

## Social Competition, Psychopathology and the (Physiological) Developmental Trauma. A Narrative Review

**Teodosio Giacolini\***

*Department of Human Neuroscience, Sapienza University, Rome*

**\*Corresponding Author:** Teodosio Giacolini, Department of Human Neuroscience, Sapienza University, Rome.

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### Abstract

The chapter considers the human individual in his BrainMind functioning within the interaction of two vertices, that of the development and that of the motivational/emotional systems. Particular attention is paid to the evolutionary period of adolescence, which constitutes above all for the human species, a real transit to a new hormonal, cerebral, cognitive and emotional organization and at the same time to new relational contests. This transit is therefore characterized, as shown, by a potential (physiological) trauma that makes the adolescent a subject particularly exposed to the difficulty of integrating the multiplicity of motivational/emotional systems in connection to brain, cognitive and emotional development and therefore with the adaptive expectations required by the culture of belonging. The consequence of this complex multifactorial dynamic is a relative vulnerability to psychopathology and to the determination of addictive behaviors both from substances and without substances.

**Keywords:** *Adolescence; Affective Neuroscience; Dominance; Submissive; Psychopathology*

### Introduction

The biologist Ernest Mayr [1] in the 1960s made the distinction between disciplines that work in search of proximate causes (proximate causation) and those that are interested in ultimate causes (ultimate causation) (therefore between a functional and an evolutionary biology). It was a landmark that has marked a significant moment not only in biology but also for those disciplines such as psychobiology or evolutionary psychology and psychiatry, that are interested, through comparative research, in identifying the phylogenetic roots of human behaviors, normal and pathological.

The proximate causes, as it is known, can be summarized by the question “how” a certain psychoneural functioning is determined or how it is an expression of an individual’s development and therefore of his ontogenesis. The ultimate causes refer, instead, to the question of “why” a given psychoneural functioning or the possibility of a certain symptomatic manifestation are present in the biological baggage of an individual, what was the reason and the history that led to their presence, therefore what is their phylogenesis.

In the human species, even more than in others, development involves in a complex way the organic and psychic dimensions, that is the development of what is currently defined as BrainMind [2]. The development of each organism is undoubtedly one of the most interesting chapters of biology of which the Evolutionary Developmental Biology, also called Evo-Devo, developed since the nineties of the twentieth century, it is the most obvious example (see [3] Arthur, 2002).

Among the developmental stages, adolescence is undoubtedly that evolutionary period that combines the organic and mental dimensions in a structural and inextricable way. The psychic characteristics, which in large extent will accompany the individual for the rest of his life, take definitive forms in adolescence, the psychopathological functioning is a dramatic highlight.

Adolescence has a particular importance, therefore, for the study of the neurobiological and mental processes connected to it, and in particular it is that moment of human existence in which they are most visible, through ontogenetic development, the phylogenetic legacies that have come to characterize its specificity of the human species. As we will see later, it is now well documented how pubertal development causes a profound change in brain structures and in its functioning [4]. As a result, the adolescent subject is experiencing a completely different self from the one perceived until a few months before sexual development took place. The consequence is to learn to adapt to a self, in many ways unknown, which pushes the adolescent towards an interaction with the relational environment full of completely new and potentially stressful experiences [5]. For a percentage of adolescents, the experiences lived within this new BrainMind frame will have the quality of an excessive stress, which is called trauma. The concept of trauma was and remains a stainless point of reference in the etiopathogenetic reconstruction of mental suffering [6,7], which has, however, in this way contributed to keep in the shade the physiologically and potentially traumatogenic contribution of pubertal development to psychopathological functioning.

