

Neuroscientific perspectives for a theory of trauma: a critical review of integrative models of biology and culture

Perspectivas neurocientíficas para uma teoria do trauma: revisão crítica dos modelos integrativos entre a biologia e a cultura

Perspectivas neurocientíficas para una teoría del trauma: revisión crítica de los modelos integradores entre la biología y la cultura

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Abstract

In the last 25 years of the 20th century, psychopathology coded a diverse range of social phenomena under the heading of trauma, featuring the study of psychological trauma as an autonomous area progressively informed by cultural and neurobiological research. In this scenario, we witnessed the emergence of the biocultural paradigm, an epistemological perspective that seeks to elucidate the interactive trajectories by which culture and biology consolidate each other's effects. This article will address the intersections between the field of psychological trauma and neurosciences, based on the analytical dimensions of expansion of the category of posttraumatic stress disorder (PTSD), the epistemological premises of neurobehavioral studies of stress and fear, and the limitations of the bidirectionality hypothesis advanced by contemporary cultural neurosciences. The elaboration of definitively integrative approaches can assist the development of comprehensive models capable of conceiving knowledges and practices at the level of human experience, avoiding reductionist interpretations that submit complex cultural and subjective experiences alternately to the imperatives of the brain and to semiologic codes of pathogenic reasoning.

Post-Traumatic Stress Disorders; Psychological Trauma; Neurosciences; Culture

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Introduction

Since the elaboration of the third version of the *Diagnostic and Statistical Manual of Mental Disorders* ¹ (DSM-III) when the American Psychiatric Association (APA) formally established posttraumatic stress disorder (PTSD) as a disease category, we have witnessed a profound transformation in the understanding of disorders related to psychological trauma and the emergence of new disciplines and practices dedicated to elucidating their etiology and effects ^{2,3,4}. Coined in the final stages of the United States' military intervention in Vietnam, the social valence of the APA construct accompanied the expansion of organized movements in the consolidation of specific social groups' civil rights, as in the case of war veterans lobbying the DSM-III for recognition of the profound lack of care they were suffering ^{5,6}. As a result of this historical and political conjuncture, PTSD became the dominant cultural idiom for discussing trauma-related stress in the Western world ⁷. Since Western biomedicine continues to expand its global influence, PTSD is also defining the way trauma-related stress is understood in post-conflict societies. For Theidon ⁸, the discourse of trauma plays a fundamental role in these societies and in the very configuration of humanitarian conceptions of suffering.

In the last three decades, the breadth of application of PTSD has expanded dramatically, making the concept of traumatic memory the dominant thrust in the medical incursion into the phenomenon of "social suffering" ^{5,9}. This scenario revealed the sociopolitical workings behind the elaboration of a veritable trauma industry destined to demarcate markets and furnish specialists to act in post-conflict societies ⁸. From Holocaust survivors to American soldiers returning from the Vietnam War, the globalization of the discourse on trauma was backed by humanitarian interventions to standardize its narrative, confining the meaning of disturbing events to the lexical possibilities of traumatic reasoning ^{10,11,12,13}.

Thus, the concept of trauma became omnipresent in the organization of contemporary Western societies, an episteme supplying the ethical framework by which theoreticians and clinicians came to describe the virtuality of the experience of violence and its vicissitudes ^{14,15}. Trauma would be the current means by which we would establish a causality between present suffering and past violence – the scar that a tragic event leaves in an individual victim or witness, and likewise a collective mark, in a group, of a historical experience that may have occurred decades, generations, or even centuries before ⁶. For Bistoën ¹⁵, whenever a sudden, unexpected, and horrific event interrupts life's natural course, the language of trauma is recruited by professionals and laypersons in their attempt to represent the unthinkable. The author notes that one now speaks of diverse experiences (rape, genocide, slavery, torture, terrorist attacks, or environmental disasters) through the same language, both clinical and metaphorical, for the trauma, as one signifier for a plurality of ills ⁶. The notion of trauma was thus dilated to cover a wide range of extreme situations and diverse individual and collective responses ¹⁴.

Although the contemporary configuration in the history of disciplines allows some level of overlapping between the concept of traumatic stress and PTSD as a disease category, we realize that the synonymy of these correlated notions reveals a hazardous epistemological imprecision for the field of psychological trauma, especially due to the ethical and technological repertoire it elicits. Such was the debate that expanded the scope of trauma beyond the semiologic limits of the psychopathological category, allowing extensive approaches at the thresholds of psychiatry ^{16,17}. In the opinion of Kirmayer et al. ¹⁴ (p. 1), "trauma can be viewed as a sociopolitical event, a psychophysiological process, a physical and emotional experience, and a narrative theme in the explanations of individual and social suffering". Therefore, the study of psychological trauma extends beyond the study of PTSD, where the latter can be considered as a sort of epiphenomenon of the more primordial event of traumatic stress ¹⁸.

