

# **A Self-attachment workshop for psychotherapy, increasing emotional and social intelligence, and creativity**

**(Part 2)**

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## **Theoretical foundation of self-attachment**

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<http://humandevelopment.doc.ic.ac.uk/>

## **Foundations of self-attachment as a proposed (therapy) method**

- Attachment theory
- The significant role of laughter in attachment, mental health, and creativity
- Neurological development and attachment theory
- Neurology and creating emotional relations
- Neural flexibility and long-term potentiation (LTP)
- Existing evidence in ethology and anthropology for self-attachment
- Creativity and self-attachment
- Modeling attachment in artificial neural networks
- The proposed method of self-attachment

## Attachment Theory

- The scientific model of developmental psychology, created by John Bowlby
- Based on the quality and type of their relationship, an infant can have four different types of attachment to his primary caregiver, which will play a significant role in his emotional development and internal activation:

1. **Secure attachment** (good parent)

The caregiver is a source of security and protection for the child in times of fear and anxiety.

The caregiver provides the infant with a secure foundation for discovering the world and interacting with others.

2. **Anxious-avoidant attachment** (avoiding parent)
3. **Anxious-ambivalent attachment** (contradictory parent)
4. **Disorganized attachment** (frightening parent)



## **“Strange Situation” experiment**

- A 20-minute experiment with a mother, an infant, and a stranger in a new room filled with toys. Since 1980, this experiment has been conducted many times in different countries and cultures, with the same result.
- The mother leaves the room twice, returning after 3 minutes. The second time the infant is left completely alone.
- The infant’s behavior is observed each time the mother returns.
  1. Secure attachment: The infant immediately calms down and returns to play.
  2. Anxious-avoidant attachment: The infant avoids looking the mother in the eyes.
  3. Anxious-ambivalent attachment: The mother is unable to calm her child.
  4. Disorganized attachment: The infant freezes upon seeing the mother, or moves here and there, sometimes falling down.

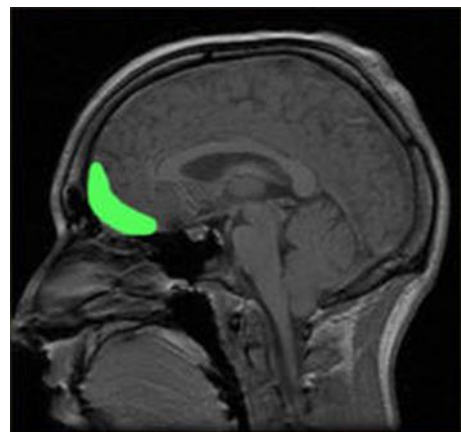


## **Mental health and different types of attachment**

- Our mental health is directly related to the type of secure or insecure attachment we develop with our primary caregivers during childhood.
- Genetic formation: Different types of attachment regulate (the expression) of genes.
- The development of different types of attachment in childhood strengthens permanent patterns of “internal activation models” in our implicit memories, which later become the basis for our interpretation of social relations and affect how we function in society.
- It is estimated that in western societies 35% of the population have insecure attachment, which is the cause of addiction to drugs and alcohol, mental disorders, crime, antisocial behavior, extremism, and other social afflictions.
- The percentage of the population with insecure attachment in developing countries is estimated to be much higher, resulting in the significant problems that exist in these societies.
- Insecure attachment can transfer from one generation to the next.

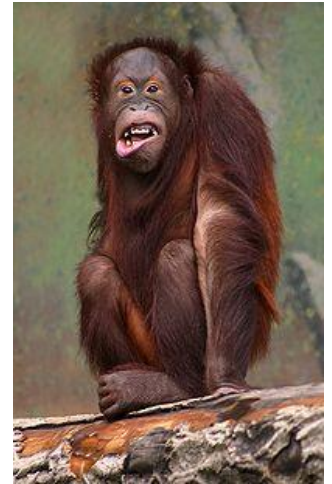
## Secure attachment networks in the first year of life (Allan Schore 2003; Julian Ford 2009)

- By looking into her baby's eyes, mimicking him, and playing, singing, and dancing with him, a good mother can understand her baby and become in synch with him while echoing his state.
- In this way the mother can increase the baby's positive affects and minimize his negative affects.
- The simultaneous interaction of the mother's right hemisphere with the baby's right hemisphere increases the secretion of dopamine and serotonin as well as tranquilizing hormones, and leads to the rapid growth of the infant's brain.
- The infant's orbitofrontal cortex (OFC) is optimized and regulates his affectively driven behavior.
- The infant develops a learning mind, with the capacity for self-observation.
- The infant gradually develops a mental image of his mother. This is an internal activation model with related neural networks, which can be used more and more in the mother's absence.



## The fundamental role of laughter in emotional/cognitive growth

- Like humans, some primates (including gorillas, chimpanzees, and orangutans) laugh during collective play and can even tickle each other.
- Undoubtedly the human capacity for laughter at word play and wit is a unique characteristic.
- It is believed that two million years ago homo sapiens began laughing in the warm areas of Africa, and this had a biological connection:
- Laughter increases positive affects and strengthens emotional connections between individuals and the group. At the same time it also reinforces cognition and intelligence, which is helpful in finding solutions to various problems and social issues.
- When gasping and out of breath during exercise, we find that it is easy to transform 3 facial expressions from one to another: a normal expression, an expression of stress, and an expression of laughter.
- A field study shows that only 3% of laughter occurs in solitude, and the rest happens in group and collective settings and is contagious.



## **Do we laugh because we are happy or are we happy because we laugh?**

- William James, one of the founders of psychology in the United States, was the first person to discover that we are happy because we laugh, and not vice versa.
- The human infant has the intrinsic capacity for smiling and laughing.
- After initial attempts at mimicking a smile, an infant performs a true smile between 6 and 12 months, and he can do a true belly laugh when he is around 5 months old.
- John Bowlby considered smiling a fundamental topic of attachment, but he never tended to the concept of laughter in any of his writings.
- A common point between psychoanalysis and attachment theory is that neither attend to the learning of laughter.



## **A child's heartfelt laughter is the foundation for his future mental health**

- In order to study the role of laughter in the emotional development of children we need to move beyond the existing theory of attachment.
- The repeated game of "the mother suddenly reappearing after disappearing temporarily behind an object or a person" (peek-a-boo) is the first instance of "trivial incongruence" that a child experiences that leads to repeated belly laughs.
- One of the most important elements of secure attachment and mental health in children is heart-felt laughter.
- If a child grows up in a happy family surrounded by laughter and joy, without arguments, fights, and abuse, he will be able to gain a strong secure attachment.
- In this way he will always be able to use laughter and humor (without ridicule) to manage his negative affects.
- He will always be able to laugh in times of stress, and try to find solutions to the problems he faces with a positive attitude and positive emotions.

## Duchenne Smile



- Guillaume Duchenne was a French neurologist who discovered a type of laughter in the 19<sup>th</sup> century that has come to be known as the Duchenne smile.
- The Duchenne smile (laughter) is involuntary and spontaneous, and it squeezes the muscles around the eyes and mouth.
- The Duchenne smile is the only type of smile that noticeably increases positive affects.
- The Duchenne smile increases dopamine, serotonin, oxytocin, and internal chemicals that increase our sense of happiness.
- The Duchenne smile can follow a joke or a trivial incongruence that is not based on ridiculing others.
- This smile is prevalent in happy families.

## **Laughter as a way of confronting problems and tragedies**

- Some people can withstand the greatest tragedies through laughter.
- They may be able to do this since childhood, or they learn it as adults.
- Some people can find something positive behind every tragedy.
- Charlie Chaplin was forced to work in a workhouse and sometimes slept on the streets when he was a child. He said, "To truly laugh, you must be able to take your pain, and play with it."
- He also said, "Life is a tragedy when seen in close-up, but a comedy in long-shot."
- And, "Laughter is the tonic, the relief, the surcease from pain."
- Therefore there are some people who can interpret any suffering in a positive way, they can laugh at it and see it as a challenge that will make them stronger. "That which does not kill us, makes us stronger." (Nietzsche)

## **The similarities between laughing and crying**

- The neural pathways that control laughing and crying are adjacent to one another.
- This proximity may be a reason why laughing and crying are like two sides of a coin and why we can switch from one to the other.
- We sometimes cry from happiness, and there are people who laugh at times of distress.
- Crying is a necessary and natural reaction to the loss of a loved one, or loss of limb in an accident.
- Like laughter, crying can help ease pain and plays an important role in regulating our excitements.
- But continuous crying is not beneficial and may lead to more pain and depression.
- To maintain psychological health, laughter needs to eventually overcome tears.