The present article aims to consider the psychopathology as the effect of the transition from the motivational/emotional System of Attachment, active above all during childhood, to the Dominance/Submission, active in consequence of sexual maturation. Connected to this aspect, the article aims to highlight how the alternation of the those two systems, with phylogenetically very different characteristics, determines an evolutionary discontinuity in the development of the BrainMind. This discontinuity constitutes a powerful factor of instability in the functioning of the BrainMind, connected to the need to integrate such different motivational and emotional systems in an evolutionary moment, characterized by strong asymmetry between the subcortical and cortical districts. This state of biological physiological instability of the BrainMind in the adolescent years, is in turn amplified by the social dimension that sees the adolescent having to acquire, outside of attachment with caregivers, a status in the group outside the family, through which continue to satisfy the need for belonging and recognition by other conspecifics. This bio-psycho-social development phase of adolescence, due to the peculiar and physiological characteristics considered above, exposes the human BrainMind „physiologically” to a state of suffering that can determine its reorganization in psychopathological function for the rest of the existence of the subject.

### **Between trauma and stress: the dynamic of motivational/emotional systems**

In the field of psychopathology, the last few decades have seen the spread of studies related to the vicissitudes of the attachment motivational/emotional system, which, as is known, was discovered in the 1950s by J. Bowlby [8]. The motivational system of attachment, instinctual endowment present also in the human species and characteristic of childhood (but not only) [8], has the function, as is known, of maintaining constant contact between offspring and caregiver. Dysfunctionalities of the attachment system have been recognized as one of the central elements in the etiopathogenesis of psychopathology both in children, adolescents and adults (Cassidy and Shaver, 2016). The adaptation, however, of the subject also to dysfunctional relational environments, while giving rise to insecure or disorganized attachments [9], can generate psychopathology only in a percentage of subjects that cannot be predicted prognostically. In this regard, the important work of M. Hofer [10] shows, through animal models, how the adaptation of the offspring to the primary context with “anaffective” and stressed parents, does not in itself determines dysfunctionality. He highlights how the developmental adaptation environment prepares the individual to use his relational learning to manage his own interaction with the world outside the primary context, expected to have similar characteristics to the caregiving environment. Hofer shows how an offspring raised by a stressed and therefore distancing mother, acquires a particularly aggressive relational “character”, which will, however, constitute a resource in the subsequent adult competition life [10]. Hofer, however, does not take into consideration the multiplicity of emotional systems that follow one another during the development of the individual, limiting himself to study only that of attachment. And here we enter the crucial point that the present work wants to highlight and address, that is the multiplicity of motivational/emotional systems that regulate relationship life, connected to the developmental timing of the individual, which follow each other characterizing the various periods of life.

With sexual maturity, the primacy of the attachment system as an organizer of both intra-species relationships and intrapsychic dynamic, passes to another biologically predetermined system present in all vertebrates and therefore also in the human species, called Agonistic Behavior [11] or motivational/emotional system of Dominance/Submission [5,12], responsible for regulating the interactions between sexually mature individuals for access to food and sexual resources. This instinctual system, which takes over the command of the BrainMind, is closely connected, as we will see later, to the hormonal and neurophysiological changes of adolescence, and exposes the individual to emotions not previously experienced, if not minimally within the primary emotional system called PLAY system [2,13], contemporaneous within the period in which the Attachment system was a priority. Learning to manage (coping) the new motivational/emotional system of Dominance/Submission involves, at the same time, the need to manage (coping) the maturation of the motivational/emotional system of Sexuality, and both can expose the adolescent to a stress that is difficult to manage.

### **From childhood to adolescence: continuity and discontinuity in the psychopathology**

The physiologically stressful dimension of the developmental stage of puberty and adolescence in human species is determined by powerful amplifying factors, including the long infantile period in which the attachment system is a priority, as mentioned above. Human childhood is temporally one of the most widespread among animal species and must give way, in a very short space of time, to two phylogenetically more archaic motivational/emotional systems, Sexuality and the system of Dominance/Submission. A second factor, closely related to the first, is the extreme complexity of the relationship and social life evolved with the development of the human species [14], which requires to the individual the ability to learn to regulate the instinctual and cognitive components in relation to specific cultural contexts, learning which to a certain extent takes place in adolescence.