The exponential propagation of the field of studies on traumatic stress incorporated research and treatment of trauma in the areas of psychiatry, psychology, and neurosciences, but also social and behavioral sciences ¹⁹. By 1993, Wilson & Raphael ¹⁹ (p. xxi) already stated the following: "To establish some perspective on the rate of growth of the field, one only has to recognize that a decade ago there were no reference books on traumatic stress syndromes, few standardized psychological measures of the disorder, little knowledge about the biological basis of behaviors associated with PTSD, and a limited understanding of effective therapeutic approaches. Today, in contrast, there are over 40 books on trauma and victimization, a Journal of Traumatic Stress, and hundreds of scientific articles in the major professional journals".

More recently, the rhetoric of trauma has been traversed by ethical and theoretical references resulting from the tension caused by the entry of new disciplines in the dispute for the debate on traumatization^{20,21,22,23}. These joint initiatives have impacted the elaboration of transdisciplinary treatises, oriented by integrative approaches^{14,22,24}, besides the epistemological shift of the concept of trauma – previously the strict discursive monopoly of American psychiatry²⁵. Complex trauma, historical trauma, mass trauma, and more recently the notion of rupture are modern variants that attest to the complexification, in the midst of this debate, of the accommodation of new paradigms associated with possibilities of collective (or secondary) traumatization and even transgenerational traumatization in affected individuals^{26,27,28,29,30,31}. Our interest in this article is to reflect on the epistemological pertinence of these models and to identify the ethical relevance that engenders them.

Neurocentrism and biological markers of trauma

Curiously, the globalization of PTSD has taken place concurrently with the rise of another discourse that became the object of special attention in the late 20th century: neurocentrism³². In the social imaginary, the growing perception of the brain's autonomy in possessing properties and responding to actions which would previously be regarded as the dominion of self and consciousness turned the brain-organ into a veritable social actor, giving life to a character that would come to be widely known as the “cerebral subject”^{32,33,34,35}. The explosion of neurocentrism^{36,37} shifted the field of traumatic stress to an entirely new arena; since the “Decade of the Brain” in the 1990s, intellectual, technological, political, and social transformations impacted the natural sciences³⁸, and researchers from other fields began to study aspects of a phenomenon that has been called the “neural turn”, “neurological turn”, or “neuroscientific turn”³².

The conditions for the neurologization of trauma were provided by technological advancements that allowed successful research in the identification of underlying biological mechanisms in animal models for fear conditioning^{4,14,39}. In 1992, Foa et al.⁴⁰ argued that the similarity between symptoms of individuals diagnosed with PTSD and animals submitted to unpredictable and uncontrollable aversive events, beyond indicating common etiological factors, consolidated a properly animal model for the disorder. This scenario contributed to the rearrangement that set the PTSD construct apart from the other posttraumatic stress syndromes (such as adaptation disorder or brief reactive psychosis) and opened the way for the link currently observed between psychological traumatology and the neuroscientific disciplines. Since then, the understanding of the biological repercussions of violence would identify their cerebral correlates through alterations in the physiology of excitation of the central nervous system (CNS), autonomous nervous system (ANS), and various effects of neuroendocrine mechanisms^{41,42,43,44}.

For evolutionary biology, the learning and extinguishing of fear, as well as avoidance behaviors, correspond to response mechanisms indicative of human evolutionary history and are part of an adaptive system whose purpose lies in management of the environment's dangerousness; that is, dealing with the threat of danger and the consequences of an imagined violence in its dimension of triviality, as a quotidian fact and inescapable condition of existence. The epistemological paradigm orienting this perspective of violence wagers on a reversal of the rationality that allowed Lifton⁴⁵ to conjure the very disease category of PTSD, since within its territory, trauma was reputed to be “*an expected part of our environment of evolutionary adaptation*”¹⁴ (p. 12). In addition, the same evolutionary assumption justified the use of animal models to study systems with analogues in the human brain. On this topic, Yehuda & LeDoux⁴⁶ (p. 19) state the following: “*The theoretical link between exposure to extreme stress and the development of PTSD (APA, 1980) provided the rationale for early hypotheses that PTSD-related biological alterations would be similar in direction to those observed acutely in animals exposed to stressors*”.