## **The second year: socializing the child (Allan Schore 2003)**

- In the second year of life, the mother begins socializing the child, encouraging her to avoid dangerous and anti-social behavior.
- When the child frequently experiences a dissonance with the mother's emotions, she will feel shame and gradually learns that she can correct this dissonance and conform with the mother's emotions again.
- By absorbing her mother's capabilities in managing her emotions, the child becomes capable of managing her excitements too.
- The child's neural pathways of secure attachment gradually extend into neural pathways for emotional self-management.



## **The emergence of secure self-attachment in children**

- Secure attachment to the mother becomes a foundation for the development of emotional self-management neural networks in the child that are the result of repeated positive interactions between the parent and child.
- By absorbing her mother's ability to balance her emotions, reduce negative affects at times of stress, and increase positive affects, the child gradually learns to mimic the mother, even in her absence.
- Secure attachment to the parents allows the child to develop secure self-attachment, which will gradually strengthen during puberty and teenage years as the process of emotional self-management further develops.
- As a result of secure attachment to her primary caregivers, the child will develop secure self-attachment. She will be able to deal with stress through laughter, and by transferring her secure self-attachment model she can create secure attachment to others.
- Children's potential for creating secure attachment will determine their emotional maturity in youth and adulthood, as well as their capacity to create successful social and intimate relations in the future.

## Insecure attachment

(Siegel 1999; Schore 2003; Cozolino 2006; Ford 2009)

- Infants instinctively attempt to create secure attachment to their primary caregivers, and good parents are successful in creating secure attachment with their children.
- For various reasons, the parent of an insecure child reacts differently to her child's emotional needs: avoiding the child (anxious-avoidant attachment), showing contradictory reactions (anxious-ambivalent attachment), or scaring the child (disorganized attachment).
- In anxious-avoidant attachment the sympathetic system, in anxious-ambivalent attachment the parasympathetic system, and in disorganized attachment both systems are disrupted.
- As a result, instead of focusing his mind and brain on learning, the child focuses his mind and brain on surviving. Because of this he fails to develop a capacity for self-management and self-observation, which will lead to emotional disorders.
- This leads to permanent disorders in the orbitofrontal cortex (OFC), and an impaired internal activation model, which in extreme cases can lead to antisocial behavior and psychological disorders.
- Insecure attachment makes the child accustomed to dysfunctional thoughts and actions that aren't socially suitable.



## Non-Duchenne smile



- Another type of smile is a non-Duchenne smile that was developed through human evolution and is conscious and non-spontaneous.
- In this form of smile only the muscles around the mouth are contracted.
- When we smile during pleasant conversation with friends it is often a non-Duchenne smile.
- The fake smile used for abiding by social norms is also a non-Duchenne smile.
- Derisive, sadistic, and egotistical smiles are all considered non-Duchenne smiles.
- Hateful smiles used for abusing others are common in dysfunctional families.
- Children with insecure attachment are often only exposed to non-Duchenne smiles, which can't help them manage their negative affects.



## **Insecure self-attachment within**

- A child with insecure attachment to his primary caregivers and lacking in emotional self-management, will develop insecure self-attachment.
- His primary caregivers were unable to regulate his excitements, reduce his negative affects, and increase his positive affects, and he will be unable to do these as well.
- In his mind he will have the same attitude towards himself and others, as his parents had toward him and one another.
- He may have the same irregularities and contradictions with himself and his surrounding that he previously had with his parents or witnessed in his family. He will evaluate all his later social interactions based on these experiences.
- In this way the dysfunctional relationship he had as a child with his parents, will be repeated again in adulthood in all his social interactions.
- In simpler terms, those who develop insecure attachment in childhood will be in conflict with themselves and their surroundings in adulthood as well.

## **The main concept of self-attachment**

- **Hypothesis:**

An effective treatment for psychological problems, including deep-seated disorders like chronic depression and anxiety, bipolar disorders, borderline personality disorder, and schizophrenia (some of which may have biological causes or be rooted in childhood trauma), requires two main features:

1. It needs to be based on a passionate internal relationship as a means for re-parenting.
2. This emotional relationship needs to lead to the learning of laughter.

- This part of the workshop will tend to the theoretical basis of self-attachment treatment through: 1) emotional connection, 2) learning to laugh, and 3) creativity.
- The next section will deal with protocol details.

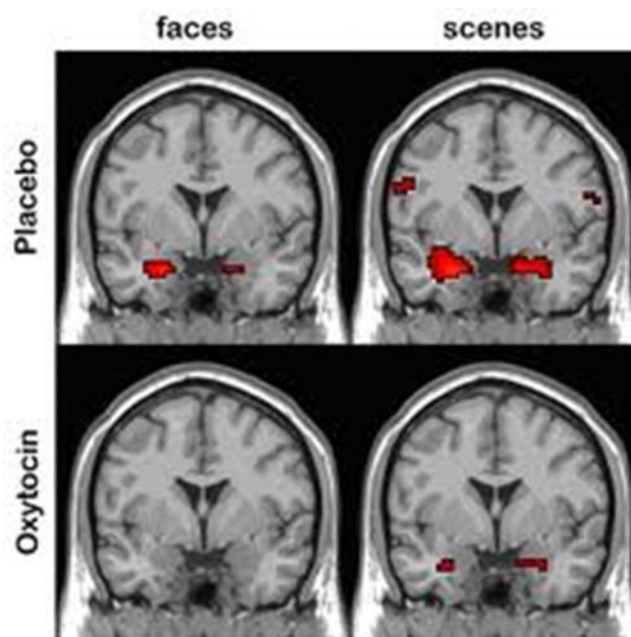
## Analyzing a loving relationship with fMRI (Bartles and Zeki, 2000, 2004; Schjødt et al. 2008)

- The foundation for developing secure attachment is a mother's unconditional and constant love.
- A number of mothers and a number of adults in love, look at pictures of their children and their loved ones, while their brain activity is measured by fMRI.
- The area of the brain that becomes active in both groups is in the caudate nucleus, which is the reward center of the neural network.
- In both groups the area of the brain that is NOT activated is in the frontal cortex, which is related to negative affects and social judgment.
- In another test the caudate nucleus became active in a group of Christians as they prayed while in the fMRI machine. However this result was only seen if the participants were fervent believers who prayed at least three times a week.
- In all these cases love and emotional relations between people activated the reward center of the neural system



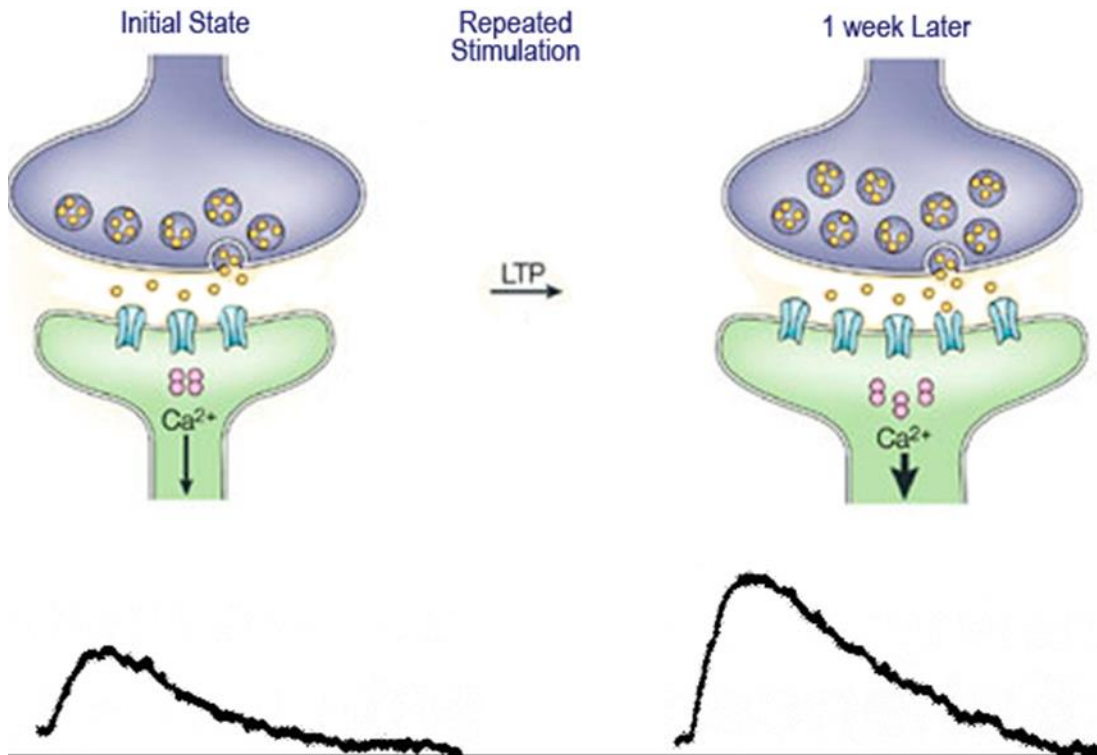
## Love and affection

- John Bowlby: Emotional bond is created through “love” and maintained through “affection”.
- Parental love and love between adults both include eye gazing, hand holding, caressing, smiling, etc.
- Hormones and neurotransmitters like oxytocin, vasopressin, and natural internal tranquilizers strengthen parental behavior and emotional connections between parents and children.
- Oxytocin reduces anger and fear that is produced in the amygdala, and therefore leads to positive affects.
- The amygdala becomes stimulated after seeing a scary image or face. But by smelling oxytocin the stimulation is reduced.