The long period of dependence of the human puppy on the caregiving figures has been identified to be, even before the attachment theory appeared on the scene of psychiatry [8], the relational basin in which experiences qualifying as traumatic and primary source of future psychopathology. The trauma was and it is one of the main etiologies of mental pain, the one that allowed us to formulate the first complex hypotheses on the causes of psychopathogenic factors, starting e.g. from J. M. Charcot with “traumatic hysteria” and from P. Janet with the concept of “accidents” [6,7]. It is only appropriate to recall that there was a historical connection between the birth of the concept of trauma in the modern sense and the medical-legal activity connected to the processes of industrialization, a consequence of the massive increase in claims for compensation to transport companies and insurance companies for diseases attributed to accidents caused by trains, trams and accidents at work in cities in the mid-nineteenth century [6,7,15]. At the same time, consequence of the diffusion of C. Darwin’s ideas [16] in the medical scientific world, the sexual instinct was identified as an etiopathogenic factor of psychopathology. Darwin had highlighted [16] how the sexual instinct was the most vulnerable to the interactions with the surrounding environment and therefore cause of anomalous development and the consequent mal-functioning of the mind. One of the elective factors of the etiopathogenic chain was precisely the sexual trauma, to which the subject could be exposed, victim of sexually unsuitable behavior by family friends, relatives, spouses etc. [17]. Traumatizing sexual experiences were identified in childhood, the cause of subsequent mental disorders, especially by Freud [17], but also by other eminent psychiatrists and pediatricians who were contemporary to him (see Sulloway, 1977) [18].

To the conceptualization of the etiopathogenesis of psychopathology related to sexual traumas suffered in childhood, it has gone alongside and partly replacing the etiology connected to the system of Attachment and to the insecure and disorganized attachments [9] as shown above. To these two theories, the contribution of the Affective neuroscience [13] has been added since the end of the 90s, which has contributed to conceptualizing BrainMind functioning in a more articulated and complex way, also opening up new perspectives as regards the definition of psychopathology. This has increased the field of research, already rich, of psychobiology, allowing to highlight the specificities of the development of the human species. Already S. Freud had particularly highlighted the characteristic of psychosexual development in two great periods, the first infantile one, characterized by three sub-stages, in which it was possible to see in the subject a sexual tension unaccompanied by a procreative capacity, which has found in the Oedipus Complex a crucial moment, and then that which appears starting from puberty with the maturation of the gonads [19]. Freud tried to find an explanation for this sexual development of

the human species, characterized by a first development in childhood and a second development in adolescence, in the phylogenesis of the human species, following the indications proposed by his pupil S. Ferenczi [19]. In this paper titled "Phylogenetic fantasy. Overview of the transference neurose" [19], recently rediscovered and which was to be part of one of the works of Metapsychology, Freud identified in the adaptation of the human species to the period of the glaciation of the terrestrial globe in the Pleistocene a powerful inhibitory factor of sexual activity, caused by the need to reduce conception due to lack of food. The inheritance of this adaptation (we remember Freud as a convinced Lamarchian) would have determined the ontogenetic development in two stages of sexuality. The Freudian theory of psychopathology, although it can be defined as continuist (Freudian continuistic theory of psychopathology), highlights a significant hiatus between the first infantile and the post-adolescent in psychosexual development. This hiatus was from the beginning conceptualized by Freud through the concept of Nachträglichkeit [17,21] translated as *Après Coup* by J. Lacan while the official English translation of Freud works by J. Strachey Standard Edition) does not use a single term to make its various occurrences: "understood later", "understood subsequently", "deferred action", "after-effect", "subsequent". With the concept *nachträglich* Freud emphasized how a childhood experience can become traumatic only in the aftermath, after puberty, thus acquiring the traumatogenic charge only in the mind of the sexually developed adolescent. Psychosexual development colors children's experiences with new meaning, highlighting the specificity of the new phase of development. Freud, who built one of the first general theories of psychic and psychopathological functioning, came to outline the picture set out above after seeing the inconsistency of the trauma (see above) as an experience reported by patients, especially women, as the cause of their suffering [17]. Famous is the statement written by Freud to his friend Fliess on September 21, 1897, about the inconsistency of that etiology: "I no longer believe in my neurotica [theory of the neuroses]" [22]. In this way the real trauma, as etiopathogenesis of psychopathological problems, went into the background and was highlighted in the foreground a model based on the processes of development of the libidinal, sexual drive. Freud, therefore, while recognizing the specificity of sexual maturation as a new structure both organic and mental, seems to have oscillated between the possibility of recognizing in this a discontinuity in psychopathological processes, the concept of *nachträglich* would be an evidence, and instead attribute the cause of future psychopathology to the intrapsychic childhood experiences in a more continuous way. This continuous etiopathogenetic model connected to psychoanalytic theory, was subsequently supported by a model on the theory of the attachment system as the first movens of the future psychopathology of adolescent and adult [23]. In both theories the problem of adolescence as a developmental phase with peculiar characteristics such as to determine a discontinuity in the etiopathogenesis has continued to be largely unrecognized. The sexual maturity to which Freud recognized the function of recontextualization of childhood experiences, is the hormonal aspect of a profound remodelling of the neurophysiological organization, which makes the adolescent an individual with specific species characteristics. Among these, the most defining bio-psycho-social characteristic of this new phase of life is the drive towards social competition, which constitutes one of the significant factors in determining psychopathology. To describe this factor, I will use psychoses as a species-specific psychopathology.

