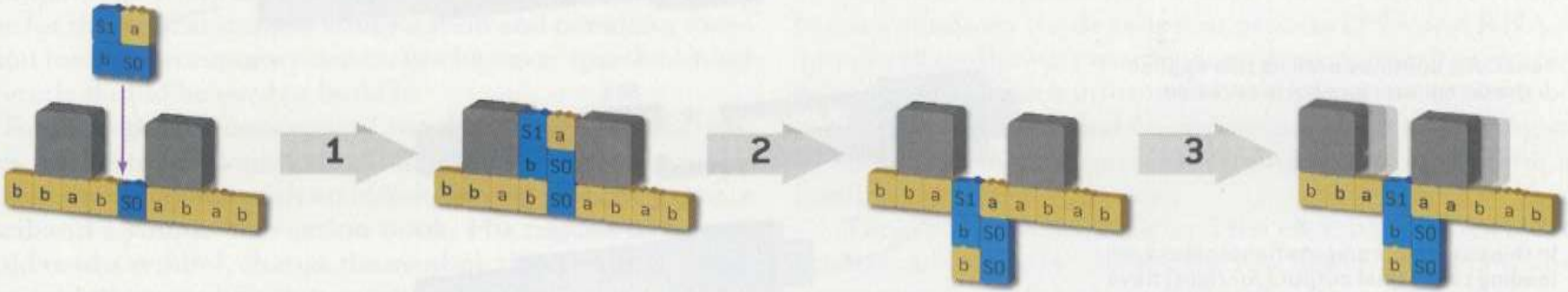
HOW IT WORKS



The machine operates on a string of symbol molecules. In its control unit position at the center, both a symbol and the machine's current state are defined.



One "computational transition" is represented by a molecule complex containing a new state and symbol for the machine and a recognition site to detect the current state and symbol. The example shown represents a transition rule: "If current state is S0 and current symbol is *b*, change state to S1 and symbol to *a*, then move one step to the left."



A free-floating computational transition complex slides into the machine's control unit (*1*). The molecule complex binds to and then displaces the current symbol and state (*2*). The control unit can move one position to the left to accommodate another transition complex (*3*). The process repeats indefinitely with new states and symbols as long as transition rules apply.

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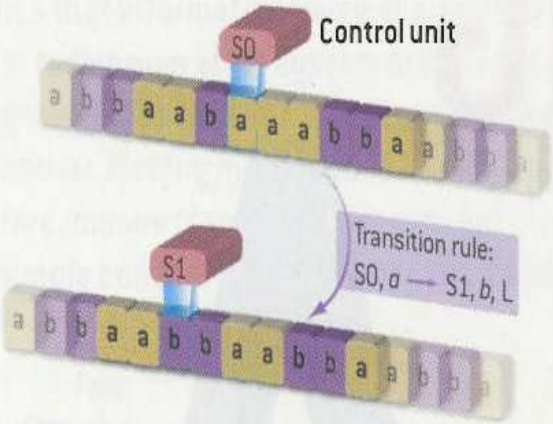
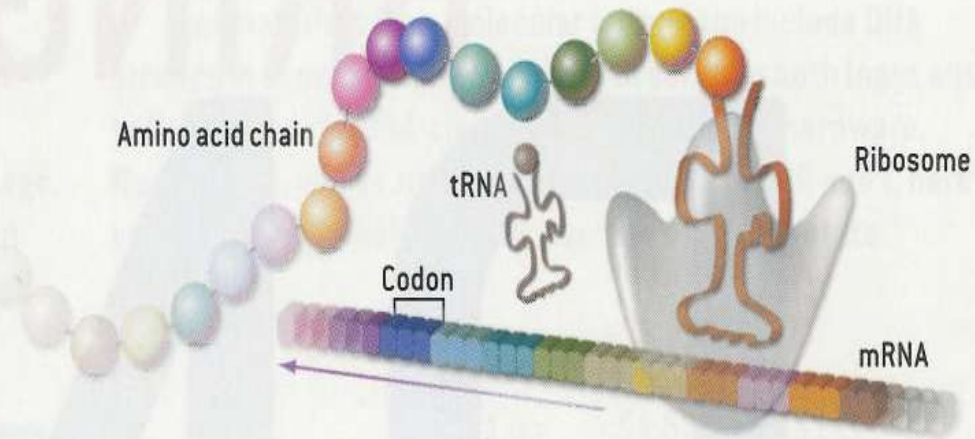
COMPUTING MACHINES: CONCEPTUAL AND NATURAL

Mathematician Alan Turing envisioned the properties of a mechanical computer in 1936, long before molecule-scale machines within cells could be seen and studied. As the workings of nature's tiny automata were later revealed, striking similarities to Turing's concept emerged: both systems store information in strings of symbols, both process these strings in stepwise fashion, and both modify or add symbols according to fixed rules.