## Neural flexibility and Long-term potentiation (LTP)

- Our attachments, mental habits, and behavior is shaped and strengthened by neural flexibility and LTP.
- Neural Flexibility: By learning new things, the brain can change in its structure and function even in adulthood and old age.
- Specific learning and LTP: Through constant stimulation, synapses between neurons are simultaneously activated and can be strengthened over time.
- Hebb's rule: "Cells that fire together wire together."



## The biological basis of attachment: animal behavior

- Konrad Lorenz's experiments of imprinting on geese that began by imitating the initial interactions between parents and offspring, led to a primitive form of "attachment" between Lorenz and baby geese, which lasted for their entire lives.

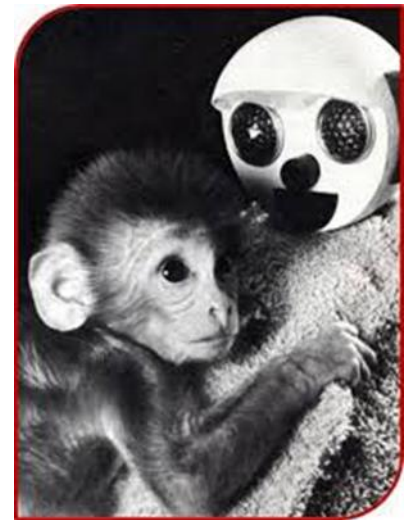


- In the same way, Harry Harlow's cloth-covered surrogate mothers could comfort baby monkeys, while the monkeys refused to take milk from wired surrogate mothers. This proved that the basis of attachment is security and affection, not a need for food.



## Objects or the concept of attachment in animal behavior

- In another experiment a group of baby monkeys were only allowed to interact with a cloth-covered surrogate mother, while another group could only interact with a wire surrogate mother.
- Each time the baby monkeys in the first group were afraid they rubbed themselves against the cloth-covered surrogates.
- The baby monkeys in the second group were deprived of this opportunity.
- After a few weeks all the baby monkeys were returned to their mothers.
- Now each time they heard a scary noise the baby monkeys from the second group would throw themselves on the floor and scream.
- While the baby monkeys in the first group would hurry to their mothers and cuddle in order to overcome their fear.
- The first group learned to use the cloth-covered surrogate as an object for secure attachment. This learning became part of their neural circuit and was recorded in their memory.



## **Comfort objects for children**

- Donald Winnicott:
- Children can create a passionate connection to “transitional objects” like a pillow, blanket, or a doll, as a replacement for the emotional connection with the mother.
- They can use these to regulate their emotions during the mother’s absence.
- Winnicott believes transitional objects encompass a realm between reality and imagination.
- This realm has a particular importance in the mental and spiritual growth of the child and can later become a basis for art and religion.



## Religion as tantamount to attachment

- Anthropology: **early humans with large foreheads** created emotional connections with inanimate objects, and later conceptual ideas, finding deep meaning in them. Through these emotional connections and related rituals and ceremonies they were able to control their excitements and anxieties and create internal as well as a social sense of calm.
- Over thousands of years these beliefs were developed further, resulting in the creation of monotheism and Abrahamic religions, as well as related spiritual schools that today shape the foundations of human civilization.
- Gordon Kaufman: “The idea of God is the idea of an absolutely adequate attachment figure.”
- Over the past twenty years social psychologists have reviewed and verified this concept in Christianity, Judaism, and Islam.

## **Faith as tantamount to attachment**

**Christianity: Gravinist, Mikuline, and Shaver 2010**

**Islam: Ghobary Bonab, Miner, and Proctor 2013**

- There is a clear similarity between attachment to a parent and the relationship between a believer and God:  
The experience of love between a believer and God is similar to how a child feels about his/her parents.
- God is a source of security for the believer, just as parents are for their children: In the case of believers, a subconscious feeling of fear can create a need for becoming closer to God.
- God is a “wise and powerful basis of security” just as parents are for a child: True faith is free from anguish and sin, and connected to a feeling of competence and self-control.
- People who turn to God show less negative emotions and increased spiritual health.
- Prayer and a relationship with God, which is a sign of attachment, are directly related to spiritual wellbeing.
- Faith can significantly reduce feelings of loneliness.

## **Two different types of faith**

**Granqvist, Mikuline, Shaver 2010**

1. “Compensation” pathway:

Those who have experienced insecure attachment as children, try to compensate for what they were deprived of through faith:

A sudden turn to faith is related to having inconsiderate parents.

2. “Correspondence” pathway:

Those who have had considerate, faithful parents, retain their secure attachment by maintaining their faith in God:

This group has experienced persistent secure attachment with faithful parents in childhood.

- William James:

1. Those who are reborn

2. Those who are born only once

## **Taking advantage of an attachment object or subject**

- In the following three areas we saw that using an attachment object or subject can play a significant role in regulating negative affects and maintaining spiritual health:
  1. Harry Harlow's experiments in behavioral studies
  2. The role of transitional objects in childhood
  3. The similarities between faith in God and a child's relationship to its parents.
- In the case of children and faithful people there is a passionate emotional relationship to a transitional object, or an attachment that is consistently in the individual's center of attention.
- It is this passionate emotional relationship that regulates negative affects and leads to spiritual growth and emotional health.
- As mentioned before, these emotional connections release dopamine, which activates the reward center of the brain, creating a sense of hope, motivation, and energy.

## **Self-Attachment method: A new birth and development**

- The adult self replaces the parent and allows the inner child (the same child who suffered trauma in the past) to emotionally grow and become a good parent.
- The emotional relationship between the adult and the inner child must be passionate and exciting in order to lead to the secretion of dopamine and other euphoria inducing chemicals, stimulating the brain's reward center in anticipation of emotional maturity and to ease mental and spiritual problems and pain.
- The adult performs exercises meant to simulate the ideal relationship between parents and children, trying to regulate his excitements, minimize negative affects, and maximize positive affects.
- We can use laughter to transform negative patterns to positive patterns.

## **Self-Attachment method: New neural pathways**

- The emotional relationship between the adult and the inner child will create new, healthy neural pathways and strong patterns in the neural network.
- Right-brain/right-brain reactions between the parent and child are replaced by similar, consistent left-brain/right-brain reactions between the adult and the inner child. This will lead to new neural pathways and strong patterns that can regulate the individual's excitements.
- Neural flexibility and long-term potentiation (LTP) will create healthy neural pathways and strong patterns of secure attachment that can compete with the inefficient and strong patterns of insecure attachment, creating a new internal activation model in the individual.
- The self-attachment therapy method can be practiced directly by the individual or directed by a therapist.
- This method can also be performed through virtual reality.

## **The connection to Bowlby's theory of attachment**

- John Bowlby limited attachment to the relationship between two people.
- As we saw in the example of faith as attachment, experts currently believe that attachment can go beyond Bowlby's original definition.
- As such, self-attachment can be considered a broadening of Bowlby's attachment theory.
- Secure self-attachment can be considered one of the objectives of intrinsic attachment.
- A secure child's ability for being alone (Winnicott) is a type of self-attachment.
- While hunting or fleeing wild animals cavemen would be separated from their kin and spend long stretches of time in solitude.
- Therefore secure self-attachment is in aligned with our biology.