### Social defeat and psychopathology

One of the prominent features of the symptoms of the schizophrenic spectrum is the sense of threat that afflicts the subject, which may be visible in most of the contents of verbal hallucinations [24], malicious and hostile sentences, which highlight a sense of danger or as an emotional experience that invades the subject as a traceable effect of the breaking of a protective presence [25,26].

Why, then, is the sense of threat, submission to the other and the emotions connected to it present in psychoses? To answer, I will use the conceptual evolutionary model through the contribution that evolutionary psychology and psychiatry and the Affective Neuroscience [13] have given to it.

A characteristic aspect of psychoses is their appearance after sexual maturity, infantile psychoses are rare, while there is a significant percentage of debuts in adolescence and young adulthood, as well as individuals who in these epochs of life manifest prodromal signs [27] that make them individuals at high risk of developing a psychosis [28]. And in fact breaks in the protective continuity attributable to

changes in an environmental context, or the breaking or disappearance of significant ties, especially primary ones, can be the detonator of a mental state that is already potentially vulnerable to the psychotic state.

The literature related to the field of evolutionary psychiatry, therefore interested in identifying the “ultimate causes”, has long shown how the dimension of threat, danger, submission to the other, present in symptomatic manifestations and in psychotic emotional states, can be considered homologous to the manifestations of Agonistic Behavior [11] and to its neurophysiology which characterizes the behavioral dynamic present in all vertebrates [29-31]. The Agonistic Behavior is activated between sexually mature individuals to establish a hierarchy between a winner, Dominant, and a loser, Submissive, in order to regulate priority access to food and sexual resources [31]. We are within the interactions of the Sexual Selection described by Darwin [16], through which the conquest is determined not only of sexual satisfaction but, in the human species, also the conquest of new bonds of attachment and dependence. Freud, as an evolutionary psychiatrist as he was, has constantly proposed to explain both physiological and pathological functioning, alongside a reconstruction of the “proximate causes”, including the phylogenetic causes of “ultimate causes”, in which the identification of intra- species conflict was a central element, just remember Totem and Taboo [32].