However, if violence is a kind of experience that has accompanied humans since the dawn of humankind – and if it is undeniable that traumatic stress produces subsequent transformations in the very functioning of the brain's apparatus –, we should expect to find its traces in the design of our brains and bodies, “*no less than in the weave of our communities*”¹⁴ (p. 1). This is the underlying principle that lends solidity to evolutionary biology and neuropsychology and that organizes the entire chain of subsequent theoretical and clinical developments.

Deduced for the first time by Kolb⁴⁷ based on the analogy between symptoms of conditioned fear and hyperactivity in animals exposed to uncontrollable shock^{48,49} and physiological and behavioral symptoms of combat veterans diagnosed with chronic PTSD, this may also be the most articulated justification for a neuropsychological hypothesis of PTSD⁵⁰. Based on the metaphor of excessive emotional stimulation, Kolb⁴⁷ aimed to draft a comprehensive theory for posttraumatic signs and symptoms, in which the principle of the functional alteration in cortical neuronal and synaptic processing was intended to explain the effects of aversive stimulation on intense memories. Later, many neuropsychological and neurobiological models of traumatic stress dominated the scientific publications, proposing additions to Kolb's pioneering theory^{18,51,52,53,54}. One reformulation of Kolb's perspective interpreted PTSD as a psychological disorder resulting from intense neural stimulations leading the brain's apparatus to develop enhanced sensitivity in the limbic system⁵⁰. This phenomenon of neurological hypersensitivity⁵⁵ allowed labeling PTSD as a classic physiological neurosis in which anatomical and physiological neuronal transformations would serve as the basis for consecutive extraordinary neuronal excitability. Consistent with this perspective, van der Kolk⁵⁴ views PTSD as a pathological inability to modulate excitation.

Challenges for a neuroscientific theory of trauma

Contemporary neuroscientific research has attempted to explain the neurobiological substrates of PTSD to illustrate the principal risk factors and vulnerability⁷. When studies on epidemiological prevalence showed that only a minority of individuals exposed to potentially traumatic events actually develop the psychiatric syndrome¹³, the field developed an alternative hypothesis, according to which PTSD is a failure of the mechanisms involved in the recovery and reestablishment of physiological homeostasis, possibly as the result of prior individual disposition⁴⁶; *"Thus, PTSD is best described as a condition in which the process of recovery from trauma is impeded"*⁴⁶ (p. 19). According to van der Kolk⁵⁴, in PTSD, the critical equilibrium between the amygdala and the medial prefrontal cortex (mPFC) changes radically, hindering the control of emotions and impulses. Neuroimaging studies in humans in highly emotional states *"reveal that intense fear, sadness, and anger all increase the activation of subcortical brain regions involved in emotions and significantly reduce the activity in various areas in the frontal lobe, particularly the mPFC"*⁵⁴ (p. 136). When this happens, the inhibitory capacities of the frontal lobe are downregulated, and persons *"take leave of their senses"*⁵⁴ (p. 136).

The first challenge for a neuroscientific theory of human trauma lies in the deductive method of the collected materials. Since PTSD is a clinical syndrome expressed by an unextinguishable fear response, the neuroimaging findings that attest to exaggerated responses in the amygdala are able not only to recapitulate but also to explain the nature of the brain disorder in PTSD⁴⁶. The distinction between the normal response to fear and the pathological condition shaped by the same emotion makes it difficult to determine whether an observed biological change is truly an aspect of the disease's physiology⁴⁶. Thus, to affirm the pathogenesis at the point of convergence between exposure to traumatic stress and biological alterations is still an interpretative and somewhat enigmatic operation, since the inferred causality of the relationship between the neuroimaging information and the corresponding physiological or functional response does not constitute conclusive proof of a given phenomenon, but simply an attributive operation inherent to the neuroscientific method³². Besides, the animal stress and fear-conditioning models capture a significantly restricted portion of the human psychological experience of trauma¹⁴. Since cultural competence is a predominantly human conquest, it seems unlikely that the cultural models of behavioral neuroscience can inform the human neuroscience research on culture⁵⁶.

As occurs with discoveries of stress, another limitation of the regular fear conditioning model – and its emphasis on the interactions between amygdala and medial prefrontal cortex (mPFC) – is that it fails to explain why only some persons exposed to fear develop the psychopathological syndrome⁴⁶. Although PTSD is a relatively rare condition⁵⁷, the symptoms of this syndrome are present in nearly everyone in the days immediately following exposure to the trauma⁵⁸; this finding supports the position that alterations indicative of stress symbolize the reflection of neurobiologically determined universal physiological response, reactivating the old debate on a possible transcultural

validity of traumatic disorders²². Meanwhile, the difficulty in examining the brain's functioning in culturally significant contexts is merely the expression of another separate chapter in the controversial application of stress and fear conditioning models to the elaboration of theories of trauma in neuroscientific research.

