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ATTACHMENT – EMOTIONS WHICH SHAPE DEVELOPMENT AND WELL-FUNCTIONING IN HUMANS

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ABSTRACT

Attachment is the evolutionarily-established process through which humans create bonds with others in order to receive care from them.

The attachment system is treated as an emotion regulation device as well as a major stress regulatory system. The intergenerational transmission of attachment is one of the core hypotheses of attachment theory.

As a new category, cultural attachment was established, referring to processes that allow culture and its symbols to provide psychological security when and individual is facing threat.

Additionally, emotions and feelings could be comprised as "somatic markers" which act as signals guiding behaviour towards beneficial outcomes. Thus emotions are very important not only in everyday functioning but also in decision making processes.

Relying on multidisciplinary evidence – from neuroscientific, developmental, evolutionary, and clinical sources it was suggested that somaticity, as a specific characteristic of attachment, has the adaptive function to modulate our inclination.

In this context, the attachment is confirmed to indispensable emotion in human functioning.

Keywords: attachment, emotions, children, culture

INTRODUCTION

In my previous paper, I mentioned that the crucial roles in human survival are the brain responses which shape the human mind where emotions play the main role. However, in modern life, they pose a serious danger to our individual and collective destiny, which can be formed by some destructive emotions (i.e. hate, craving and delusions) [1]. Figure 1 represents the hierarchical tree of homeostasis proposed by Antonio Damasio. It is obvious that emotions and feelings are on the top of the tree of homeostasis which confirms their importance in human life and functioning [2]. I also mentioned in my previous articles that emotions have the privilege of being the unique difference between artificial intelligence and humans.

For this primary point of view, it is logical that without emotions human life would be impossible, especially from the aspect of social communications and well-being. It must be also pointed out that, different from animals, children need essential physical and emotional support from parents, not only for survival but also for their own growth and development. In this context, emotions are doubtless indispensable to all human functioning.

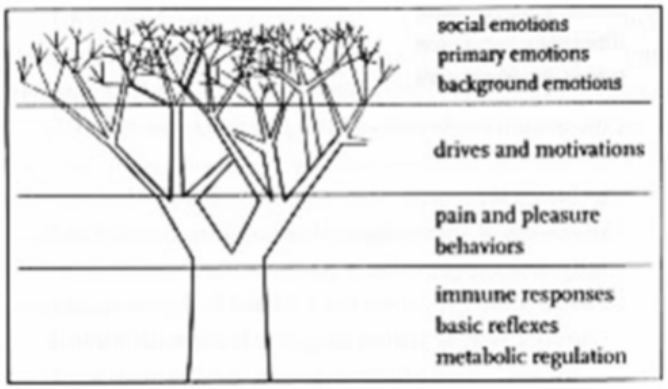

Fig. 1. *Damasio's hierarchy of homeostasis*

ATTACHMENT

Attachment is comprised as an emotional bond between the infant and caregiver, construed in order to help the satisfaction of primary needs of the helpless infant. This bond is understood as a real promotor of subsequent social, emotional, and cognitive development of the child. The infant's early social experience stimulates the growth of some structures in the brain and can influence the formation of stable relationships with others.

The bond between infant and caregiver is usually well established before the end of the first year of life, and for scientific and practical needs it is possible to test the nature and quality of the bond at that time. The type of parenting can influence attachment security, but for a successful parenting not only personal characteristics, but other factors—including genetics—play an important role.

Psychology differentiates four main forms of attachment : secure, anxious-resistant, avoidant and disorganized attachment.

Two important scientists are associated to the theoretical approach of attachment - John Bowlby (for infants) and Mary Ainsworth (for adults) [3, 4]. Bowlby viewed attachment as a product of evolutionary processes [12]. Through the process of natural selection, a motivational system is the main factor which regulates attachment. In this context, primary caregivers who are available and responsive to the infant's needs allow the child to develop a sense of security.

In humans, the behavioural attachment system does not conclude in infancy or even child-