## **Signs of self-attachment in behavioral studies**

**(John Capitanio 1986)**

- When mammals are separated from their kind at birth they show three different types of unusual behavior.
- One of these is similar to the type of behavior that baby monkeys show toward their mothers, which has a soothing, calming effect:
- Instead of suckling at its mother's breast, hugging the mother, and wiggling in her arms, the baby monkey sucks its thumb or other body part, grabs its own arm or leg, and wiggles its upper body.
- These can be considered primitive signs of self-attachment.
- Since this type of behavior is not learned, it must be instinctive and part of the attachment system discovered by Bowlby.



## **The first key of psychotherapy: Learning to laugh**

- During childhood we learn from our parents, our context, and school, when and where we should laugh, and when and where we should not.
- Each time a toddler falls down when initially learning to walk he/she will look at her parent's face:
- If the parent shows any signs of anxiety to this event the child will begin to cry.
- But if the parent approaches the child while smiling and picks him/her off the floor the child will be unaffected by the fall and may even smile.
- In a family and context where the reaction to problems and hardships (even after a short time) is accompanied by a smile, the child will learn to approach all of life's challenges with a happy attitude and a smile.
- He will even be able to laugh at his mistakes in front of others without feeling embarrassed or inferior.

## Why and when do we laugh?

There are different theories about laughter:

1. Laughter is intended to show superiority (Plato, Descartes, Hobbes): this is the reason why laughter was banned in early Christianity.
2. Laughter is a way of letting go of energies that are blocked inside due to social norms (Shaftesbury, Spencer, Freud): sexual jokes fall in this category.
3. Laughter is the result of discovering an incongruity (Aristotle, Kant, Schopenhauer, Kierkegaard): today this is the main theory behind jokes and witticism.
4. Laughter is the result of understanding or seeing a contradiction, or the refutation of something (generalization of type 3).
5. Laughter is the result of success (without malice) in an action (expansion of type 4).
6. Laughter is a signal for playing (Aristotle, Aquinas): in behavioral studies it is shown that monkeys mimic acts of aggression in their games, therefore there is a need for a signal so that the other side of the game understands this as a form of playfulness rather than true aggression.

## **The second key of psychotherapy: Laughing can be forgotten**

- A child who learns to laugh in the context of an ideal home, can forget it due to long-term trauma.
- Following the trauma he may avoid laughing in situations where he previously would have.
- The most important behavioral effect of trauma is forgetting how to belly laugh.
- Children who learn mocking laughter (type 1) at home, will use this laughter to make fun of other children at school.
- This process may also teach other children this type of mocking laughter.
- In our society adult laughter is most often used for mocking officials (type 1).
- Becoming habituated to mocking laughter may cause us to forget true belly laughter.
- And it may lead us to believe that laughing at our mistakes is the same as mocking ourselves.

## **Learning to laugh in self-attachment**

- The first objective of self-attachment is for individuals to be happy and joyful.
- Happiness is the result of persistent and predominant laughter in day-to-day life.
- In self-attachment we teach the inner child how to laugh and what to laugh at (even to laugh at himself). The inner child will learn to laugh consistently (and not just at exceptional fleeting moments).
- Laughter protocols in self-attachment are meant for those who experienced belly laughing in childhood, but have forgotten it due to various reasons.
- These protocols can also be used in the case of people who have never experienced or learned belly laughter in childhood.
- Self-attachment uses laughter type 3, 4, 5, and 6 (which are all related).

## **Learning to laugh in self-attachment**

- The key to learning to laugh is that after becoming aware of our emotions and gaining the power for regulating our excitements at times of stress, we gradually learn how to laugh at all times:
  1. To laugh with ourselves, without the presence of others (types 3, 4, 5, or 6).
  2. To laugh at ourselves and our understandable and reasonable contradictions without anger or derision (type 4).
  3. Belly laughter or Duchenne smile protocol (based on type 3) teaches us to laugh at problems and tragedies.
  4. Continuous, persistent laughter has been designed so it is heartfelt but by using very little energy. Since the change that leads to laughter in this case (type 4) can be a very small change in behavior or interpretation, continuous, persistent laughter can occur over and over again in day-to-day life.

## **Why is laughter missing from common psychotherapies?**

- From the time of Freud to the present, thousands of researchers and therapists have worked in the area of psychoanalysis and psychotherapy using a variety of different methods.
- One of the main differences between healthy individuals and those suffering from mental disorders is undoubtedly the different amount of joyful laughter among the former.
- If learning and forgetting how to laugh (due to trauma) play important roles in psychotherapy, why do none of the common methods of therapy attend to this issue?
- The first answer to this question is that learning to laugh has important prerequisites in the area of regulating excitements. Therefore psychology predominantly considers laughter to be un-learnable.
- The other reasons for this are the global dominance of drug makers, and the personality of Freud and other founders of psychoanalysis such as Jung and Adler, whose methods continue to have a deep impact on psychoanalysis and all its derivative methods.
- In their theories, these founders of psychoanalysis generalized their own personal issues to cover all human beings, and through this generalization they provided solutions to manage and modify these problems.

## **The capacity for being alone: Developing creativity**

- Donald Winnicott suggested that one of the higher aspects of secure attachment is self-attachment.
- “I wish to make an examination of the capacity of the individual to be alone, acting on the assumption that this capacity is one of the most important signs of maturity in emotional development.”
- Winnicott claims that it is only through gaining the capacity to be alone that the child finds its “true essence” and finds its true self.
- Otherwise the child will only gain “a false life built on reactions to external stimuli”, in other words the child will grow in relation to his context and his essence (self) will be dictated by this external context.
- It is because of this self-discovery that the “capacity to be alone” in children is considered a source of independence and creativity, and one of the main aspects of emotional intelligence.

## **Self-attachment in important historic figures**

- The role of self-attachment in reaching the highest levels of independence and creativity can be found in three important historic figures that according to Michael Hart, the American astrophysicist and author, have had the greatest impact on history:  
1) The Prophet Muhammad, 2) Isaac Newton, 3) Jesus Christ
- A common point between the three is a deep self-attachment that led to different results in each case and influenced human history in significant ways.
- The Prophet Muhammad spent long periods of time (especially during the month of Ramadan) praying and worshipping alone in the Cave of Hara', which is where he received his first revelation of the first Surah of the Quran.
- Isaac Newton was an introvert as a child and spent much of his time playing alone.
- According to the Gospel of Mathew and the Gospel of Luke, Jesus Christ spent 40 days battling Satan in the Judean Desert before returning to Galilee and beginning his ministry.



## Isaac Newton

- Among these three figures, each of whom reached deep levels of self-attachment, we know that Newton who lost his father before he was born, suffered very much during childhood.
- His mother remarried when Newton was 3-years-old and left him with his grandmother. In his memoir he writes that he felt a great hatred toward his mother and her new husband and had a desire to burn down their house.
- Newton is an example of how, even in those who have suffered trauma during childhood, self-attachment can become a basis for creativity and in turn become a significant tool for regulating excitements, anxiety, and depression.
- Therefore like religion, there are two different paths for self-attachment: one is as a continuation of secure attachment, and the other is as a compensation for insecure attachment and trauma.

## **Albert Einstein**

- Albert Einstein's childhood is a good example of how the capacity for being alone can result in imagination and creativity.
- Einstein preferred playing alone quietly, to playing noisily with other children. When he was 4 or 5-years-old Einstein got sick and his father bought him a compass.
- When he became famous later on in life, Einstein often retold how this compass and its dial that moved on its own in order to indicate a fixed direction enthralled him.
- He described how he would be so captivated by the compass that his body would shake and turn cold. Einstein claimed that the effect of this childhood experience led to his scientific studies in adulthood.

## **The architecture of self-attachment**

- Imagine the human brain as a biologic computer whose architecture is the neural network and the operating system and user are the individual.
- “Mental damage has its roots in the non-optimal development and cohesion of the neural network and initial implicit learning.”
- It is our claim that it is possible to create a holistic self-therapy where optimal neural networks are created in an individual who has experienced insecure attachment in childhood, and where these new neural networks can compete with the existing non-optimal neural circuits.
- This method of self-treatment is an algorithm for re-learning that we call self-attachment.
- This algorithm creates an interaction with the neural network hardware in order to optimize it.