In addition, until recently, researchers lacked a technology to study these questions in humans⁵⁶. Even the major transformations in the scope of the currently available data and techniques for understanding the human genome's structure and function, attributed to molecular biology – or to the flourishing field of human neuroimaging in the last three decades –, require time to present convincing discoveries on the mutual constitution of genes, brain, mind, and culture⁵⁶. Meanwhile, the lack of the academic community's awareness of the intrinsic biases of scientific production in populations studied under the “neuro-” and “psy-” labels has encouraged a growing number of critical neuroscientists to document the researcher's interference in the construction of theories and the methodological designs of future experiments^{56,59}. While in the field of psychology, 95% of the psychological samples come from countries with only 12% of the world population⁵⁹, “*within the field of human neuroimaging alone, 90% of peer-reviewed neuroimaging studies come from Western countries*”⁵⁶ (p. 289).

Since the neurobiology of trauma can result in certain transcultural differences in symptomatology, we may conjecture that it will be a challenge for specialized neuroscientific models to grasp the multiple ontological dimensions of traumatization, but likewise even the existence of local biologies of trauma²².

Biocultural experiences: the cultural neuroscience model

The presumed isonomy between human and animal responses to the threat or experiences of pain and injury is the fundamental premise for the ramification of the neurobiological architecture that pretends to infer human trauma from the animal stress and fear-conditioning models; however, this conceptual system of equivalences and communications, holding the trump of producing a “natural” theory of trauma, does not prevent access to the cultural dimensions of pathogenic causality. Disguised under the analogy between human and animal traumatic experiences, the hypothesis of cooperation between biological susceptibility and traumatic event lends a peculiar etiological format to PTSD, since it unifies recognizable social cause and unique biopsychological profile⁷. From this ontological characteristic of this entity's formulation, we have simultaneously the only psychiatric condition with a perfectly identifiable etiology and the likelihood that this disorder derives from social causes.

This condition of possibility ultimately shapes the integrative approaches to the phenomenon of trauma within the neuroscientific field^{3,22}. Based on symptomatologic manifestations, when the study focuses on the past, and when anthropological considerations allow a view of the idiomatic expressions of suffering^{7,22}, what is at play is a pluralist conceptual structure that is indispensable for the culturally comprehensive structures. The discoveries of ways that neuroanatomical differences reflect cultural influences, or the extent to which diverse cultural contexts produce systematically distinct brain structures are enunciations that can be derived from the affirmation of a feasible relationship between cultural factors and neurobiological functioning²¹. In the intersection between neurobiological and social studies of trauma, a certain optimism has been invested in approaches capable of elaborating models that are sensitive to familiar cultural contexts for the human experience¹⁴. Such are the examples of cognitive neuropsychology and cultural neuroscience, which seek to infer how the values and norms of systems of shared meanings, provided by a given cultural scenario, shape (and are shaped by) biological and psychological processes²¹.

Circumscribed in the scope of the dual inheritance theory, the gene-environment interaction model aims to explain how genetic factors influence individuals' psychological outcomes – not by direct interference, but through moderation exerted by environmental data on their deterministic potential. The same prerogative shifts the relevance from the notion of genetic risk to the more accurate understanding of susceptibility to environmental influence, where certain genes are expected to be associated with the degree of sensitivity to certain aspects of environmental stimuli. Based on this idea of differential susceptibility, the model of gene-culture interaction assumes that genetic influ-

ences shape behavioral and psychological predispositions and that cultural influences can shape the social manifestation of these predispositions in the form of behavior, or the individual manifestation of them through psychological outcomes. This speaks to the existence of a genetic basis for susceptibility to the environment, organizing (to a greater or lesser extent) the specific behaviors expressed in a specific cultural framework. Therefore, from a neuroscientific perspective, *“the study of culture provides valuable information on the ways in which certain neural structures may serve similar functions across cultures while at the same time being malleable in response to cultural inputs”*²¹ (p. 506).