TURING MACHINE

This hypothetical device operates on an information-encoding tape bearing symbols such as "a" and "b." A control unit with read/write ability processes the tape, one symbol position at a time, according to instructions provided by transition rules, which note the control unit's own internal state. Thus, the transition rule in this example dictates that if the control unit's state is 0 (S0), and the symbol read is *a*, then the unit should change its state to 1 (S1), change the symbol to *b* and move one position to the left (L).

BIOLOGICAL MACHINE

An organelle found in cells, the ribosome reads information encoded in gene transcripts known as messenger RNAs (mRNAs) and translates it into amino acid sequences to form proteins. The symbolic alphabet of mRNA is made up of nucleotide trios called codons, each of which corresponds to a specific amino acid. As the ribosome processes the mRNA strand, one codon at a time, helper molecules called transfer RNAs (tRNAs) deliver the correct amino acid. The tRNA confirms the codon match, then releases the amino acid to join the growing chain.

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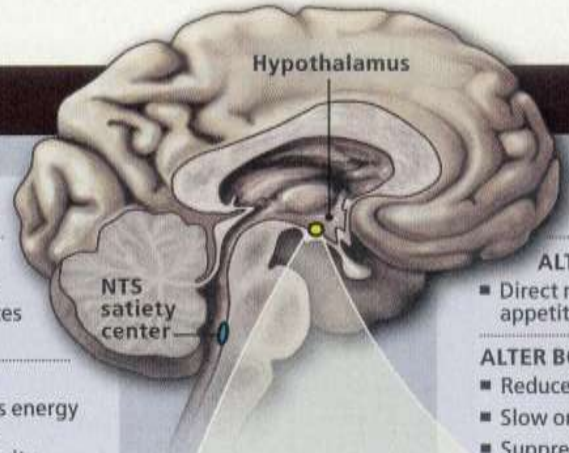
DNA STORES DATA naturally,
making it ideal raw material
for building computers.

[THE BRAIN]

COMMAND CENTER

The human brain regulates weight by integrating information about the body's energy needs and the status of its stores, then initiating changes in behavior and energy processing in response. Specialized brain areas stimulate feelings of appetite or satiety to cause more energy, in the form of food, to be taken in or to terminate a meal. Over time, the brain can also raise or lower the body's overall energy use and reallocate energy away from systems, such as reproduction, that are not essential for short-term survival.



INFORMATION

STORED ENERGY STATUS
- Circulating leptin, a hormone generated by fat cells, indicates how much fat they contain

METABOLIC STATUS
- Circulating glucose represents energy immediately available to cells
- Various indicators of liver activity signal that ingested energy is being processed

FEEDING STATUS
- Neural and chemical signals from the gut indicate whether digestive organs are full of food

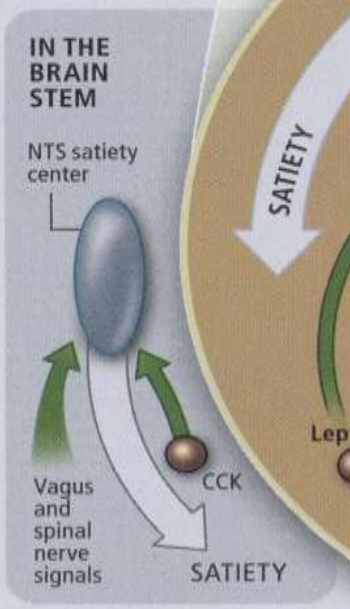
RESPONSES

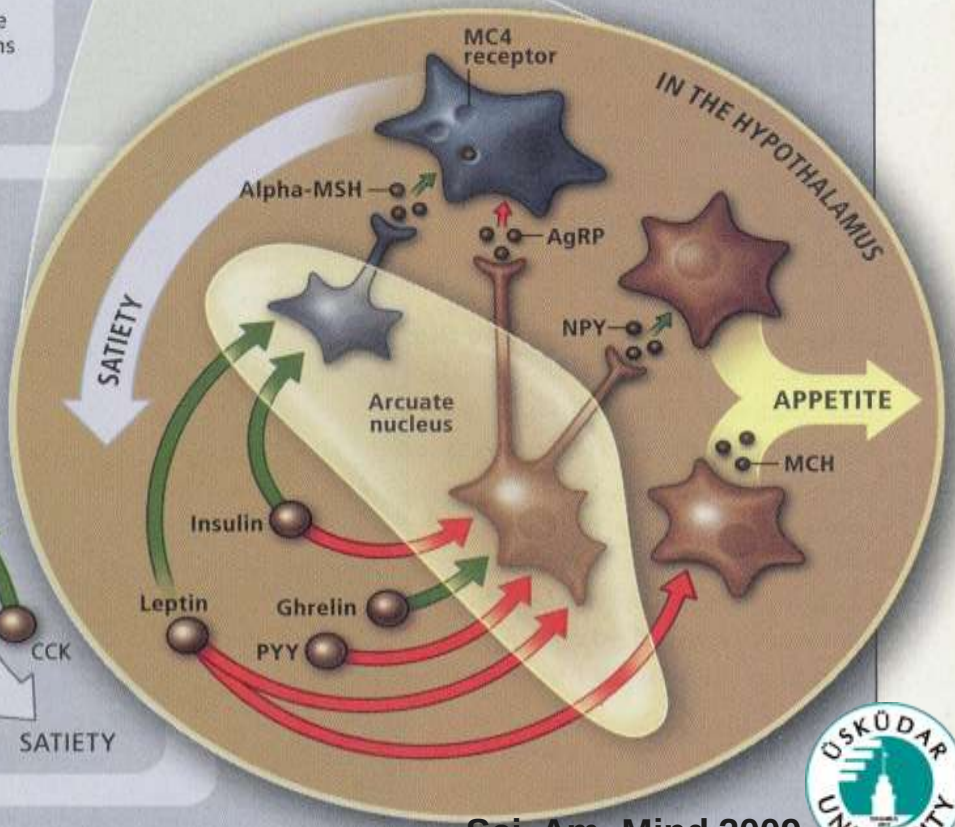
ALTER BODY'S ENERGY INTAKE
- Direct meal timing and size through appetite and satiety signals