## **Analogous to synthetic biology**

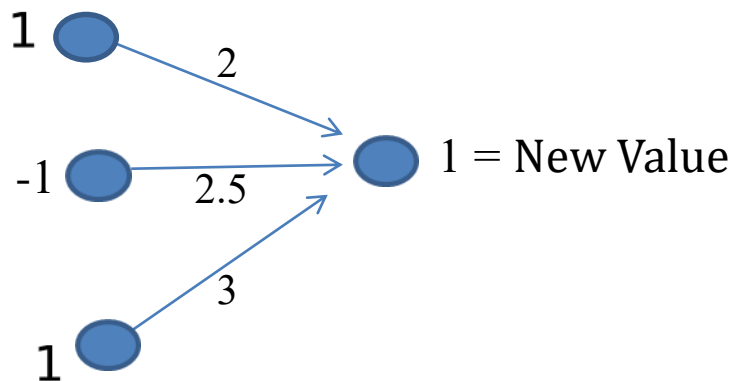
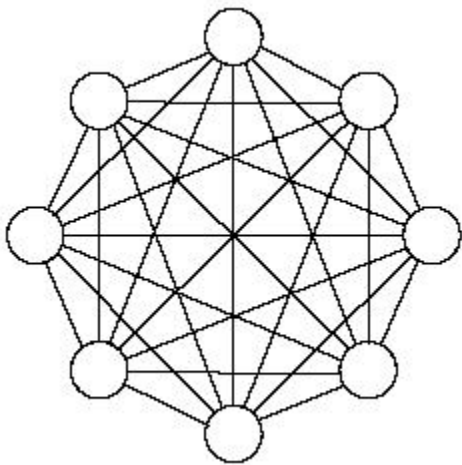
- Genes are the basic units of all living beings.
- In synthetic biology genes from one living being are injected into another living being in order to create a more useful being.
- Different types of attachment and the “internal activation models” that result from them can be considered basic mental units.
- In this manner we can wonder whether it is possible to supply a person who has had non-optimal mental units since childhood, with more optimal mental units in adulthood.
- The algorithm of self-attachment provides a solution to this question.

## **Modeling artificial memory networks**

- Artificial neural networks can mimic human memory.
- These networks can learn numerous images of human faces and record them in their memory.
- After this learning, the network can find the most similar face in its memory to any image it is shown.
- In other words the network can associate any image it is shown with the images recorded in its memory.
- The human brain acts in a similar way.
- We can model behavioral and cognitive aspects of different types of association in an artificial memory network.
- Self-attachment as a new method of psychotherapy was inspired by different experiments on artificial networks.

## Modeling mental and behavioral habits in artificial networks

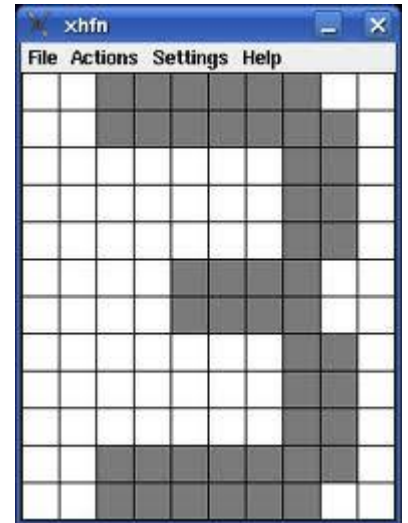
- The Hopfield network is a type of associative memory.
- It is composed of  $N = L \times K$  cells. Each cell has a value of +1 (black=active) or -1 (white=inactive):  
 $S_i = 1$  or  $-1$  (where  $i = 1, \dots, N$ )
- We can imagine the network as a computer screen with  $N = L \times K$  black or white pixels.
- The connectivity weight ( $w_{ij}$ ) between two cells is the number  $i, j$ , which determines the amount of connectivity between the cells.
- The value of every cell is updated based on feedback or input from other cells over a certain time ( $t$ ), according to the connectivity weight between the two cells.



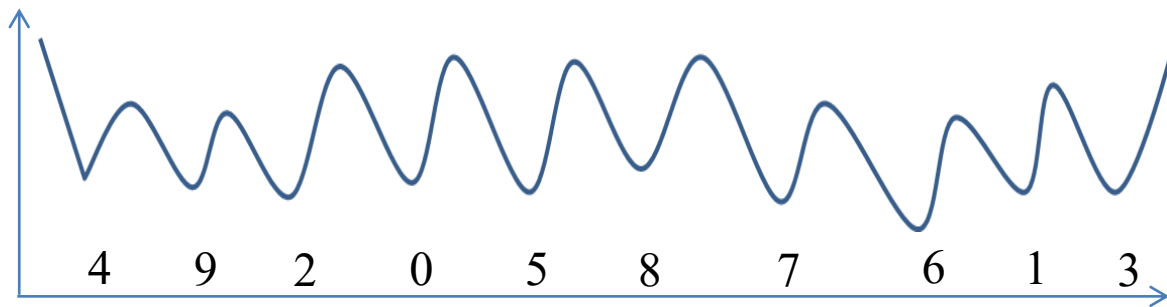
$$\begin{array}{ll} \text{If } h_i^1(t) := \sum_j w_{ij} S_j(t) \geq 0 & \text{then } S_i(t+1) = 1 \\ & \text{otherwise } S_i(t+1) = -1 \end{array}$$

## The Network's Learning

- The network can record a number of situations or patterns in its memory (like black and white images of numbers 0 to 9):
- Each situation (image) is defined by a particular number of (+1) or (-1) for each cell.
- The connectivity weight of the network is calculated by a formula based on Hebb's rule.
- After learning the images, the minimum points on the graph are subjected to energy/stress.



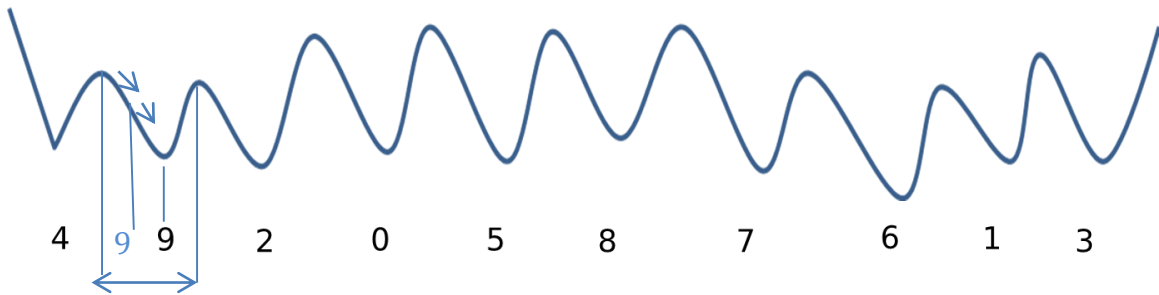
Energy/Stress



Pattern/Situation

## Recalling from memory

- After learning the network is continuously updated with every pattern that stimulates it, until it finds or associates the closest pattern in its memory.
- This can be compared to a person who sees someone from a distance and after a pause makes a guess that it is an old friend.
- Each recorded pattern or image creates a pattern or basin of attraction in the network.



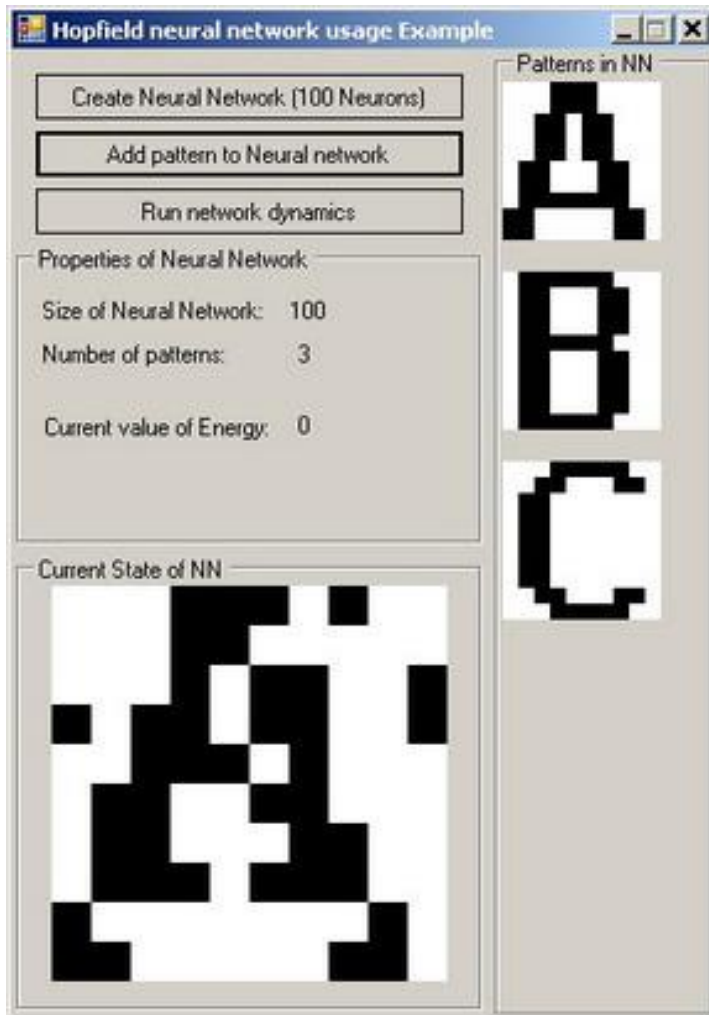
Basin of attraction 9

- If  $p < 0.138N$  where  $p$  is the number of recorded patterns, the network's memory will work with 99% accuracy, meaning it will associate the patterns in its memory correctly.