The psychotic mental state, with the paranoid dimension constantly around the corner and the sense of danger so present, to which in a reactive manner can follow massively aggressive rebellion, can be considered particularly connected to the dual motivational/emotional system of Dominance/Submission [12,33]. This complex system, present from birth in the biological heritage of the subject, has its full maturation with the development of the sexual system at puberty and in particular with the production of androgenic hormones that support one of the two components of the system, the competitive engagement for the affirmation of one’s own Dominance. Complementary to the system of Dominance is that of Submission, which is activated when the subject recognizes that he is inferior within the agonistic competition, consequently manifesting behaviors of submission, avoidance, withdrawal aimed at defusing the aggression of the winner and perceived by human beings as anxiety, sense of inferiority, danger and threat. The Submission system is connected to the HPA(hypothalamic–pituitary–adrenal) stress axis and therefore to cortisol, which are the fulcrum of the primary motivational/emotional systems of Fear (FEAR system) and of Panic (PANIC system) studied by Affective neuroscience [13]. These two systems, the neuro-emotional basis of the Submission behavior, are responsible for the homologous characteristics that we find in the animal and human world, particularly studied by Robert Sapolsky [34]. The American psycho-biologist has conducted comparative research, highlighting how the submissive animals live in a state of perpetual alarm, caused by the expectation that the dominant reaffirms its apicality. This chronic state of alarm is manifested through the neuro-hormonal characteristics of chronic stress, that is the HPA stress axis no longer responds to negative feedback remaining cortisol hyperproduction to which is added the low production of androgen hormones, with behaviors homologous to human ones of reactive anxiety and depressive avoidance [34]. Similar situation has been detected in schizophrenic male patients, characterized by low presence of testosterone and cortisol hyperproduction [35,36], a similar situation in women where we find low presence of estrogen and hyperproduction of cortisol [36].

The system of Dominance/Submission is one of the most archaic systems of regulation of interactions between conspecifics [37] and has in the dopaminergic system another nerve center, of which the nucleus accumbens plays a particular role in recording and expressing the experiences connected to the Social defeat [38,39].

Returning to psychosis, the significant prevalence of this pathology between males compared to females has been linked to the production of androgen hormones, which in males is about ten times greater than in females,

which in turn increases the synthesis and regulates dopaminergic transmission [40]. Simultaneously during puberty both testosterone and estrogen determine the proliferation of oxytocin receptors in the various limbic structures, including amygdala and nucleus accumbens [41], raising awareness of the salience of relational stimuli. Always connected to puberty there is an increase in the basal production of cortisol and of its receptors in the regions of the dopaminergic system such as prefrontal cortex PFC, hippocampus, striatum

[41,42]. To this is added that the amygdala, the central element of the emotional system of fear (FEAR system) at puberty, as it is known, matures long before the cortical areas called to modulate its functioning. All these features related to pubertal development, make the adolescent subject more sensitive to social fear than he was previously in childhood. Thus the adolescent subject finds himself dramatically exposed, on one hand to the urge to affirm himself to excel in the new context of sexual selection and at the same time to a greater vulnerability to social adversary signals, to fear and to the effects of defeat. Thus the biological presuppositions of that vulnerability to mental suffering that interacts with the complexity that, in the human species, has acquired the agonistic system of Dominance/Submission, compared to what we find in the other animal species, come to emerge. The complex relational life, a species-specific aspect, exposes the human subject to having to compete but, if defeated, not being able to run away but having to remain close to the winner in a position of subordination, to avoid the loss of belonging to the group and his same existential recognition. The evolutionary history of the Oedipus Complex sketched by Freud is the representation of this state of affairs within the infantile family microcosm, which finds a solution with the supremacy of the Attachment system. But with puberty things change, the subject is driven by his sexual and neurophysiological development to get out of the protective walls of the family to go in search of new attachments, to be conquered through the ability to compete which simultaneously implies the ability to create and cultivate alliances and friendships. This function with two unknowns, competing and cooperating [43], makes the relational dynamic, starting from adolescence, extremely complex to manage, so much so that we can speak of a physiological developmental trauma [5]. The subject is exposed, starting from adolescence, to experience catastrophic anxieties and annihilation, connected to the perception of his own incapacity to modulate and integrate the desire for relationship with the drive to excel within those same and simultaneously with the need to tolerate frustration and fear related to Social Defeat. The latter implies, let us remember, not only give way to the contender but above all activation of atavistic anxieties connected to the fear of not being able to access the new attachment bonds and therefore remain on the margins of social relations, with the spectre of definitive expulsion from the group. An example of this is the extensive literature that shows how the increase in complexity of social life, and therefore of complexity in managing and integrating competition, cooperation and defeat, correlates with the increase in percentages of psychoses connected with urbanization [44] and immigration in new contexts [45-47].