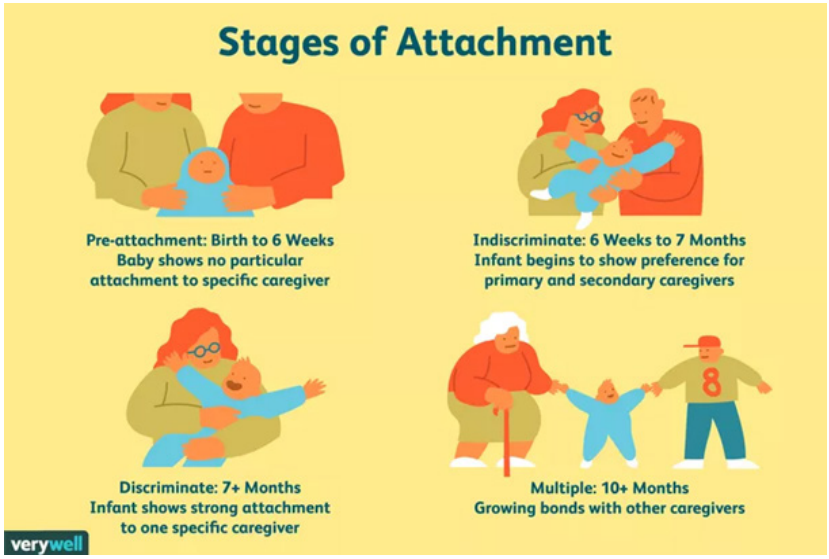

Fig. 2. *Stages of attachment presented graphically*

hood. Instead, it is active throughout the lifespan, where significant other individuals allow comfort from physical and mental representations. Mery Ainsworth confirmed in her studies the profound effects of the attachment on adult behaviour as well.

Based on their own observations, two other psychologists, Schaffer and Emerson [5], outlined four distinct phases of attachment, including:

Pre-Attachment Stage (in the period from birth to 3 months infants do not show any particular attachment to a specific caregiver. Crying and agitation as main signals, naturally attract the attention of the caregiver and the baby's positive responses encourage the caregiver to remain close).

Indiscriminate Attachment (between 6 weeks of age to 7 months, infants begin to show preferences for primary and secondary caregivers. Infants develop trust that the caregiver will respond to their needs. While they still accept care from others, infants start distinguishing between familiar and unfamiliar people, responding more positively to the primary caregiver).

Discriminate Attachment (from about 7 to 11 months of age, infants show a strong attachment and preference for one specific individual. They will protest when separated from the primary attachment figure manifesting separation anxiety and begin to display anxiety around strangers - stranger anxiety).

Multiple Attachments (after approximately 9 months of age, children begin to form strong emotional bonds with other caregivers beyond the primary attachment figure. This often includes a second parent, older siblings, and grandparents).

Figure 2 presents stages of attachment.

The modern approach, from a neuroscience perspective, the study of emotions and attachment especially, has been particularly provoking. Neuroscientists believe that attachment is like a primal need related to the networks of neurons in the brain dedicated to setting it in motion in the first place and that the hormone—oxytocin fosters this process.

It was proven that a strong attachment to the caregiver is critical for survival, especially in altricial species, including humans. Altricial species are those species in which the young are underdeveloped at the time of birth, but with the aid of their parents they mature after birth.

NEUROBIOLOGY OF ATTACHMENT

TEven some behavioural aspects of attachment have been very well characterized in the past, its neurobiology has only, however, recently received attention. Using a mammalian imprinting model, Moriceau S. et al. (2005) assessed the neural circuitry that enables infant experimental rats to bond to a caregiver, thus enhancing survival in the nest. Specifically, the authors confirmed that the hyper-functioning noradrenergic locus coeruleus (LC) enables pups to learn rapid, robust preference for the caregiver. Conversely, a hypo-functional amygdala appears to prevent the infant from learning aversions to the caregiver. Adult LC and amygdala functional initiation correlate with sensitive period termination. This study suggests that the neonatal brain is not simply an immature version of the adult brain but is uniquely designed to optimize attachment to the caregiver [6].

Still, the infant attachment neural circuitry is difficult to define or describe, perhaps because of the difficulty in characterizing terms such as love, security, and comfort. In clinical terms, a secure attachment is one in which the child–caregiver relationship provides not only love, but at the same time pleasure, security, and safety for the child, and results in psychological well-being.

It is proven that the child's attachment to the mother appears to begin even before birth, when the baby receives information 'in utero' about the mother's voice and smell. Attachment continues after birth when the infant recognizes the mother's face. The maternal smell specially produces orienting responses and mouthing and relieves a crying infant. Some novel smells quickly acquire some of these properties through classical conditioning. These smells may have qualities of "safety" or comfort (attenuates crying, orienting) as described in Bowlby's characterization of attachment. It is quite possible that this neonatal learning about the caregiver is the first postnatal expression of learning within the attachment system, and perhaps one of the first ways in which our sense of safety is constructed. Figure 3 presents the neuronal circuit important for the attachment.