ALTER BODY'S ENERGY USE
- Reduce or increase physical activity
- Slow or speed cellular energy use
- Suppress or restore growth, reproduction and immune function

APPETITE CONTROL

In the arcuate nucleus (ARC) of the hypothalamus (*far right*), indicators of energy and feeding status in the form of gut peptides such as ghrelin and PYY, and hormones including leptin and insulin, act upon groups of neurons associated with appetite (*brown*) or satiety (*blue*). Each substance either stimulates (*green arrows*) or dampens (*red arrows*) the neurons' responses. When stimulated, the ARC cells release peptides such as NPY, AgRP and alpha-MSH, which act on a second set of hypothalamic neurons that induce appetite or satiety. Leptin and insulin act through both types of cells simultaneously to promote satiety while suppressing appetite. Nerve signals and the gut peptide cholecystokinin (CCK) also communicate feeding status directly to the nucleus tractus solitarus (NTS), a satiety center (*right*) in the brain stem.





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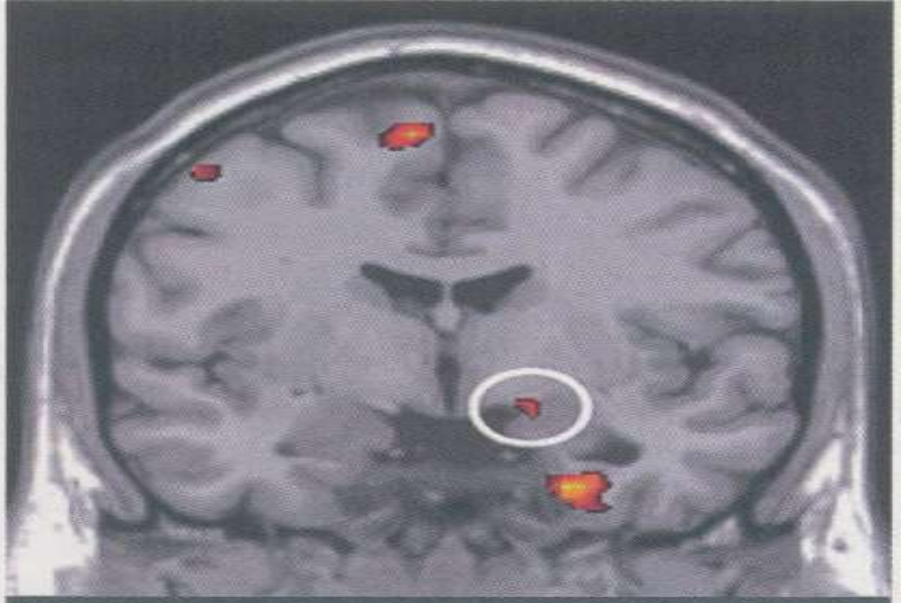
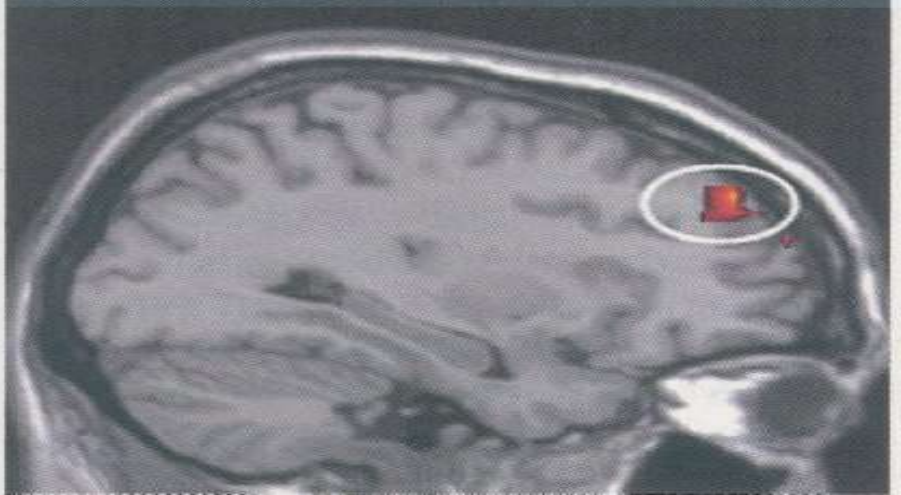