To fill the gap that historically stratified studies of culture and biology (the social and natural sciences, respectively), cultural neuroscience has matured as an emerging and interdisciplinary field whose proposal consists of the bidirectional influence of culture and genes on the brain and behavior^{32,56}. Gradually, interaction between the ethnographic holism of social psychology and the biological reductionism of neurosciences appeared less eccentric, and the combination of theories and methods arranged so heterogeneously in the scientific spectrum allowed the study of the implications of cultural values, practices, and beliefs for brain function, but also of the ways the human brain creates cultural capacities themselves^{60,61}.

Culture is a system of dynamic mutual relations between individuals and their environments, including biological and psychological processes that facilitate adaptation and social interaction⁶². Despite the rich theoretical motivation for studying culture-biology interactions in the human brain, *“precise empirical demonstrations and theoretical models of bidirectional relationship between cultural and biological mechanisms have largely remained elusive”*⁵⁶ (p. 288). The biocultural perspective proposes to reduce this knowledge gap through elucidation of the interactive pathways by which culture and biology operate. A better understanding of cultural and genetic influences on brain function can expand our knowledge on processes of traumatization, demonstrating not only how genetic transcription reveals biological vulnerability via social stressors, but also how the cultural meaning assigned to a traumatic event can play a significant role in the development and severity of a psychological sequela²².

To the extent that human behavior results from neural activity, the cultural variation of behavior probably emerges from the cultural variation in the neural mechanisms underlying such behaviors, corroborating the plethora of evidence from cultural psychology on culture’s influence on psychological processes and behavior⁵⁶. Cultural diversity and biological variability suggest the existence of an interaction between cultural processes and biological mechanisms to create the heterogeneity subsumed under the label of PTSD, and by extent to other correlated posttraumatic conditions. In addition, cultural variations in neural mechanisms probably exist even in the absence of cultural variation at the genetic or behavioral level. In this sense, neuroscience is particularly useful for determining when two apparently distinct mental operations are responsible for underlying processes, and inversely, when two apparently similar operations derive from quite different neural processes⁶¹.

*“By using the cultural neuroscience framework to identify and investigate candidate phenomena using the multiple levels of analysis approach, we will enhance our chances of understanding how sociocultural and biological forces interact and shape each other as well as find potential ways to direct this knowledge toward timely issues in population health”*⁵⁶ (p. 301).

Since the range of biological findings acknowledges the relationship between PTSD and the hypothalamic-pituitary-adrenal (HPA) axis, making the existence of a univocal profile unlikely for this condition/psychopathology, there are probably also different paths produced through variations in environments of the development of trauma, in the pre-trauma setting, in the types and meanings of traumatic experiences, and in the circumstances following traumatic exposures²². Thus, the interpretation of the traumatic phenomenon based on a biocultural perspective can facilitate the development of convenient integrative models for a more accurate understanding of the suffering associated with multiple post-traumatic conditions and the most appropriate respective interventions.

The disagreement between explanatory matrices for the cultural diversity of neural mechanisms – for some, resulting from gene polymorphisms⁵⁶; for others, originating essentially from a determinant social context for the biological response in psychopathology – nonetheless does not rule out a common postulate, namely, to treat culture and biology as independent processes will produce incomplete and possibly equivocal interpretations²². An interactive model that examines how biology and culture coproduce life’s experience, including PTSD, would be crucial for elucidating risk factors and recovery in posttraumatic conditions.

Limitations of bidirectional models in neurosciences

What kind of beings do we think we are? “*Are we psychological persons, inhabited by a deep, interior psyche that is shaped by experience, symbols and signs, meaning and culture? Is our very nature as human beings shaped by the structure and functions of our brains?*”⁶³ (p. 1). In attempts to answer these questions, the new brain sciences have endeavored to sustain the alignment with a form of rationality that represents corporeality in constant exchange with its milieu, where the biological and the social are not distinct but interwoven dimensions⁶³. However, the optimism that accompanied the formation of cultural neurosciences was not translated as the elaboration of definitively representative models of human biopsychosocial experience^{64,65}. This is because the neuroanatomical embodiment of cultural concepts and meanings, or the affirmation of neural differences underlying psychological differences, while constituting axiomatic principles in these approaches, are still not empirically verifiable or sufficient to explain the phenomenology of learning, memory, or even trauma^{32,66}.

