

AFFECTIVE NEUROSCIENCE. EMOTION FROM “BASIC EMOTION” APPROACH

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CZU: 159.942

DOI: 10.46727/c.25-04-2024.p141-152

Abstract. The emotional experience that accompanies us in experiencing life has caused numerous controversies due to the subjectivity of this experience, so that currently there is no scientific consensus on the place it occupies in psychic life, its nature, as well as the mechanism of production. Affective neuroscience has sought and provided an answer to these challenges by outlining a theory of personality from a bottom-up perspective, identifying seven primary emotional systems specific to the mammalian brain that originate in subcortical structures. The identification of these emotional systems was possible through the use of electrical stimulation techniques, pharmacological manipulation as well as studying the lesions caused at the animal brain level. The proposed vision in which emotion is seen from a categorical perspective, is a monistic one of the classic brain-mind duality, intending a new perspective in which the intrinsic aspect of the brain in certain mental contents is taken into account. This article provides an overview of this paradigm in which emotions originate in primary emotional systems determined by the process of evolution with a role for survival.

Keywords: emotion, affective neuroscience, emotional system.

Introduction

Emotion is an essential construct in psychology which, as Mihai Golu [1] tells us, has provoked numerous controversies due to its nature, place and mode of production. As we find in Elaine Fox's fairly recent work [2], there is still no

scientific consensus on the nature of emotion. There are two fundamental approaches to this construct, namely a perspective where emotion is seen as basal, evolutionarily determined, and a perspective where emotion is seen as evaluative in nature and originating from cortical activity. The perspective proposed by the affective neuroscience positions itself towards a paradigm in which emotion is basal, categorical and argues for the neural constitution of emotions. A picture of basal emotional systems that have a biological basis is put forward. These being located in subcortical areas, reinforcing this evolutionary perspective of the brain, it brings novelty through its bottom-up character. In this sense, looking hierarchically, through the prism of affective neuroscience, emotion precedes cognition. This monistic perspective of brain-mind duality is given a dynamic role in which emotional experiences program neocortical functions. Given the important implications of this perspective in various research areas, it is also the motivation for the choice of the topic of this article. This theory has experienced and is experiencing criticism, but the article aims to provide an overview of this theory and its applications, starting from the definition of emotion and the two scientific directions through which emotion is approached.

The subjective experience of emotional experiences brings with it a difficulty in dealing objectively with this process. According to Shields and Zawadzki [3] researchers have distinguished emotion from mood and affect, viewing affect as an automatic positive or negative general emotional state when interpreting the world, and mood as a general background emotional state that has no object. As for emotion, it is defined as "a constellation of high-intensity responses involving typical expressive, physiological and subjective manifestations" [4, p. 411], a "fundamental affective phenomenon that develops either as a spontaneous and primary reaction, in the form of primary emotion or affect, or as more complex processes, linked to a secondary motivation and representing, according to our systematization of the emotions proper" [5, p. 231], a "complex pattern of reaction, involving experiential, behavioural and physiological elements, by which the individual attempts to cope with a personally significant problem or event" [6,

p. 197], an ability to experience in a subjective manner the states of our nervous system [7]. The definitions associated with emotion make it possible to understand the essential role it plays in the dynamics of mental life, thus making it necessary to understand its nature, purpose, content and trigger mechanism. The literature outlines two fundamental theoretical perspectives in the scientific study of emotion, namely a categorical perspective in which emotions represent biologically constituted action plans in interaction with the world [2], emotions being "basal" [8] and a dimensional perspective in which emotions are explained by their "evaluative" character [3]. Emotion is a common theme in the writings of philosophers and writers, often linking it to thought and how emotion can be controlled [3]. According to Gendron and Feldman Barrett [8] the debut of the scientific approach to emotion is given by Charles Darwin in 1872 who in his paper "*The Expression of the Emotion in Man and Animals*" [8, p. 316] advances a view that humans and animals exhibit similar bodily stereotypic expressions. The same article reports that in 1884 a critique followed from the psychologist-philosopher William James, who in his paper "*What is an emotion?*" [8, p. 316] he points out that in fact emotion is produced by bodily activity and not vice versa. This perspective regards cognitive interpretation as responsible for somatic changes [9]. As Sheila Hayward [10] reports, in the same period, although they had a separate investigative path, psychologist Carl Lange launched a similar theory, which is why the theory is called James-Lange. Gendron and Feldman Barrett [8] point out that this theory too was criticized by Walter Cannon in 1927 in his article "*The James-Lange Theory of Emotion: A Critical Examination and an Alternative Theory*" [8, p. 316], in which it is shown that bodily reaction cannot generate emotions because of the ambiguity of the senses and because visceral changes are too slow. This was followed by a 40-year period of the "Dark Ages" [8] dominated by behaviorism and in which the emotion dimension was no longer addressed, with the paradigm of behaviorism becoming dominant in experimental psychology in the USA [3]. According to Atkinson et al [11], the founder of behaviorism John B. Watson stopped any introspection process, behavior became the main source of information in the