Briefly glimpsing a black face can unleash heightened activity in the brain's center of vigilance, the amygdala (*circled region above*). Slightly longer exposure to such a face seems to activate frontal brain areas (*below*) that could underlie the will to overcome bias.



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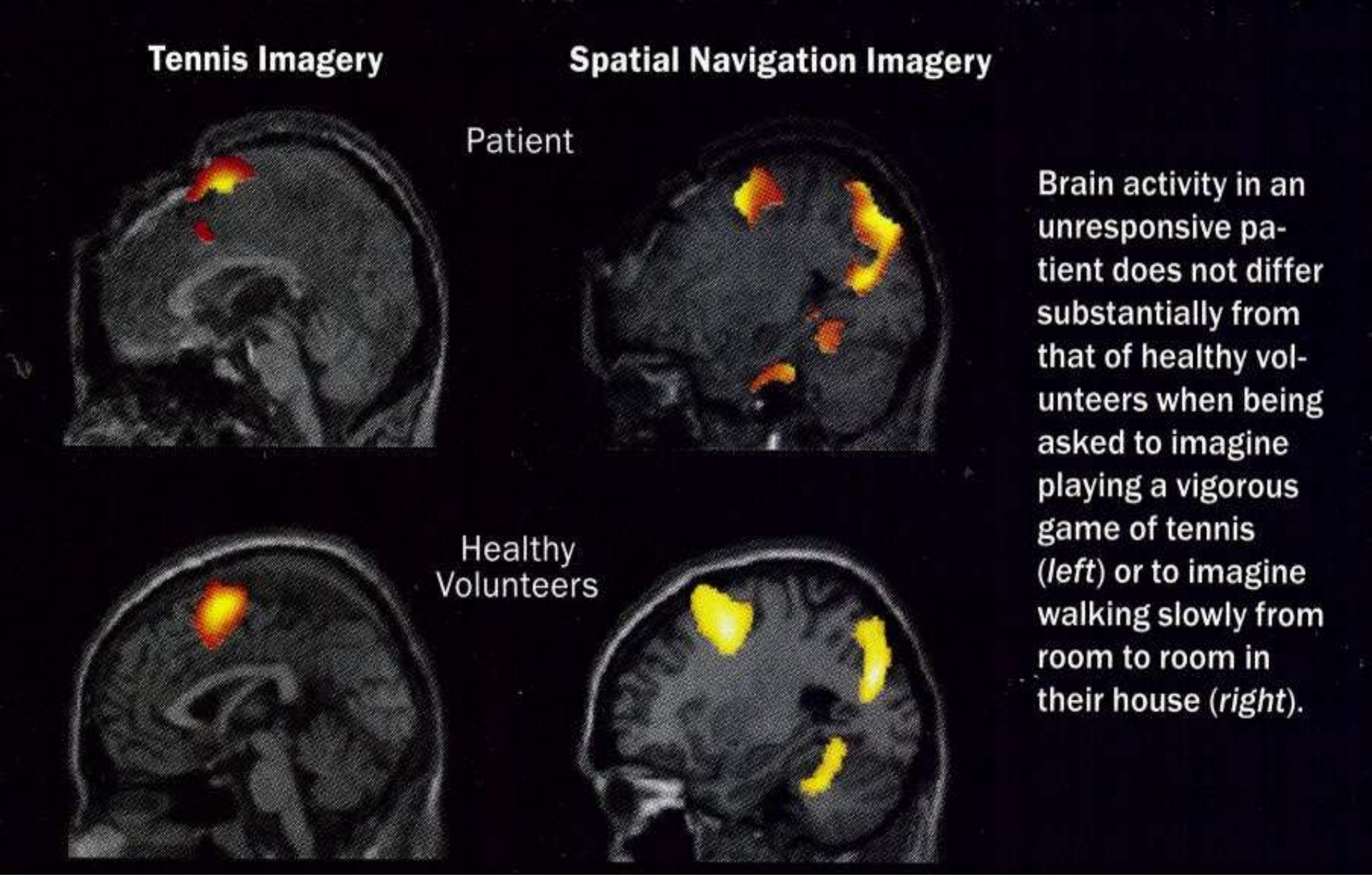

Brain activity in an unresponsive patient does not differ substantially from that of healthy volunteers when being asked to imagine playing a vigorous game of tennis (*left*) or to imagine walking slowly from room to room in their house (*right*).