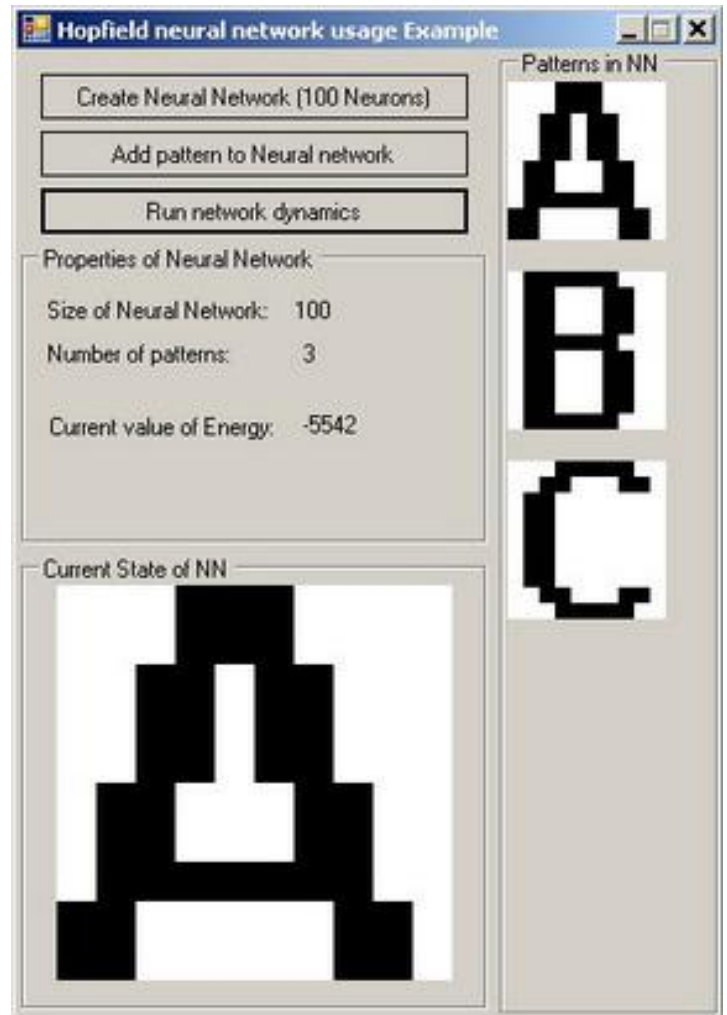


## A simple example

$p = 3$   $N = 10 \times 10 = 100$  Memory = A, B, C



Initial pattern, situation or image



Final pattern, situation or image

## **Strong patterns for modeling behavioral and cognitive problems and different types of attachment**

**(Edalat 2012, Edalat & Mancinelli 2012, Edalat 2013, Edalat & Lin 2014)**

- Behavioral and cognitive patterns, and different types of attachment, are the results of repeatedly learned patterns or similar associations from primary caregivers.
- A strong pattern in a network is a pattern that has been learned more than once, or repeatedly.
- The basin of attraction of strong patterns is proportional to the number of times they have been learned.
- The square law of attraction (Edalat 2013): If a strong pattern is of degree “d” (meaning it has been learned “d” times), it will still be constant in a network with the following number of patterns  $p < 0.138 N d^2$
- Therefore the power of attraction of a strong pattern will increase proportional to the number of its repetitions squared.
- The conclusion is that strong patterns are suitable for modeling attachment and behavioral and cognitive habits.

## A simple experiment in the network

$N = 50 \times 50$

- The image of a sad face is recorded in the network 30 times.
- 30,000 other images are also recorded in the network.
- Each time the network is updated with an additional image, it will recall the sad face.
- Hence the network can be compared to a depressed person who associates every event with sadness.
- Continuing the learning process a smiley face is recorded 40 times in the same network.
- From this point on, it is likely that every time the network is updated with a new image, it will recall the smiley face.
- Therefore the depressed person has now been transformed into a positive person who most likely associates events with happiness.



- It is most likely that the smiley face will be recalled



- The result of this experiment leads us to the suggested method of self-attachment.

## **Modeling dependence/love and strengthening dependence/loving**

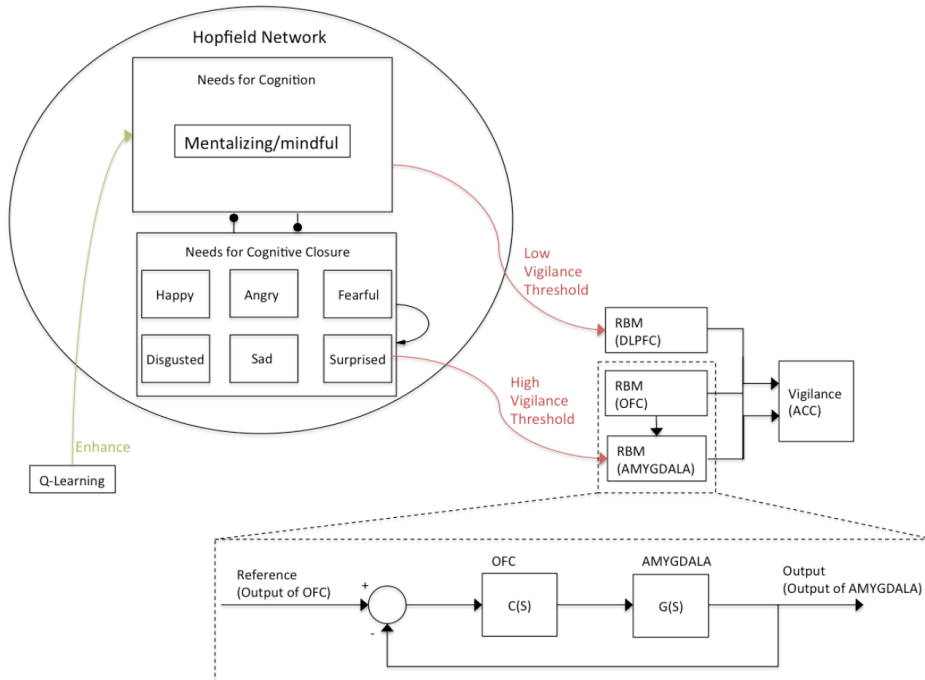
- Love and dependence to an idea, a behavior, or a person can be compared in the degree of attraction they produce in memory.
- In experiments on artificial networks the degree (strength) of a pattern equals the number of times it has been repeated.
- In the human brain the strength of learned patterns also depends on the amount of dopamine that is secreted, meaning the love, interest, and excitement we show in expectation for a reward.
- From this point of view we can model in the following way:
- Creating an emotional relation, habit, or attachment = the creation of a strong pattern
- Showing love/or strengthening habits or attachment = repeating a strong pattern more often and with love
- Also: insecure attachment = a strong pattern
- So in order to create secure attachment in a person who has insecure attachment there is a need to create a pattern of secure attachment that through loving repetition can eventually become stronger than the existing insecure attachment pattern.

## **The suggested method of self-attachment**

- The functioning of the human brain can be categorized as follows:
- Mature adult: The thinking/analytical section, the active cells are primarily in the frontal lobe and the left hemisphere.
- Inner child: The excitable/emotional section, the active cells are primarily in the limbic system and the right hemisphere.
- The self-attachment method is an algorithm that using a particular system and order replicates the relationship between a child and a good parent in a person with insecure attachment, until the mature adult becomes a good parent and the source of secure attachment for his inner child:
  - 1) The adult creates a kind, compassionate relationship with his inner child.
  - 2) The mature adult falls in love with his inner child: He creates a passionate emotional relationship with the inner child and accepts him as his imaginary child.
  - 3) The adult does detailed exercises with the inner child in order to balance the child's excitements, minimizing the negative excitements and maximizing the positive.
  - 4) Using the laughter protocol and through constant laughter the child's negative attitude will transform into a positive one.