It was proven that the separation of mothers and infant provokes an increased risk for morbidity and mortality for babies. Based on the gen-

eral bonding hypothesis, in modern paediatrics, especially in neonatology, it was suggested that kangaroo mother care (KMC) creates a situation where mothers become more prone to sensitive caregiving. The general hypothesis is that skin-to-skin contact in the KMC will build up a positive perception in the mothers and a state of readiness to detect and respond to infant's needs [8]. In this context, in many modern neonatal departments, in our country as well, kangaroo mother care was promoted and applied.

Clinically, it is confirmed that the insecure or disordered attachment to the caregiver results in a variety of maladaptive behaviours and an increased incidence of many mental illnesses in the future period of life. Sullivan RM (2003) supposed that the learning-induced changes in the neonatal olfactory bulb are still present in the adult bulb are related to these adult behavioural effects [7].

In modern neuroscience several research projects, dedicated to the connection of the attachment to the brain and the body, have proposed possible models of how attachment functions. One great innovation for studying the mind–body interaction is the brain–gut axis. The brain–gut connection is the likely culprit as both organs are intimately linked via the vagus nerve. Both structures mediate the neuroendocrine and autonomic outputs to the body and the gut via the vagus nerve. For practical reasons, as a powerful and informative psychophysiological index, skin conductance response (SCR) is used to measure autonomic nervous system (ANS) activity in the study human cognition and emotion. In this context my own experience is very positive.

CULTURAL ATTACHMENT

It is proven in practice that people are different in their responses and ability to cope with emotional events, and that individuals have different emotional thresholds which depend on both genetic and environmental factors. This knowledge imposed the development of an extension of Attachment Theory in the so cold “Cultural attachment (CA)”.

CA refers to processes that allow culture and its symbols to provide psychological security when an individual is facing threat [9]. When an individual is introduced to a new culture, he/she is introduced to different norms, values, beliefs, and structures. The home culture is perceived as a secure base allowing the individual to explore and better regulate his/her emotions in the new environment. In this context, there are evidence of maternal, paternal, and cultural attachment influence the different manifestations of intercultural adjustment [10].

It is unknown if all the features and major principles of attachment theory (AT) could be also applied to the specifies of the cultural attachment (CA). However, two of the many principles established in AT are important: the internal work model (IWM) and the function of attachment targets as secure bases.

Figure 4 shows a schematic and a simplified model of attachment containing these two principles. The internal working model or IWM (the black box), through repeated experiences,

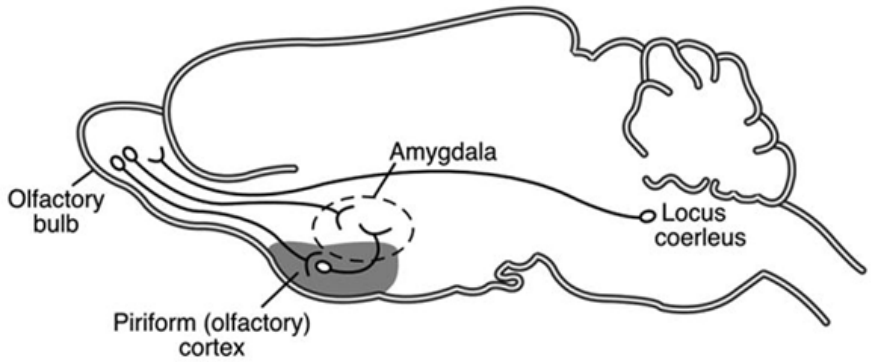

Fig. 3. *Schematic representation of circuitry important for neonatal learning during the sensitive period. To learn a smell preference, a smell must be paired with norepinephrine released from the locus coeruleus. Odor aversion learning from odor-shock conditioning appears to be prevented due to lack of amygdala participation in this learning. (Ann N Y Acad Sci. 2003 Dec; 1008: 122–131.)*

identifies and selects reliable attachment targets which then act as secure bases when these individuals are under threat. The mechanisms behind the IWM and its interaction with the presence and availability of secure bases are currently under-explored. Figure 4 presents possible relations between behavioural responses and secure bases.

An IWM refers to the cognitive framework of mental representations based on the individual's experiences (Bowlby, 1980) [11]. In attachment theory (AT), IWMs relate to representations of the self, others, and their relationship. These representations are mostly implicitly learned and based on childhood experiences with the caregiver. This relationship generates the first rules and expectations about how to interact with others. These rules are then transferred to other social relationships. The core of the prototypical (maternal) AT depends on the early experiences of the child with the caregiver and this form represents a basis for an IWM for further social relationships. In fact, some researchers have associated IWMs with the development of brain areas related to memory and socio-cognitive capabilities.