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Hypnotic Phenomena

- Hypnotic induction,hypnotic abilty
- Hypnotic trans levels;
- Selective attention and focusing on suggestion
- Relaxation,alertness and sleep
- Degree of absorption and dissociation
- The nature of hypnotic suggestions , specificity and intensity

Hypnotic Theories

- **1-State theory** which is concerned with the altered state of consciousness (Barber 1969), explains the hypnotic trans and levels
- **2-Sociocognitive theory,** which is concerned with the interpersonal model. According to this theory hypnotic interactions and social context influence the hypnotic experience. Patient expectations and clinical demands combine to produce the hypnotic phenomena (Kirsch,2000)

3- Neodissociation Theory of Hypnosis

- One of the most contemporary theories of hypnosis, it's actually a reformulation of an old theory in contemporary terms and embedded within the modern clinical practice
- Dissociation or a divided consciousness is a pathological situation. Psychological information processes like input, storage and output are actually deflected.

Cognitive Hypnotherapy

- Some dissosiative disorders, automatism, amnesia, fugues and multiply personality are unconsciousness psychological illnesses similar to hypnotic experiences.
- In those disorders,EMDR and cognitive hypnotherapy maximize treatment gains and enhances positive expectancy

Psychedelic Process

- Dissociation is a psychedelic process. There are active deflections from normal psychological integration. The dissociation is usually easier than a normal reaction. But both follow logical reasoning (West 1967)

Hilgard's reformulation 'Self and will' concept (Hilgard 2003)

- According to Hilgard's concept, there are pyramidical and/or modular structures of cognitive controls and operations. Illnesses cause these controls and operations to change positions within the structures.

The Hidden Observer

- Cognitive process rearrangement involves some degree of loss of voluntary control or division control (e.g. During a hypnotic experience, eye catalepsy may occur, he may not be able to-open his eyes when challenged to do so).
- In hypnosis the hypnotist causes the executive ego to release “self” with it’s with volunteer control .There is also the ‘Hidden Observer’.

Volunteer Control, PFL

The concept of information processing in the cognitive model of illness and consciousness is similar to brain functions e.g. selective attention, volunteer control, and executive function in the PFL (Hilgard and Assen 2008).

Hypnotic Modulation of Pain

- During hypnotherapy the executive ego doesn't control the 'self ' with it's volunteer preference
- A hypnotized individual may report feeling no pain. The Cognitive system changes pain perception and reports about feeling of pain to executive ego (Feldman 2004)
- Phanthom Phenomenon

Altered State Consciousness (ASC)

- The fragmented network is activated in hypnosis similar to dreaming. The Brain works without time tags and references because the cognitive system lacks the associative links to a time frame.
- In ASC: The psychological functions of internal experience and external environment could occur simultaneously and alter their interaction.Sensory input psychological dynamics and motor activity can produce an altered state.

What is the Hypnotic Consious?

- **b.SC :** baseline state of consciousness, normal cons.
- **d.SC:** discrete state of consciousness, sleep or dreaming, is a unique and dynamic pattern or configuration of the psychological structures
- **d.ASC:** discrete altered SC, reconfiguration or repatterning of existing resources or cognitions
- The hypnotic experience changes the internal construction of the attitude, like motivation, values, expectancies… (Assen 2008)

HYPNOSIS AND EMDR

- What is a traumatic experience?
- Most psychiatric patients have hidden traumatic experiences in their past.
- The first type is 'manifest', like post-combat, natural disasters, sexual violence or emotional neglect, in PTSD and ASD.
- The second type are 'hidden' traumatic experiences

Significance of Negative Cognitions

It blocks the emotional life of most OCD, Depression, and Panic Disorder patients. There are some emotional imbalances and deficiencies

Some things we hear from those coming for psychiatric help due to traumatic experiences reveal what is responsible for some of the negative cognitions

We are extremely afraid of speaking in a group. When asked the reason why we only say "I'm scared of being embarrassed"

Throughout these situations we are thinking to ourselves 'I know its crazy for me to be afraid of this. I know there is no basis for this fear. It's much exaggerated, but what can I do. I can not stop it'.

" It's as if my reason and my feelings are speaking different languages."

Sometimes "the fear of the fear itself " starts to become a traumatic situation.

The person avoids those situations which will create the fear or a feeling of anxiety.

Avoidance Behaviour

If his work is on the other side of the river and he is afraid of getting on the ferry boat,he may move to the other side or change his job.

Here every fear experience he lives, can become a traumatic experience itself. Like a situation in which he faces the thing he fears (experiencing a panic attack on the ferry boat) or even just the thought of the situation (the thought that he might experience a panic attack on ferry boat)

Fear and Traumatic Experiences

- Here we can see that in every experience he has with that fear, the fear itself can become a traumatic experience.
- These fear experiences can leave such a scar that the person will avoid every situation that he believes will create the fear or anxiety.
- It's as if fears drive this person's life.
- We said that there are big or small traumatic experiences in every person's life.

