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Towards an evolutionary perspective on cognitive psychopathology

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Abstract

This paper aims to offer a framework for integrating research findings from two traditionally distinct domains: cognitive science and psychopathology. It proposes that the ongoing refinement of cognitive science's epistemological foundations, together with the increasing recognition within psychiatry and psychopathology of insights drawn from neuroscience, ethology, and evolutionary theory, create the conditions for a shared conceptual ground. This convergence opens up new possibilities for reconciling perspectives that have often been considered fundamentally incompatible.

Keywords: cognitive psychopathology, evolutionary psychopathology, epistemology of cognitive science

Introduction

Cognitive science presents a compelling and complex object of study: it investigates the processes by which human knowledge is produced and actualized. Fundamentally, the objective of the disciplines within this epistemological framework is to identify and elucidate the functioning of the mind in thinking systems, whether artificial or natural. As is well-established, and as evident from the stated aims of inquiry, the outcome to which cognitive science aspires is scientifically monumental. This is because it entails obtaining objective data on the mechanisms by which human beings (and, more broadly, non-human animals) process environmental stimuli and transform them into cognitive worlds, thereby manifesting the characteristic aspects of their respective species.

Cognitive science emerged, therefore, from the convergence of investigative efforts of pre-existing disciplines that had long operated in parallel, albeit with differing methodological perspectives, despite sharing patently common objectives. Consequently, in 1956, leading figures from philosophical, psychological, neurological, linguistic, computer science, and anthropological studies formally articulated the charter of this investigative paradigm. This paradigm was distinct from the specific aims of each individual discipline, being founded instead on an interdisciplinary research method, which rapidly became a model for an ever-increasing volume of research in fields progressively further removed from the foundational disciplines. Indeed, it is no coincidence that we currently witness the emergence in the scientific arena of fields that append the adjective "cognitive" or the prefix "neuro-" to their classical designations (e.g., cognitive ethology, cognitive psychology, and neurophilosophies in general). These fields often attract negative critiques that scrutinize the criteria underpinning the "cognitive turn" of the parent discipline, alleging a mere juxtaposition between the original epistemological perspective and one "contaminated" by studies on neuro-cognitive aspects (cf. Legrenzi & Umiltà, 2009, for a discussion). Despite criticisms—whether well-founded or not—regarding the proliferation of cognitive science, a broader analysis reveals the evident success of its adopted interdisciplinary method. The implementation of this method has certainly not been straightforward and continues to demand careful reflection on the potential contributions of each discipline that engages with it, so as to avoid misunderstandings or epistemological distortions.

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This paper seeks to offer potential guidance for integrating theoretically disparate research data: specifically, data originating from cognitive science and those derived from psychopathological findings. Fundamentally, the aim is to illustrate how both the maturation of the epistemological framework of cognitive science, and the growing awareness within psychiatric—and indeed psychopathological—domains of the relevance of data gathered from neuroscientific (as well as ethological and evolutionary) fields, can provide a shared foundation for the fruitful integration of perspectives previously deemed by many to be largely irreconcilable.

The Epistemological Framework of Cognitive Science

This type of integration is achievable—provided certain methodological caveats concerning reductionist tendencies are observed—primarily because cognitive science today has modified its initial perspective on the nature of cognition. Indeed, in its early stages, this perspective was rigidly predicated on the conviction that cognitive mechanisms were primarily cybernetic in nature and traceable to defined anatomical-cerebral aspects (cf. Pennisi, 2006, for a discussion). Essentially, thought was regarded as a macroprocess divisible into cerebral sub-units (modules) amenable to individual investigation, each performing a specific task. Specifically, neuroscience has produced a body of data regarding the possibility of definitively identifying cerebral correlates of cognitive functions, previously deemed irreducible to organic matter (e.g., consciousness and identity formation mechanisms). However, this data did not terminate the debate concerning both the nature of complex cognitive phenomena and the possibility of identifying their anatomical aspects. In fact, a historical review of the type of data collected reveals that these were primarily studies that progressed from analyzing basic cognitive processes to those often imprecisely termed 'higher cognitive processes'. Consider, for example, the considerable volume of initial data on the neural functioning of areas dedicated to vision or, more broadly, to the processing of sensory stimuli.