The emergence of a neuromolecular perspective of the brain by which the latter’s structure and functioning become comprehensible as material processes of interaction between molecules, was essential for consolidation of the belief that we can actually see the mind, culture, or any human products directly in the living brain^{66,67}. Not only passions, desires, beliefs, emotions, and behaviors came to be conceived in terms of the biophysical, chemical, and electrical properties of the brain’s constituent parts, but everyday actions could be represented by the neural correlates captured in brain imaging^{32,63}. Far from recent is the critique that language, history, society, and culture, in short, the key dimensions of humanity, are scarcely conceivable by the simple, trivial action of brains, rather than of complex individuals⁶⁷. However, it is still true that if the human brain evolved by and for the strict function of sociability, that is, for the capacity to live in groups and respond to the mental states of others, it is because the ethical model underlying the brain’s understanding remains grounded in causal unidirectionality⁶³. If the human mind and its multiple linguistic, social, and cultural products are conceived apart from the structures and composition of the material world, it is because it is argued (more or less explicitly) that there is a kind of essential complementarity in the biogenetic and sociocultural dimensions of human existence⁶⁸.

The thesis of complementarity considers human beings as constituted simultaneously as organisms within systems of ecological relations and as persons with systems of social relations⁶⁷. The critical task is thus to comprehend the reciprocal interaction between the two types of systems, social and ecological⁶⁸. Since every organism is a discrete and limited entity, that is, the representative of a population of related beings relating to other organisms, the lines of contact that prescribe their interactions are insufficient to transform the structure of their basic nature. In this model, organisms and persons are conceived as separate components in the human being – the former corresponding to the population dimension, the latter to the relational dimension⁶⁸. However, if every organism “*is not so much a discrete entity as anode in a field of relationships*”⁶⁸ (p. 3), then we must think of a new biological rationality. The combination of “relational” thinking in anthropology, “ecological” thinking in psychology, and “systems development” thinking in biology, performed by Ingold⁶⁸, produced a synthesis whose ontological conception would no longer be sustained by a composite entity with separable but complementary parts, such as body, mind, and culture, but as “*a singular locus of creative growth within a continually unfolding field of relationships*”⁶⁸ (p. 4). From this perspective, organic life is not so much the realization of prespecified forms, but the very process in which the forms are generated and stabilized.

Thus, what does this aggregate consisting of organism-plus-environment correspond to, which customarily involves the anthropological definition of a social subject immersed in cultural exchanges, but also the physicality of the material universe? According to Ingold⁶⁸, an anti-ecological perspective of the mutuality between organism and environment requires a genotypically specified organism, and complementarily, an environment harboring a set of physical restrictions imposed on it. Obviously, conventional ecology portrays organism and environment in opposite planes, both of which possessing exclusive integrity and independent of the reciprocity which they may establish⁶⁷. Meanwhile, an ecological approach should furnish a link between the organism’s biological life and the mind’s cultural life in society, and thus the aggregate organism-plus-environment should denote not a composite of two things, but an indivisible totality. Ingold⁶⁸ referred to the interpretative matrix of the development system represented by this totality as “vital ecology”.

We reiterate that the neuroscientific proposal of a bidirectionality remains strictly confined to dualism and to the philosophical problem that gave rise to modern reductionist doctrines, whether of the materialist tradition or the social-constructivist tradition ⁶⁷. While not proclaiming explicitly, neither did its disciplines abandon the axiomatic formulation that established the hypothesis of complementarity, namely, the idea that things proper to the body are not knowable by the mind, and that things proper to the mind are alienated from knowledge by processes of corporeality. In addition, although not categorical in representing the mind as merely one of brain's numerous emerging properties ⁶³, the thesis of bidirectionality disguises (behind its purported reciprocal determinism ⁶⁴) a striking causal asymmetry that reaffirms the brain's ontological primacy over the dimensions of mind and culture ³². Representing human groups as communities of brains – and cultural diversity as neurodiversity –, this process of neurologization relegates culture to a secondary position with the appeal to flatten cultural concepts and meanings. Examples of this phenomenon are the extensive use of neuroimaging as an investigative artifact and essential element for the interpretation and elaboration of experimental designs ⁶⁹ and the expectations for pharmacological correction of neurobiological disorders originating from traumatic experiences ⁵⁴.

Thus, the confidence around biocultural models in the neuroscientific world, backed by exuberant promises ^{56,70}, has still not sufficiently overcome the brain-person and culture-individual dualities by which the philosophy of science implemented the materialist reductionism characteristic of Western rationality ⁷¹. Phrases such as “*behavior arises from neural events*” ⁵⁶ (p. 290) or “*the brain gives rise to the mind*” ⁶⁹ (p. 646), more than typifying the field's ambition to celebrate the discovery of a panacea for some of humankind's immemorial mysteries, symbolizes the existence of an implicit epistemic hierarchy that complexifies the obeisance of neurosciences to synergy and bidirectionality ³². In fact, the “cultural” label in neurosciences does not convey their predilection for neurobiological data.