- Our clinical experience has shown us that **these traumatic experiences are a root of most psychological problems.**
- The same way **physical injuries** affect our bodies, **psychological injuries** affect our brains. When our brain's resources are in good condition (working properly) they automatically bring about healing.
- Just as our physical body and tissues have incredible healing potential for physical injuries, in the same way our brain has incredible potential to heal psychological injuries.

The Metaphor of Physical Injury

- This is a natural and spontaneous tendency. Under normal conditions intervention is not necessary.
- However in some situations, this natural healing process is interrupted by various factors.

- We can’t keep our physical injury sterile or protect it from negative external affects while it is healing. Just like physical injuries need good conditions to heal, psychological injuries need good conditions to heal as well. Negative Cognitions are like viruses.

Some Negative Cognititions

1.	I don't deserve love	1	2	3	4	5	6	7
2.	I am b bad person	1	2	3	4	5	6	7
3.	I am terrible	1	2	3	4	5	6	7
4.	I am worthless(inadequate)	1	2	3	4	5	6	7
5.	I am shameful	1	2	3	4	5	6	7
6.	I am not lovable	1	2	3	4	5	6	7
7.	I am not good enough	1	2	3	4	5	6	7
8.	I cannot be trusted	1	2	3	4	5	6	7
9.	I cannot be trusted	1	2	3	4	5	6	7
10.	I cannot turst myself	1	2	3	4	5	6	7
11.	I cannot trust my judgmet	1	2	3	4	5	6	7
12.	I cannot succeed	1	2	3	4	5	6	7
13.	I am not in control	1	2	3	4	5	6	7
14.	I am powerless(helpless)	1	2	3	4	5	6	7
15.	I am weak	1	2	3	4	5	6	7
16.	I cannot proctect myself	1	2	3	4	5	6	7
17.	I am stupid (not smart enough)	1	2	3	4	5	6	7
18.	I am insignificant(unimportant)	1	2	3	4	5	6	7
19.	I am a disappoinment	1	2	3	4	5	6	7
20.	I deserve to die	1	2	3	4	5	6	7
21.	I deserve to be miserable	1	2	3	4	5	6	7
22.	I cannot get what I want	1	2	3	4	5	6	7
23.	I am a failure (will fail)	1	2	3	4	5	6	7
24.	I have to be perfect (please everyone)	1	2	3	4	5	6	7
25.	I am permanently damaged	1	2	3	4	5	6	7
26.	I am ugly (my body is hateful)	1	2	3	4	5	6	7
27.	I should have done something	1	2	3	4	5	6	7
28.	I did something wrong	1	2	3	4	5	6	7
29.	I am in danger	1	2	3	4	5	6	7
30.	I cannot stand it	1	2	3	4	5	6	7
31.	I cannot trust anyone	1	2	3	4	5	6	7
32.	I cannot let it out	1	2	3	4	5	6	7
33.	I do not deserve	1	2	3	4	5	6	7
34.	It's not okay to fell (show) my emotions	1	2	3	4	5	6	7
35.	I cannot stand up for myself	1	2	3	4	5	6	7
36.	I am different(don't belong)	1	2	3	4	5	6	7
37.	I should have known better	1	2	3	4	5	6	7
38.	I am inadequate	1	2	3	4	5	6	7

Some Parameters

- When was the traumatic experience ,
- how long did it last,
- was there professional help,
- what did the negative experience mean to the person,
- how difficult was it for the person to adapt to his environment after the traumatic experience and social support,
- These affect whether or not the person will experience psychological problems in the future.

Natural Brain Information Process

- In a healthy state, with time the brain processes the negative experience.
- At the end of this natural brain information process, even if the person remembers the traumatic event, he will feel little or no discomfort regarding this event.
- Sometimes this natural brain information process is interrupted .The negative experience itself and related pictures, thoughts and feelings fail to be processed normally.
- This obstacle creates a feeling of hopelessness
- “This past experience can’t be overcome”

Neurophysiological Perspective

- Even though reason says this event is in the past, he can't overcome it because his emotions about the event override his judgment.
- This traumatic memory creates a breakdown in brain processes that prevent it from being naturally processed and stored like other memories.
- Next are some various views of the psychological processes we discussed from a neurophysiological perspective.

Dual Stimulation of EMDR

- It is known that EMDR treatment has a positive effect on the limbic system and the amygdala which were negatively affected by the traumatic experience.(van der Kolk,1996)

- It is put forward that in the dual stimulation of EMDR treatment, neurobiological mechanisms are stimulated, the past episodic memory is moved, then the episodic and semantic cortical memory systems are integrated, and the whole process is sped up.