analysis, removing claims about consciousness. During this period the emphasis was placed on objectivity by quantifying the stimulus-effect equation, removing aspects of subjective experience. The work of Gendron and Feldman Barrett [8] shows that this was manifest until 1960 when Magda Arnold published her paper "*Emotion and Personality*" [8, p. 316], followed by Sylvania Tomkins with his paper "*Affect, Imagery, Consciousness*" [8, p. 316] and Stanley Schachter and Jerome Singer's "*Cognitive, Social, and Physiological Determinants of an Emotional States*" [8, p. 316], which brought the emotion dimension back into focus. These directions currently constitute the fundamental paradigms in the scientific approach to emotion. Shields and Zawadzki [3] show that Magda Arnold is seen as the proponent of the dimensional perspective of emotion being followed by Richard Lazarus, George Mandler, Nico Frijda and others, and Sylvania Tomkins as the modern inspiration for the categorical perspective in which emotions are basal, being followed by researchers such as Izard, Ekman and Panksepp.

About Jaak Panksepp's affective neuroscience

According to Montag et al. [12], Jaak Panksepp introduced the term affective neuroscience in 1992 and is the founder of one of the most prominent theories in the science of emotion. He was born in Estonia in 1942 in Tartu [13] but, as Davis and Montag [14] report, the situation due to the Second World War led his family to move with him to the United States where Jaak Panksepp ended up studying engineering for a short time at the University of Pittsburgh, quickly changing his field to clinical psychology. The two authors point out that during this period of study he worked with psychiatric patients in a psychiatric hospital where it dawned on him that understanding psychopathology requires understanding emotions, which is also why he switched from clinical psychology to neuroscience, as we call it today. He completed his master's degree at the University of Pittsburgh in 1967, and in 1969 received his PhD in neuroscience from the University of Massachusetts [13]. According to Davis and Montag [14], he realizes that the way to understand human emotions is to use experimental research on the animal brain thus helping to remove the speculative approach found in clinical theory. Thus, by means of

electrical stimulation of the brains of mice he sought to identify the neural constitution of emotions following in the footsteps of Walter Rudof Hess [14]. Focusing on the hypothalamus, he identified two types of aggression in mice, which were later shown to be in response to stimulation of the FURY system and the FIGHT system, respectively [14]. Arriving in 1972 at Bowling Green State University [13] he began to outline his own hypothesis regarding a role for opioids in modulating behavior and social emotions and in the formation of social attachment [15]. It then identifies the PLAY system demonstrating that decortication of newborn mice does not produce a loss of the need to play [14]. As Davis and Montag [15] point out, in 1998 Jaak Panksepp presents in his paper "Affective Neuroscience: The Foundation of Human and Animal Emotions" [15, p. 2] seven primary emotional systems specific to the mammalian brain that originate in subcortical structures, namely the systems of SEEKING, FEAR, SADNESS, ANGER, LUST, CARE and PLAY. In his paper, Jaak Panksepp [7] points out that this picture of emotional systems may be an incomplete one and that there may be several primary emotion systems controlling different types of distinct behaviours. The proposed theory actually adopts a bottom-up perspective, from the archaic subcortical areas to the neocortex, with the subcortical areas seen as the foundation for these primary emotional systems [16]. As Montag et al. [12] report, their identification required the use of electrical stimulation techniques, pharmacological manipulation as well as studies of brain damage. In order to understand brain functioning, affective neuroscience proposes the solution of psycho-neuro-ethological triangulation, which studies both animal brains and specific subjective mental states as well as emotional instinctual behaviours [16, 17]. As Panksepp and Biven [16] point out, the proposed view is a monistic one of the classical brain-mind duality with the intention of a new perspective that takes into account the intrinsic aspect of the brain in certain mental contents. In this view of affective neuroscience, emotional experiences represent the expression of the dynamics of the variety of emotional systems of the brain that generate instinctual emotional behavior [17]. Thus, as presented in the works of Panksepp [17] and Panksepp and Biven [16], the