Furthermore, the conception of mind and culture as resulting from elementary cerebral operations contributes to a homogenizing understanding of diverse social and cultural processes ³². Neuroscientific work itself, based on the inference of hypotheses by the conjugation of correlational results and causal argumentations, can reinforce a priori definitions, naturalizing cultural stereotypes in the laboratory ⁷². The use of univocal categories such as “Western culture” and “East Asian culture” in research experiment designs in cultural neuroscience and neuroanthropology illustrates this process of simplification ⁶⁹. Likewise, while the advantage of revealing the “brain imprint” of a possible cultural affiliation, even in the absence of observable behavior, reiterates the principle that norms, beliefs, and meanings are embodied in the individuals of a given group, it also reserves for the neural level the possession of a truth about humans as cultural beings, which, paradoxically, could not be recognized by the study of social and cultural practices themselves ³². In addition, since neural mapping can signal recruited brain regions and structures but not the meanings involved in performing a task, the neuroimaging finding will hardly be definitive for indicating how the cultural experience is capable of modulating preexisting patterns in neural activity. For Vidal & Ortega ³², the central issue is whether the neurosciences will finally achieve their essential purpose of shedding new light on culture.

Conclusion

The last three decades have witnessed a profound expansion in the use of neurosciences to study complex social and cognitive processes, as well as that of cultural psychology to understand human diversity ⁶¹. As the field of studies on traumatic stress has endeavored to inform itself increasingly through the range of action of cultural and neurobiological research, we have seen a synchronous phenomenon that resulted in the exportation of the discursive rationality of trauma to other disciplines and knowledges and simultaneously the reinforcement of neuroscience as an essential method in the search for truth.

PTSD is currently considered a hegemonic psychopathological category, concentrating in its orbit multiple lines of research funding and a plethora of studies interested in representing the phenomenon of trauma based on a descriptive model which, since the DSM-III revolution, purged the official American disease classification of its psychodynamic matrix ⁷³. PTSD appears as a point of confluence between diverse areas of knowledge – the locus of intersection between the neurosciences, psychia-

try, and psychological traumatology, and whose predominance indicates the solidarity that relays the episteme of trauma and neurosciences⁴⁶. The research output attests to the growing use of neuroscientific technological instruments in the study and understanding of disorders related to psychological trauma^{18,51,54}. However, unlike other scientific fields on which the neurosciences notably imposed their method⁵⁴, it would be more precise to state that there was an exchange, with the mutual transit of the neuroscientific model, expanding upon the universe of traumatization, while that of trauma inculcated its principle of irreversibility of phenomenal processes: dual propagation that leads one to ask whether one of the spinoffs of the neurologization of culture would be a sort of “neurologization of trauma” and thus whether the latter would be one more accessory aspect of the neural turn³².

We highlight the inconsistencies in the application of neurobehavioral models of stress and fear conditioning in animals for understanding the complexity of the human biopsychosocial experience⁴⁰. Such models, grounded in the paradigm of violence as an evolutionary condition intrinsic to the species, customarily results in simplification of the cultural experience with the purpose of preserving the purported isonomy of human and animal brain functioning, which guarantees the usefulness and adequacy of its experimental evidence¹⁴.

Recently, the theory of biocultural co-constructivism emerged as an enunciative method for the trajectories of development by which genetic and cultural factors communicate, but above all as a way of explaining the competence of neural plasticity in redirecting these trajectories and even their vicissitudes⁷⁴. One of the representative conceptual models of this paradigm is that of cultural neuroscience. In this model, transcultural neuroimaging is used to infer the bidirectional linkage and the emerging properties of mental, neural, and genomic processes²¹. Ames & Fiske⁶¹ argue that the integrative approach of cultural neuroscience, besides helping us build a more complete picture of the relations between culture, psychology, and biology, can consolidate other benefits, namely, the improvement of educational practices, the development of a progressive mutual intercultural understanding, and the elaboration of more effective mental health care for persons worldwide⁶¹.

Although frequently portrayed as a “future discipline”⁵⁶, we highlight some of the challenges still posed for cultural neuroscience – as well as for other neurosciences aimed at understanding how the brain “mediates” social and cultural interactions and produces emotion and cognition³². Such challenges feature the existence of an epistemic hierarchy that disavows multiple causalities from interfering in and influencing the interpretation of biocultural phenomena; the juxtaposition of cultural and neurobiological data that serve the homogenization of culture by neuroscientific experimental methods and projects; and the adoption of reductionist epistemological notions that operate in the simplification and universalization of shared concepts and meanings proper to cultural processes^{64,69}.