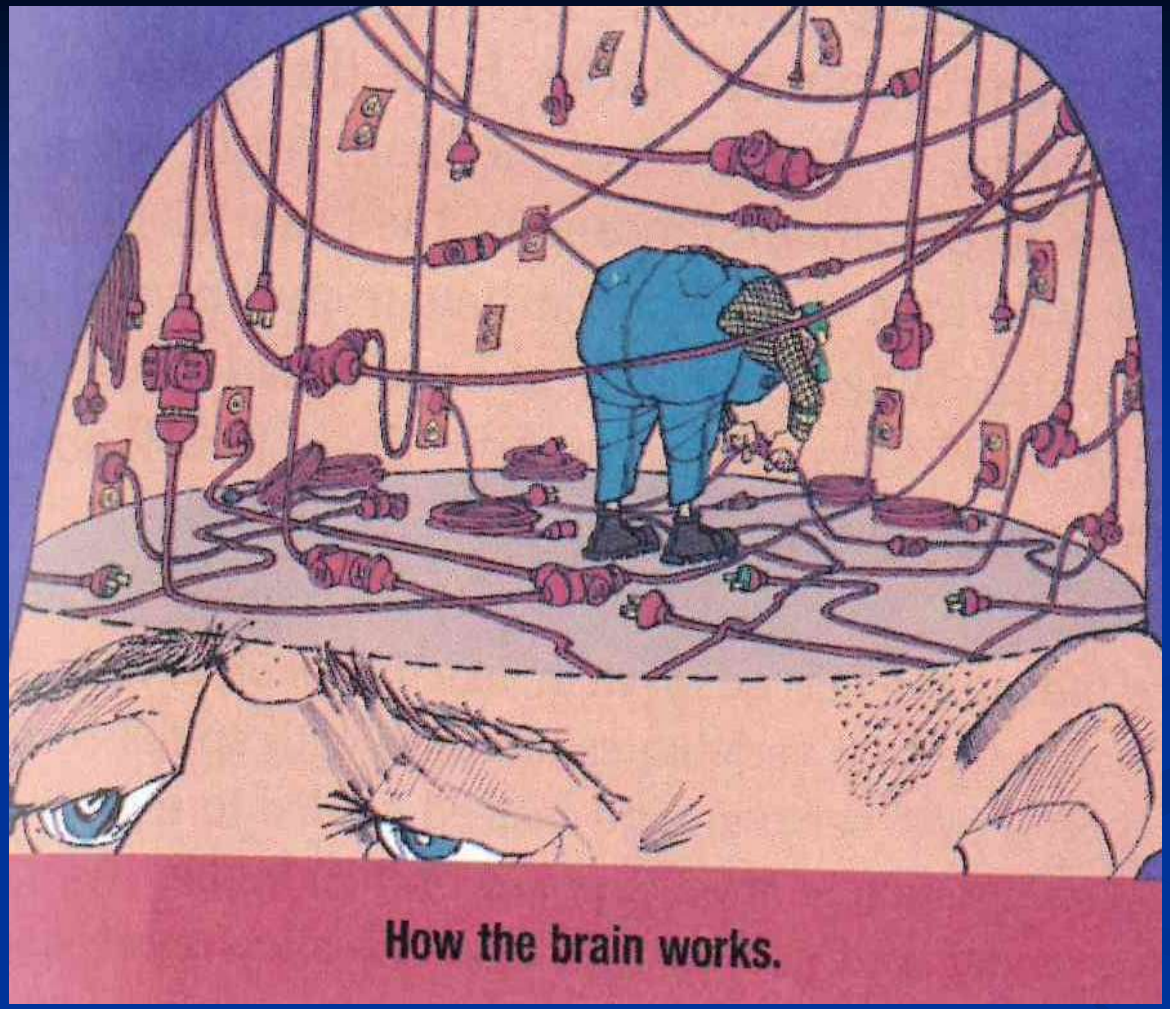
Different Memory Systems

- From this we can see that there are different memory systems in the brain. The memory of the experience is divided into parts ,and stored in these separate memory systems.

- Sticgold brought together the various researchers views on the different memory systems in the brain and showed the ideas were all same direction.

‘Six Networks’

- In view of memory locations and processes most researchers see three foundational memory systems
- These are represented by the sensorial memory system ,episodic memory system, and semantic memory system
- You might consider six networks in the memory process. They could be represented by a Question Paradigm “5W’s, & 1H “
- Who, What, When, Where, Why and How



Westen Psychology 1998

The Hypnotherapist's work is like an electrician's

Adaptive Information Process

- In the traumatic affect, it is thought that over an extended period of time the episodic memory is left open and improperly compressed.
- Important data from neuro-imaging studies show us how the post-traumatic adaptive information process fails (van der Kolk, 1996).
- Research results show when the traumatic memory is brought to life (revived) in a person's mind, the brain's right hemisphere becomes hyperactive and he relives the past feelings. This is because the amygdala of the limbic system (responsible for emotion) becomes hyperactive.