At the same time the Social defeat powerfully activates the nucleus accumbens, fulcrum of the mesolimbic and mesocortical dopaminergic system, as well as of the SEEKING system [13] (Panksepp, 1998). According to the unifying theory of the function of the nucleus accumbens and of the dopaminergic system [48], this system becomes active both for new appetitive stimuli but also for aversive stimuli [49] to find a way to "salvation". Not only that, the nucleus accumbens is also involved in the learning and expression of the Social defeat [36] [37] in interaction with the dorsal striatum [50]. Interestingly, the same nucleus accumbens (shell) is also involved in the learning and expression of dominant aggression [36,37]. The dopaminergic system, which has always been identified as significantly involved in the dynamics of psychosis, is therefore also a nerve center for learning and expressing the system of Dominance/Submission.

S. Gould in his *Ontogenesis and Phylogenesis* (1977) [50] highlights how one of the variables that determined the evolution, in particular, of the human species, was the progressive developmental delay that allowed a "morphological neoteny" but above all a "behavioral neoteny" that has determined: "[...] the persistence of that "youthful" character that characterizes our behavioral flexibility" (cit. in Gould, 1977, p. 361) [50]. In this regard K. Lorenz writes regarding behavioral neoteny: "Exploratory and inquisitive behavior confined in animals to a brief phase of development, has extended (in the human species N.D.R.) to persist until the appearance of senility" (cit. in Lorenz, 1971, p. 239) [51].

The psychosis, therefore, seems to have roots in that passage from the Eden of childhood, where the Attachment/Care systems excelled, which allowed to continually rebalance the disregard caused by interaction with reality thanks to the intervention of a caregiver, to the harsh reality of the emotional system of Dominance/Submission. This passage constitutes a real developmental trauma [43], such as to invade the subject's psyche with fears never experienced during childhood, connected to the emotions of the system of Dominance/Submission. The characteristics of this system, described above, make it particularly able to crystallize prematurely that "behavioral

neoteny” which makes ductile our functioning, monopolizing the subject’s motivational and emotional world, making it less plastic and adaptive, as in the psychosis.

In the present article, the methodology was overlooked because it is a narrative review. The article, therefore, took into consideration the literature of research on neurophysiology of brain development that takes place in adolescence, in parallel with sexual development, as illustrated in this article. These results allow us to argue that this is a phase of development with peculiar characteristics, which creates a discontinuity with the BrainMind organization of previous periods. The hormonal and neurophysiological characteristics of adolescence primarily organize the motivational/emotional system of Dominance/Submission that matures in this growth period. This system in turn becomes the main organizer of the emotional systems responsible for regulating the interactions between conspecifics, and therefore, especially in adolescence, the main organizer of BrainMind emotional functioning. In fact, the research data show that adolescence is an evolutionary moment of particular instability of the BrainMind, due first of all to the asymmetry of the maturation of the sub-cortical areas with respect to the slower development of the regulatory areas of the prefrontal cortex. Alongside this it is peculiar, and a source of instability, the work of integration that the BrainMind is called to support to make synergistic two motivational/emotional systems, Attachment and Dominance/Submission, belonging to phylogenetically different eras and having bio-social purposes altogether different. The subject who adapted in childhood to remain close to the caregiver who took care of him in order to survive, with sexual maturation must adapt to a self that can have ties of belonging, affective, and therefore of social survival, only if he will be able to adapt to manage the archaic system that drives him to compete with his fellow-men, tolerating the fear of defeat, or the elimination from the group to which he belongs.

### Conclusion

The neuroscientific researches in the clinical field have allowed to highlight, as described above, that the aspects connected to the activation and integration in the BrainMind of the subject of the archaic system of Dominance/Submission, constitute the main organizer of human mental suffering, or psychopathology. Greater attention to the study of this system and to its conscious management in the clinical setting will allow a more effective treatment of mental suffering not only in an elective way in adolescence, where psychopathology has its debut but also throughout adulthood.

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