The Figure 5 presents how culturally relevant stimuli (B) activates the IWM (D). The expanded version of the IWM contains several brain regions that could be involved in acquiring and learning about valuable cultural stimuli. AT suggests that the IWM is activated in the presence of threat (A) to aid in mitigation before a behavioural response (C) is made.

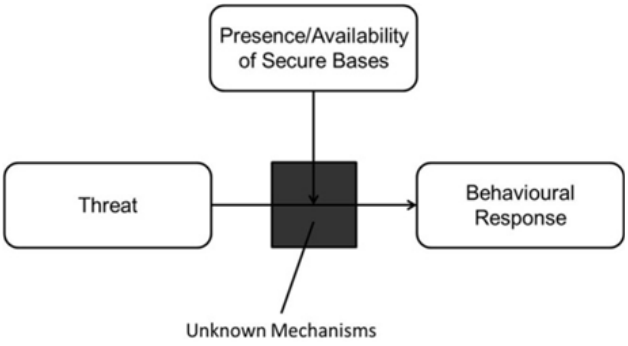

Fig. 4. *Possible relations between behavioural responses and secure bases. (Front Hum Neurosci. 2019; 13: 209)*

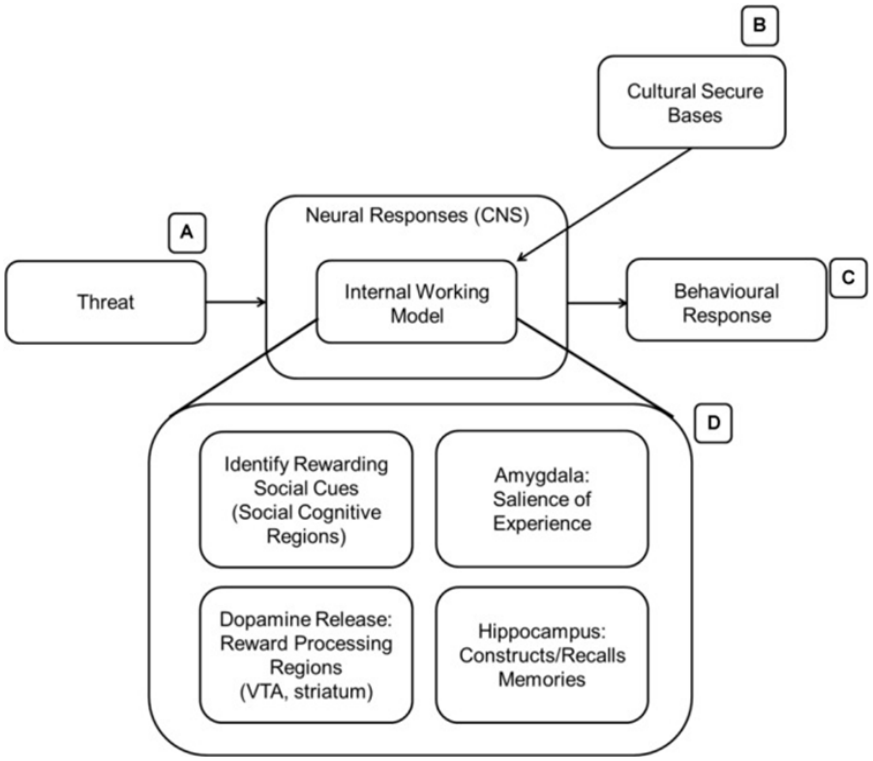

Fig. 5. *The presence of culturally relevant stimuli (B) activates the IWM (D). The expanded version of the IWM contains several brain regions that could be involved in acquiring and learning about valuable cultural stimuli. AT suggests that the IWM is activated in the presence of threat (A) to aid in mitigation before a behavioural response (C) is made. (Front Hum Neurosci. 2019; 13: 209)*

EMOTIONS AS A SOMATIC MARKER

Antonio Damasio and his team are the most important and well-known scientists dedicated to the research of emotions. He has highlighted the importance of emotions in human functioning and suggested some new aspects.

The Somatic Marker Hypothesis (Bechara and Damasio, 2005) suggests that emotions and feelings could be comprised as "somatic markers" which act as signals guiding behaviour towards beneficial outcomes. Therefore, emotions are very important not only in everyday functioning but also in decision making processes, cognitive process. Deficiencies in these markers can lead to inappropriate social behaviour which can be seen in patients with certain types of brain damage [13].

The hypothesis was postulated that reasoned decision making is influenced by wrong signals (named as somatic markers) which arise from changes in the body periphery. In this context, some reactions like increased heart rate or visceral responses which appear as a response to some stimuli, could be reactivated in similar decision situations. It is argued that there are primary and secondary inductions of emotional responses. The primary induction can be understood as innate or learned affective responses arising from a confrontation with pleasurable or aversive stimuli. Secondary inducers comprise affective responses induced by the recall of past events or anticipation of future states which are cognitive phenomena related to memory.