Verbal Therapies don't Work

- When the traumatic event is remembered, the left hemisphere containing the Broca which is responsible to verbalize the experience doesn't function properly.
- Traumatic experiences are stored in the same way as physical symptoms and signals. For this reason the analytic and semantic processes are insufficient.
- Traumatic memories are stored in the limbic system of the right hemisphere of the brain. Therefore verbal therapies don't work.

How EMDR Works?

- EMDR reactivates the brain information processes which failed to adapt. Then the traumatic memories are reprocessed and integrated in a more adaptable form.

- The goal of EMDR is to easily and quickly reprocess the information related to the negative experience

- In psychological problems there are commonly deficiencies in processing emotions.

Adaptive Resolution

- During EMDR with dual stimulation the counselor wants the counselee to think about an uncomfortable situation by focusing on a scene, thought, emotion or physical sensation.

- At the end of the treatment process, the maladapted information process is discovered and removed. The hidden negative experience is revived then relived and reprocessed in a healthy way and then the process is resumed in a healthy way.

Replace the Negative Beliefs with Positive Beliefs

- The aim of treatment is not only relieving anxiety but also to replace the negative beliefs with positive beliefs.
- EMDR treatment can resolve a traumatic event in 1 to 4 sessions
- In dual application EMDR, it is supposed that there are faulty adaptive information processes.
- EMDR techniques reactivate the stopped adaptive process and speed it up

Similarty to the REM Sleep

- The techniques of dual application EMDR can be performed with eye stimulation as well as with hearing and touch stimulation

- It is hypothesized; that the effect of eye movement in EMDR treatment is similar to the effect of eye movement in the REM sleep period.

- In REM sleep; there are orbital 'spherical' eye movements which compare with those of deep sleep.

Reconfiguration of the Brain

- The biochemical and bioelectrical conduction of the brain is similar to the electrical conduction of a computer
- In EMDR; we use the eye movement method to reconfigure the brain
- Thus, in hypnosis we use eye fixation or a hypnotic disc to make the brain work in a different configuration
- Both techniques are similar in style and in concept.They work like the REM sleep configuration. In this way; cortical integration of the traumatic memory is realized easily.

EMDR has been Approved

- Shapiro (2001, 2002) asserted that eye movements enhance brain cognitive process and cortical functions
- APA approved it in the treatment of ASD,PTSD (American Psychiatric Association Practice Guideline for the Treatment of Patients with Acute Stress Disorder and Posttraumatic Stress Disorder, 2004)

Which Indication?

- EMDR can be used in the following disorders as a psychotherapy method:
- Natural disaster, child abuse, combat stress, sexual traumas, bereavement or similar negative experiences
- Panic disorders, phobias, mourning, drug dependencies,depressions, headaches, and chronic pain

Step by step EMDR treatment process

- 1-Psychological profile of client,
- 2-Preparation: a clear explanation and instruction, a safe area, brief the client about the technique,
- 3-Evaluation:

  A-What is the final aim or target memory?

  B-According to aim; what is the negative belief and positive belief (Now and Right away 'not later')?

  C-According to aim: Is the positive belief available? Assessment of the availability and objectivity.

  D-What is the emotion related to the target memory? (Now and Right away)

  E-What are the physical symptoms during recognition?

Alternative thinking

- 4-Desensitization
  5-Replacing
  6-Body screening
  7-Completion

- As is seen: the real aim of treatment is to critique thoughts and to create alternative thinking.

Adaptive Solution

- **First stage;** Applying the EMDR device, we move the hidden traumatic experience to the conscious area,
- **Second stage:** Determining alternative information,
- **Third stage:** Using analytic reasoning and emotional reliving to complement the adaptive process.

The Comparison of EMDR and Hypnosis.

Similarities

- 1-In both; therapist should be more active
- 2-In both techniques; a long interview is not required.
- 3-In both techniques the use of eye movement or the five senses are compulsory
- 4-Both techniques require trust and submission to the therapist
- 5-Both techniques detect key information and make patients' own it.

Differences

- 1-In hypnosis; Treatment control belongs to therapist but in EMDR; treatment control is organized jointly,
- 2-In hypnosis; the method of sleep is primary, but in the EMDR technique sleep is not required,
- 3-The study of the trauma has some risk in hypnotherapy techniques. Hidden psychosis can appear suddenly.
- 4-Hypnotic methodology uses the alter conscious state for switching brain configuration. But EMDR allows full consciousness while switching brain configuration.

If the traumatic experience is left to itself, it could turn our life into a tragedy. Usually our brain has the capacity to heal itself.

Conclusions

- 1-Different levels of hypnotic experinces may involve different brain connections or different configurations of brain networks

- 2-EMDR and Hypnotherapy are similar brain configuration techniques. In the treatment of trauma a recommended method could be "Starting with EMDR and continuing with Hypnosis" (Hypnotic EMDR).

‘THANK YOU FOR YOUR ATTENTION’