# Neural modeling of cognitive-behavioral therapy

AE & Lin 2014



- Needs for cognition
- Needs for cognitive closure
- RBM: Restricted Boltzmann Machine
- DLPFC: Dorsolateral Pre-frontal cortex vigilance threshold
- ACC: Anterior cingulate cortex
- Q-learning

- This model is based on Levine's neural model of pathways for emotional-cognitive decision-making. Depending on the level of existing strong patterns in the two needs networks, decisions are made either through the lower emotional pathway without stimulating vigilance, or they are made through the upper cognitive pathway by stimulating vigilance.
- The treatment begins by overcoming the pattern of anger in the emotional needs network: Learning followed by reward gradually increase the degree of the Mentalising pattern in the cognitive needs network, and ultimately overcomes the emotional patterns in the needs network, which concludes cognition.

## **Evidence in support of self-attachment**

- The self-attachment therapy method was first introduced in January 2012 at University College London (UCL), and at the Psychiatric Institute in London in May of 2013.
- A number of volunteers who had been through different methods of psychotherapy but continued to suffer from chronic anxiety and depression, showed signs of improvement after a few days or weeks of practicing self-attachment protocols.
- A number of psychotherapists in Tehran attended two self-attachment workshops at the Psychology Institute of Iran in April and December of 2014, and began applying this method to some of their clients.
- The pilot project to evaluate the effectiveness of self-attachment in treating chronic depression and anxiety was concluded last year.
- The results were positive and will be presented in another session of this workshop.



## **The connection to other methods of psychotherapy**

- Today's methods of psychotherapy such as cognitive-behavioral therapy (CBT), mentalisation, Schema therapy, TA, compassion centered, mindfulness meditation, acceptance and commitment (ACT), and psychoanalysis can all be considered tools for creating secure self-attachment.
- Self-attachment therapy uses ideas from all these different methods, just as good parents use various ways of behavior, talking, emotion, and analysis to help their children grow and develop.
- Self-attachment is essentially a method of self-treatment, but many people need to consult a therapist that is familiar with this method in order to be able to use it independently.

## **Establishing different styles of attachment based on minimizing free energy or minimizing the amount of unfamiliarity**

- Intrinsic and extrinsic motivators of attachment under active inference.
  - PloS ONE 13(4), 2018
- David Cittern and Abbas Edalat
  - Algorithmic Human Development, Imperial College London
- Tobias Nolte and Karl Friston
  - UCL

## Strange Situation Reunion

<b>Categorizing the Child</b>	<b>Behavior upon reunion</b>	<b>The behavior of the primary caregiver at home</b>	<b>Percentage of population (USA)</b>
Secure	Gets close to the caregiver and quickly returns to playing	Consistently responds to the child's needs and is sensitive to the child's pain	62%
Anxious Avoidant	Avoids the caregiver and continues playing	Is distant from the child and avoids him/her	15%
Anxious Ambivalent	Is hyper-active, carefully approaches the caregiver and is slow to return to playing	Shows inconsistencies and contradictions in behavior, and in relation to the child	9%
Disorganized	The child's reactions are inappropriate and scattered, i.e. he/she freezes in place or screams	Is hostile and causes fear, and shows contradictory signs in relation to the child	14%

## Decision-making model in the strange situation

Gains Chart	Behavior of the primary caregiver		
	Attending	Ignoring	The child's average gains
Child's behavior	Probability q	Probability 1-q	Amount of comfort or stress
Approaching the caregiver	g	-s	$g q - s (1-q)$
Approaching the caregiver carefully	h	-t	$h q - t (1-q)$
Avoiding the caregiver	0	0	0

- “Mathematical Models of Mother/Child Attachment”, Buono et al., 2006

Three sections for the probability of q with the condition

$$0 < t < s \quad \text{and} \quad 0 < h < g \quad \text{and} \quad h > g t / s$$

Secure:  $(s - t) / (g + s - h - t) < q < 1$

Anxious Ambivalent:  $t / (h + t) < q < (s - t) / (g + s - h - t)$

Avoidant  $0 \leq q < t / (h + t)$

## **Self-attachment based on minimizing free energy or unfamiliarity**

### **Karl Friston's Free Energy Principle**

- Human and animal brains behave in a way to minimize a quantity called free energy.
- The framework is based on the following principles:
- Actions or controlled situations created by the actor (child):
  - 1) approaching the caregiver, 2) approaching the caregiver carefully, 3) avoiding the caregiver
- The final situation:
- The child's action and the primary caregiver's behavior, which influences the child's stress level, has the parameter "q"
- The transition between the final situation based on the child's action and the existing final situation
- Observing the child's stress level, which goes up and down, and depends on the final existing condition as well as gains  $t$ ,  $s$ ,  $h$ , and  $g$ .
- Modeling the child for the final situation and observing the dynamism
- Predicting the result of behavior and the final situation
- The child will select actions that based on his predictions will minimize the free energy or unfamiliar situation
- By minimizing the free energy the child behaves in a way that will lead to results he prefers (based on previous observations), because he will have less stress.

## **Discovering the parameter, or the probability of $q$**

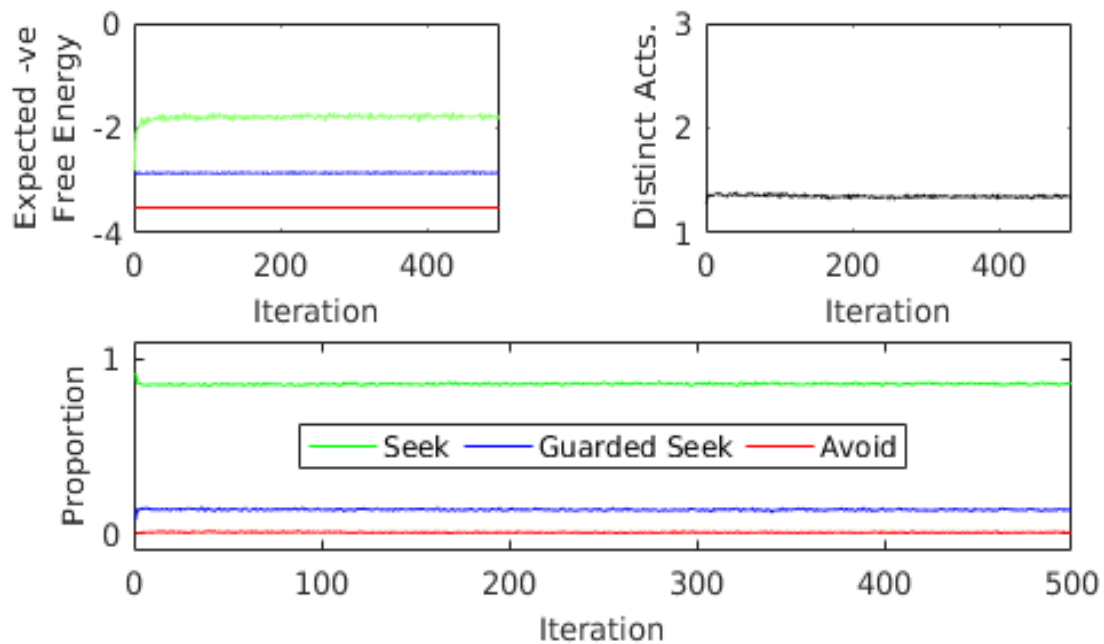
- We assume the child knows his caregiver's "type" or the quantity of " $q$ "
- We minimize the free energy:
- In large expanses of the parameter, three styles of attachment for different levels of " $q$ " are created.
- The simulated model shows that in general minimizing free energy is in accordance with decision-making based on gains.