From a neurophysiological view, it is supposed that after an initial affective response triggered by the amygdala (primary induction), the ventromedial prefrontal cortex (VMPFC) subsequently prompts deliberative considerations, which, in turn, triggers further affective responses (secondary induction). Additionally, the somatic marker hypothesis supposes the differentiation between the “body loop” and the “as-if loop”. The “body loop” represents actions of the body itself, whereas the “as-if loop” is associated with the brain representation of the expected/anticipated body action [14].

A key aspect of the somatic marker hypothesis is the “body-loop”, which supposes that emotive events that are expressed in the body can influence decision-making via afferent feedback to the brain. In this claim, evidence for the neural and peripheral mechanisms that support interactions between bodily states and cognitive functions has been confirmed.

Decision making in this context is not mediated only by the orbitofrontal cortex but arises from large-scale systems that include other cortical and subcortical components such as the amygdala, the somatosensory/insular cortices and the peripheral nervous system.

SUMMARY

The emotional regulatory aspects of attachment have been an important issue for many researchers. The attachment system is treated as an emotion regulation device as well as a major stress regulatory system.

Positive feelings of attachment facilitate the release of oxytocin into motivational circuits in the brain. Oxytocin and vasopressin are synthesized in large quantities in the hypothalamus. The hypothalamus co-ordinates activity of physiological and behavioural systems during maternal (or pair bonding in adults) and is important in social tranquillizing during neural threat. The hypothalamus (as part of the HPA axis) is also involved in the regulation of autonomic nervous system responses. Oxytocin release has also been associated with aggression in response to perceived threat to offspring, with whom one shares a strong social bond.

Attachment is the evolutionarily-established process through which humans create bonds with others to receive care from them. The phenomenon is essential for our physical survival, as well as to our psychological development. An increasing number of studies demonstrates that, in sensitive periods during the early years of life, our brain circuitry is programmed in line with the interactions with our caregivers, with the imprinting of information over multiple attachment dimensions.

More recently, adopting a basic *brain-computer analogy*, we can think of this knowledge as the psycho-social *firmware* (software stored in a computer's ROM) of our mind. The caregiving task of reflecting and confirming the child’s (internal) states – such as sensations, emotions, and representations – was suggested to induce

the acquisition of the child's *somaticity*, the somatic attachment dimension. Somaticity is has the adaptive value to modulate affiliation, but also the possible drawback of increasing the vulnerability to social anxiety and eating disorders. Relying on multidisciplinary evidence – from neuroscientific, developmental, evolutionary, and clinical sources it was suggested that somaticity has the adaptive function to modulate our tendency. [15]

Finally, it must be mentioned intergenerational transmission of attachment is one of the core hypotheses in attachment theory. How parents or other caregivers look back on their childhood attachment experiences can shape their infants' attachments. [16]

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Резиме

ПРИВРЗАНОСТ – ЕМОЦИИ ШТО ГО ОБЛИКУВААТ РАЗВОЈОТ И ДОБРОТО ФУНКЦИОНИРАЊЕ КАЈ ЛУЃЕТО

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Приврзаноста е еволутивно воспоставен процес, преку кој луѓето создаваат врски со другите за да добијат повратна грижа од нив.

Системот за приврзување се третира како уред за регулирање на емоциите, но и како главен систем за регулирање на стресот. Меѓугенерацискиот пренос на приврзаноста е една од суштинските хипотези во теоријата на приврзаноста.

Како нова категорија воспоставена е културната приврзаност, која се однесува на процеси што овозможуваат културата и нејзините симболи да обезбедат психолошка сигурност кога поединецот се соочува со закана.

Дополнително, емоциите и чувствата би можеле да се сметаат како „соматски маркери“, кои дејствуваат како сигнали што го водат однесувањето кон корисни резултати. Тоа значи дека емоциите се многу важни не само во секојдневното функционирање туку и во процесите на донесување одлуки што претставува когнитивен процес.

Потпирајќи се на мултидисциплинарни докази – од невронаучни, развојни, еволутивни и клинички извори, беше предложено дека соматичноста, како специфична карактеристика на приврзаноста, има адаптивна функција, со цел да ја модулира нашата тенденција.

Во тој контекст, потврдено е дека приврзаноста се смета за неопходна емоција за човековото функционирање.

Клучни зборови: приврзаност, емоции, деца, култура