issue of consciousness is brought to the fore, with two types of consciousness being indicated, namely an affective one as an intrinsic function more specific to subcortical areas and which has its onset in the dynamics of the variety of emotional systems and a cognitive one more specific to the neocortex. Unlike the "dimensional" paradigm of emotion in which emotion originates from cortical activity, from cognitive reflection, emotional experiences originate in subcortical areas, namely in instinctual action systems, in the emotional action apparatus that determines unconditioned emotional behavior and programs neocortical functions [16, 17]. According to Panksepp and Biven [16], animal studies show that the neurochemistry and neuroanatomy of these systems show more similarities than differences concluding that the basic biological values of the mammalian brain follow the same pattern. Three levels of control in the emotional-affective brain are proposed, namely a primary process level specific to emotional, homeostatic and sensory affect, a secondary process level of emotion comprising learning through conditioning and behavioral and emotional habits, and a tertiary affect level comprising thoughts about experience [16]. A specific word was used for the system names using the lettering of each system to emphasize their scientific meaning rather than their common meaning [7, 12, 15]. From the perspective of affective neuroscience, as presented by Jaak Panksepp [17], emotion includes affective, cognitive, behavioral, and physiological changes, affect is the component of subjective experiential feeling, and emotional affect is related to internal brain action states triggered by environmental events. The specific brain regions with primary emotion generation indicated by affective neuroscience start from the midbrain especially the periaqueductal gray matter (PAG) to the hypothalamus and medial thalamus, to the limbic system including the amygdala, basal ganglia, cingulate cortex, insular cortex, hippocampus and septal area, and to frontal, medial and ventral cortical brain regions [16]. As presented by Montag et al. (2021), depending on the valence of the emotion generated these primary emotional systems are divided into primary emotional systems that generate positive emotions SEEKING, LUST, CARE and PLAY and those that generate negative emotions

ANGER, FEAR and SADNESS. Basically, the type of these emotions guide behavior as well as learning based on the pleasure principle. In this sense, emotions determine the positive or negative valence of situations encountered with implications for learning [12]. According to the work of Jaak Panksepp [7], Davis and Montag [14, 15], Montag et al. [12], Solms [18] who present the seven primary emotional systems, it appears that a first emotional system called the SEEKING system determines intense exploration behavior being accompanied by euphoric curiosity, enthusiasm, excitement in anticipation, having an important role in survival. According to Jaak Panksepp [7] this circuit has been narrowed down to its broad meaning by assigning it the role of reward learning. Another identified system called the ANGER system evokes the experience of frustration and anger when the mammal is constrained from action with the purpose of defense and guidance for survival [7, 12, 14, 15]. The FEAR system is responsible for determining flight or locking behavior in order to avoid destruction, avoid danger to bodily integrity [7, 12, 14, 15]. The PANIC system is activated by separation anxiety [7, 12, 14, 15], and according to Solms [18] it is specific to the stereotypical sequence of rebellious behavior followed by desperate behavior. It is a system that ensures social dependence and dependence on parents [7]. The LUST system determines the emergence of the need to mate which unanticipatedly involves the survival of the family genes and thus the species through the satisfaction of pleasure [7, 12, 14, 15, 18]. The CARE system, when activated, generates caring behaviors towards the young in need [7, 12, 14, 15] but also towards family and friends [14]. The PLAY system causes the emergence of the need for play, which through social interaction leads to learning boundaries and hierarchies, learning the rules of interacting with others [7, 12, 14, 15], but which may also contribute to cortical regulation [12].

Applications of affective neuroscience theory

The bottom-up perspective brought by affective neuroscience on emotional experiences, which are grounded in subcortical areas with implications in neocortex programming, shows its usefulness in various areas of interest. There is a significant range of research fields investigating the theory of affective neuroscience, which

shows the important character of the theory by proposing primary emotional systems as the physiological foundation of human personality [19]. A moment of research expansion using the theory of affective neuroscience was the appearance of an evaluation tool for primary emotion systems. Thus, Davis et al. [19] published a paper in which they proposed an evaluation tool for basic psychic emotions called Affective Neuroscience Personality Scale [19] to identify personality variability given by these primary emotion systems and in which the relationship identified between the ANPS dimensions and the five major personality traits is presented. An instrument appears that allows the identification of these primary emotion systems, however, it renounces the LUST system due to the bias that the responses to items specific to this dimension can cause [12]. Although it is an indirect assessment of emotional experiences, the instrument currently knows several variants as well as a series of translations, these being used in numerous studies on the emotional nature in different contexts [14]. By the prediction it proposes, namely that the process of primary emotions represents the "psychobiological foundation of personality" [15, p. 7], the theory of affective neuroscience shows its importance in the study of personality. In this sense, the studies carried out have highlighted a link between primary emotional systems and the five major personality traits, but also with the 6-factor model called HEXACO [12], the affective personality profiles showing stability over time [20]. Understanding personality also involves promoting well-being [21]. Thus, the theory of affective neuroscience is also approached in the clinical field in the study of endophenotypes proposed by theory in order to identify markers that can explain the etiology of mental illness [22], in the study of depression [21], in the study of anxiety regarding coping style [23], in attention deficit hyperactivity disorder (ADHD) [12]. Moreover, it is also found in the field of work by creating an application to identify possible areas for intervention [24], in the field of education regarding, for example, the choice of the educational field [25], as well as in biological validation studies [12].

Discussions

From the perspective of the research interest of this theory, the importance of its possible validation is understood, offering a new perspective on emotion, the role of the affective process that is related to the cognitive process and not against it [2]. Considering that the affective experience is present in the subjective experience of contact with the environment, the perspective of using this theory becomes very comprehensive.

Maybe the cognitive effort to look towards what emotion represents, as well as its importance, requires a dethroning of cortical fallacy and an acceptance regarding function and not position.

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