It remains to determine whether the monopoly of contemporary etiopathogenic reasoning conquered by the neurosciences-trauma dyad will be capable of facilitating the development of practices that are sensitive to the sociocultural realities of diverse populations¹⁴. Even the integrative approaches of the neuroscientific field, although addressing difficult-to-solve problems in behavioral perspectives or self-report measures, still carry a dualist tradition in conceptions of the brain, mind, and culture and analyze these phenomena and their interactions based on specialized emphases that compartmentalize the human biopsychosocial experience⁷⁰. The implementation of the biocultural project depends to a certain degree on considering the historical contexts and observing a comprehensive conceptualization of culture, not only in the experiments’ interpretation, but also in the conception of their methodological designs, addressing the transcultural meaning of experimental categories and the influence of cultural beliefs on the project and the results of research in the area⁷². The elaboration of definitively integrative approaches can assist the development of models capable of conceiving the knowledge and practices at the level of human experience, thus avoiding mechanical and abstract representations that equate culture to an epiphenomenon circumscribed to activity in the prefrontal cortex⁷⁵. In the field of psychological trauma, which expanded its scope extensively in the 20th century, this outcome is essential, since it would mean that persons and groups affected by radical experiences would be less subject to reductionist interpretations that submit complex subjective and cultural experiences alternately to the imperatives of the brain and the semiologic codes of pathogenic reasoning. However, it would especially mean correcting the historical exclusion of the cultural dimension from the social, etiological, and clinical reasoning common to the theoretical and technological repertoire generally recruited in response to the emergence of a traumatic event.

Contributors

The authors contributed equally to all stages in the article's elaboration (conception, writing, and revision of the material).

Additional informations

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Resumo

Durante o último quarto do século XX, a psicopatologia codificou um arco diversificado de fenômenos sociais sob a rubrica do traumatismo, notabilizando o estudo do trauma psicológico como área autônoma e progressivamente informada pelas pesquisas culturais e neurobiológicas. Nesse cenário, presenciamos a emergência do paradigma biocultural, perspectiva epistemológica que procura elucidar as trajetórias interativas pelas quais cultura e biologia consolidam, entre si, os seus efeitos recíprocos. Este artigo abordará as interseções entre o campo dos psicotraumatismo e as neurociências, tomando, como eixos de análise, a expansão da categoria do transtorno de estresse pós-traumático (TEPT), os pressupostos epistemológicos das pesquisas neurocomportamentais do estresse e do medo, e as limitações da tese da bidirecionalidade, preconizada pelas neurodisciplinas culturais contemporâneas. A elaboração de abordagens definitivamente integrativas pode auxiliar no desenvolvimento de modelos compreensivos capazes de conceber os saberes e as práticas ao nível da experiência humana, evitando interpretações reducionistas que submetem vivências culturais e subjetivas complexas ora aos imperativos do cérebro, ora aos códigos semiológicos do raciocínio patogênico.

Transtornos de Estresse Pós-Traumático; Trauma Psicológico; Neurociências; Cultura

Resumen

Durante el último cuarto del siglo XX, la psicopatología codificó un arco diversificado de fenómenos sociales, bajo la rúbrica del traumatismo, poniendo en relevancia el estudio del trauma psicológico, como área autónoma, y progresivamente informada por las investigaciones culturales y neurobiológicas. En este escenario, presenciamos el surgimiento del paradigma biocultural, perspectiva epistemológica que procura elucidar las trayectorias interactivas por las cuales cultura y biología consolidan, entre sí, sus efectos recíprocos. Este artículo abordará las intersecciones entre el campo de los psicotraumatismos y las neurociencias, tomando, como ejes de análisis, la expansión de la categoría del trastorno de estrés postraumático (TEPT), los presupuestos epistemológicos de las investigaciones neurocomportamentales del estrés y del miedo, y las limitaciones de la tesis de la bidireccionalidad, preconizada por las neurodisciplinas culturales contemporáneas. La elaboración de abordajes definitivamente integradores pueden apoyar el desarrollo de modelos comprensivos, capaces de concebir los saberes y prácticas en el nivel de la experiencia humana, evitando interpretaciones reduccionistas que someten vivencias culturales y subjetivas complejas, bien sea a los imperativos del cerebro, bien sea a los códigos semiológicos del raciocinio patogénico.

Trastornos por Estrés Postraumático; Trauma Psicológico; Neurociencias; Cultura

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