Studies on the physiological conditions of perceptual modalities were, quite naturally, an indispensable source for realizing the initial project of cognitive science: to obtain knowledge about the functioning of cognitive processes and to implement them on not necessarily biological platforms (an objective still unachieved today, characteristic of artificial intelligence and simulationism in general). This constituted a paradoxically disembodied paradigm that aligned well with the positions of linguists who argued for the irrelevance of anatomical aspects for the actualization of linguistic function and of specific modes of human cognition (cf. Chomsky, 1966). Although the work of neuroscientists challenged the disembodied conviction that viewed processes as formal and abstract procedures, the data they gathered confirmed the hypothesis of the traceability of simple cognitive and neuroanatomical elements, on the basis of which our brain elaborated higher forms of cognition. The prevailing idea was based on the conviction that by decomposing mental functions into elementary components and analyzing the latter, the necessary information would be obtained to understand the entire functioning of all cognitive mechanisms: physical processes would take place in the brain which, upon attaining adequate knowledge, could be defined as transformations of expressions within modules according to specific rules (cf. Fodor, 1983, for a disembodied definition of 'module').

ISSN: 3035-062X
2025, 2(1)
Preliminary Reports and Negative Results in Life Science and Humanities

However, in the transition to analyzing complex cognitive processes, which often necessitate integration with other cognitive processing systems (consider, for instance, categorization tasks, the construction of one's knowledge about the world, or even the functional use of language), the rigid modularist model proved inadequate, even from the perspective of the neuroanatomical functioning of cerebral areas. Essentially, the notion that our brain is constituted by anatomically and informationally encapsulated segments (i.e., "pieces" of the brain exclusively—and independently of the rest—responsible for precise functions and possessing a predetermined localization) not only no longer holds at a conceptual level but is also unverified by neuroanatomical data. Based on current neuroanatomical evidence, there is a greater inclination to speak of functional flows (integrated networks) and multiple functions for the same cerebral areas.

Once the sanctity of the necessary correlation between a cerebral structure and a cognitive function was violated, the mind sciences began to seek an explanation for this lack of correspondence in evolutionary terms: if the brain (and not only the human brain) functions holistically, this implies that, over the course of evolution, a functional regulatory mechanism was positively selected, attributing certain tasks, whose fulfillment is ensured by the functioning of the entire network, to privileged circuits rather than to single areas (cf. Pennisi, 2006, for a revision of the classical neurolinguistic model). If even a single connection within the circuit underlying the analyzed cognitive activity is altered, it is probable that its entire functioning will be compromised. Studies in psycholinguistics and aphasiology in recent years, for example, have amply demonstrated that the residual capacities of Broca's aphasia patients depend largely not so much on the cortical impairment of Broca's area, but on deep damage extending towards subcortical structures (basal ganglia) of the linguistic network (cf. Grodzinsky & Amunts, 2006, for a review). Research on neuropsychological subjects and psychopathological cases has contributed decisively to the modification of the epistemological framework of cognitive science. Indeed, the results of such investigations have shed light on the irreducibility of psychic functioning to activations of specific cerebral areas. A case in point is the data from neuroscientific and neurobiological experiments conducted on schizophrenic subjects, which failed to achieve the objective of identifying organic or neurobiological alterations that could be considered the specific cause of schizophrenic disorder and did not fall within normal individual variation (cf. Frith, 2004). In this second phase of studies on human knowledge, the epistemological objective shifts from analyzing formal aspects to studying the biological phenomena that produce cognition, and the brain, once an anatomically privileged object, is now considered an organ like any other, to be understood within the living organism. Cognitive functions, therefore, emerge as an expression of neural connection circuits that have been positively selected for their adaptive value.

Evolutionary Psychiatry and Neurophenomenology: Two Models of Integration

Cognitive science, as described above, has constituted a moment of epistemological reflection for many disciplines concerned, at various levels, with the human mind. Psychiatry, too, has been captivated by the neuroscientific phase of cognitive science, wherein the metaphor of the brain as a source of data to explain the mind was dominant. Indeed, the organicist anathema directed towards studies approaching biological research in the psychiatric field was, from the early 1990s, withdrawn in favor of increasingly enthusiastic participation in the "neuroscience revolution" (cf. Troisi, 2006).

ISSN: 3035-062X
2025, 2(1)
Preliminary Reports and Negative Results in Life Science and Humanities

In reality, it is precisely this unconditional affiliation with only one of the disciplines forming the epistemic framework of cognitive science that has led to a reductionist perspective, which contemporary debate in psychiatry deems surmountable by adopting the very interdisciplinary method that characterized the second phase of cognitive science (cf. supra). Attempts by certain sectors of both psychiatry and psychopathology to approach a holistic perspective, in which neuroscientific data are sometimes complemented by evolutionary hypotheses, should be interpreted in this light. In this paper, we will examine two epistemological endeavors: Darwinian psychiatry and neurophenomenology which, proceeding from different theoretical premises, have attempted to employ cognitive science data in a constructive and problematizing manner, identifying the complexity of foundational neuroanatomical structures and functions as the key element from which the difference in psychic manifestations between normal and psychopathological individuals emerges.