## Learning the primary caregiver's characteristic

- Children do not know the “type” of their caregivers at first.
- They have to learn the characteristic ( $q$ ) of their caregiver over time.
- We begin with a child who has an average assumption of his caregiver's type, but with a great amount of uncertainty ( $q_0 = 0.4$ )
- By modeling the minimization of free energy the child gradually learns his caregiver's type.
- The parameters have been selected as follows:  
 $g = s = 2$   
 $h = 0.75$   
 $t = 0.9$

## Learning secure attachment

- Sensitive, consistent caregiver ( $q = 0.9$ )
- Top left image: Negative average of free energy
- Top right image: Number of different actions selected in each repetition
- The percentage of each action's selection

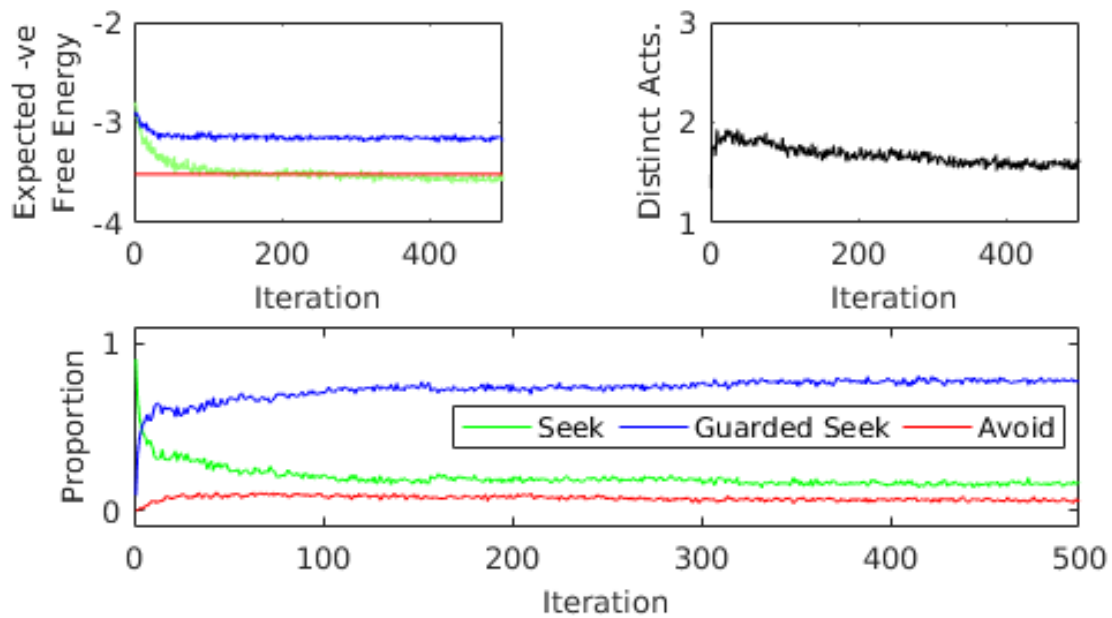


- Approaching the caregiver: green
- Approaching the caregiver carefully: blue
- Avoiding the caregiver: red



## Learning ambivalent attachment

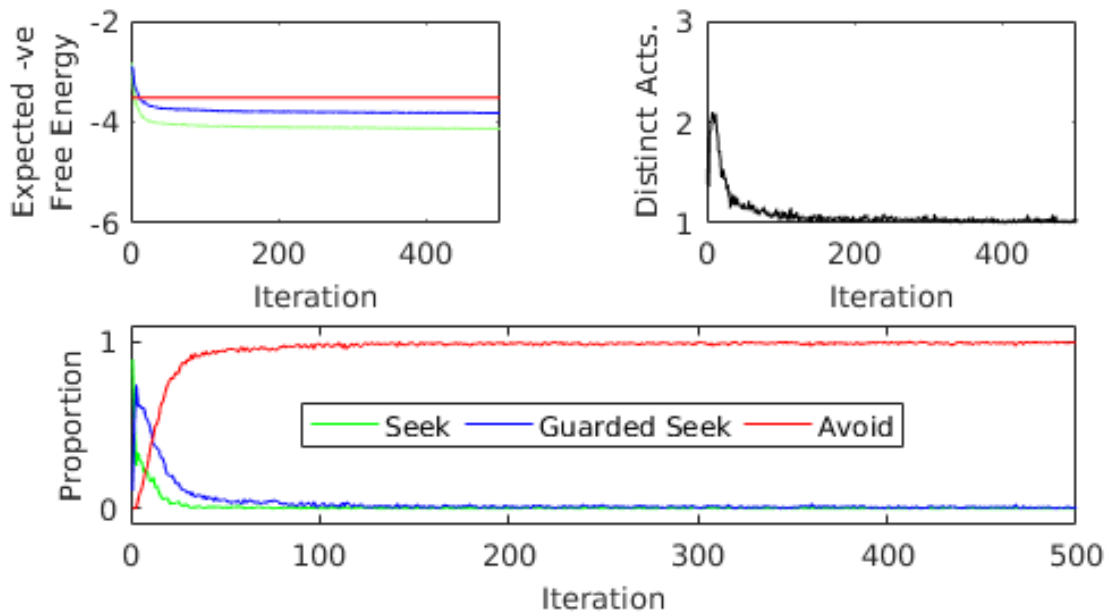
- Contradictory primary caregiver ( $q = 0.4$ )
- Top left image: Negative average of free energy
- Top right image: Number of different actions selected in each repetition
- The percentage of each action's selection



- Approaching the caregiver: green
- Approaching the caregiver carefully: blue
- Avoiding the caregiver: red

## Learning avoidant attachment

- Avoidant primary caregiver ( $q = 0.1$ )
- Top left image: Negative average of free energy
- Top right image: Number of different actions selected in each repetition
- The percentage of each action's selection



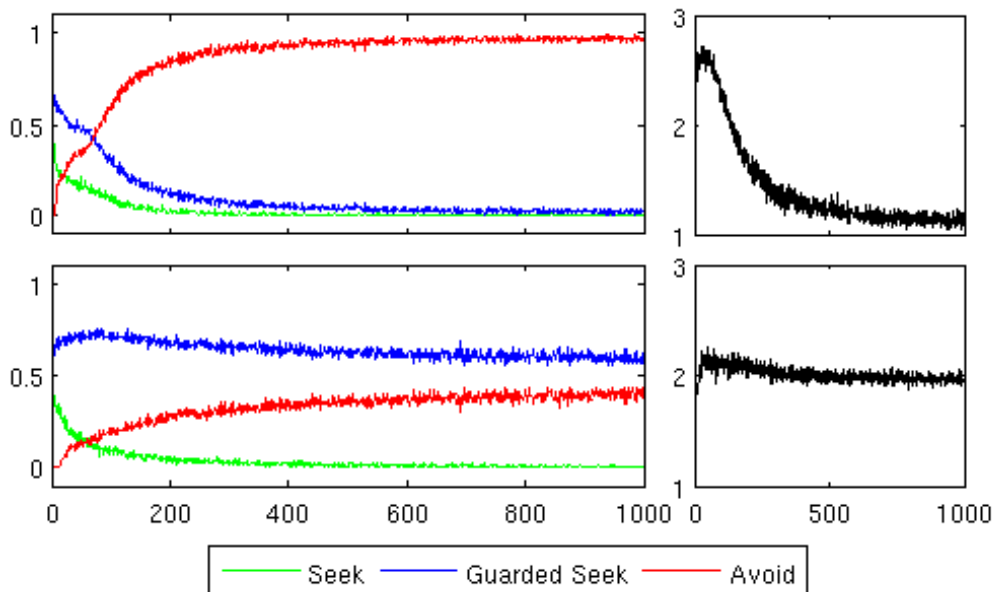
- Approaching the caregiver: green
- Approaching the caregiver carefully: blue
- Avoiding the caregiver: red

## **The caregiver's confused signs and signals to the child**

- The caregiver shows confused emotional signals (Karlen Lyons-Ruth et. al)
- Research shows that confused emotional signs and signals from the caregiver can lead to ambivalent or disorganized attachment.
- Confused emotional signs and signals can be misleading or vague.
- For instance in the formation of disorganized attachment:
- The primary caregiver asks the child to come near, but then distances herself/himself from the child.

## Learning disorganized attachment

- The model:  
The caregiver's confused signs and signals continuously increase the child's stress levels
- Top row: Without confused signs and signals, the low level of  $q$  leads to avoidant attachment.
- Bottom row: With low levels of  $q$ , there is a 50% probability that the caregiver's confused signs and symbols will lead to avoidant attachment.



- Approaching the caregiver: green
- Approaching the caregiver carefully: blue
- Avoiding the caregiver: red

## **Self-attachment hypothesis**

- Self-attachment creates flexibility in the primary pathways associated with attachment.
- Creating an internal emotional attachment:
  - It leads to the secretion of dopamine and serotonin.
  - It strengthens the pathways that prevent amygdala-ofc
- Describing self attachment using the free energy minimizing model:
  - The adult self learns to increase the amount of “q” to create secure attachment in the inner child.