Darwinian psychiatry originates from a theoretical presupposition according to which the current distinction between health and illness, particularly in the psychiatric domain, is flawed by an assumed direct derivation of functional aspects from organic causes. Mental illness, essentially, would be caused by an alteration of the basic organic state, and the symptoms of mental illness would be the outcome of this alteration. However, as previously noted, the history of psychiatry is replete with unproductive attempts to identify the organic basis of psychopathological states. A recent example is the acknowledgment by Chris Frith, one of today's foremost neuropsychologists, of the non-specificity of hypothesized anatomical modifications in schizophrenic subjects. The search for specific alterations in the structure or functioning of the schizophrenic brain has yielded only a series of data that could fall within normal individual variation. According to proponents of Darwinian psychiatry, the explanations for the failure of such research are to be found precisely in the concept of mental illness deriving from organic pathologies (typically lesions or neurobiological malfunctions). Today, the prevailing opinion in psychiatry is that it is difficult to identify an exclusive cause that produces mental illness. Returning to the case of schizophrenia, for instance, Andreasen (2000) maintains that, precisely because "visible neuropathological markers" do not exist and the nature of schizophrenic disorder "is not focal or localizable in a single region," it is necessary to seek other hypotheses and methods: anomalies in the maturation and development of cerebral processes, disturbances in neural connectivity, and, above all, defects in the information processing of schizophrenics (Andreasen, 2000, pp. 110-111), which would be a typical capacity arising from the interaction between various cognitive processes.

The methodological integration effected by Darwinian psychiatry is contained precisely in its definition of the concept of mental illness; this definition is based on the criterion of biological disadvantage: "illnesses are those conditions, whether state or trait, that result in biologically maladaptive consequences for the afflicted individual" (Troisi, 2006, p. 170). Mental illness, therefore, is considered both from a functional aspect (consequences are evaluated, not the biological causes, which might play an adaptive role in response to a state of environmental maladaptation; illness is a consequence of the alteration of those anatomical, physiological, psychic, and behavioral systems that enable the achievement of biological goals) and from an ecological aspect (functional capacities are not evaluated in absolute terms but always in relation to the environment in which the individual lives).

ISSN: 3035-062X
2025, 2(1)
Preliminary Reports and Negative Results in Life Science and Humanities

From such a perspective, therefore, mental illness is no longer considered a consequence of an anatomical alteration that aligns a subject with a nosographic category—often inadequately described—based on symptoms. Evolutionary biology—from which Darwinian psychiatry originates—along with neuroscientific investigations, has demonstrated that neurobiological variation cannot be equated with mental illness, and the concept of altered psychic life necessarily depends on interactions with the subject's relational environment. An individual suffering from a psychopathology, therefore, is not merely an individual bearing a lesion or a neurobiological modification requiring pharmacological treatment for a potential return to normal conditions. Instead, they are a subject whose functions for regulating fitness (in an ethological sense) have been altered. Understanding the reasons for this alteration, consequently, means attempting to re-establish positive adaptive environmental relations for the subject. The inclusion of the ecological parameter within psychiatric assessment, then, allows for a comprehensive overview of the subject's cognitive activity, preserving its subjective dimension precisely in the analysis of environmental relations: each person constructs these relations within a range of variation from the most adaptive to the maladaptive, which produce psychic distress.

The experiential component is also determinant for the second perspective to be examined as a proposal for integrating cognitive and psychopathological data. Neurophenomenology, as one might surmise, stems from Husserlian phenomenology and its applications in the psychopathological domain by Binswanger and Minkowski. It is the methodological proposal advanced by Francisco Varela (1996) to reconcile modern cognitive science with a rigorous approach to human experience. According to this perspective, the sole "natural" link (though not in the reductionist sense of Quinean naturalism) between mind and consciousness is the structure of human experience. Specifically, the hypothesized methodological approach posits that phenomenological analysis of the structure of experience and its counterparts in cognitive science are reciprocally constrained and correlated. The dimension of lived, concrete experience, of the Husserlian "lifeworld," would be conveyed through a dynamic integration of psychic activity via four aspects of the method (attitude, intuition, invariants, training), each implying a specific concrete characteristic that neurophenomenological inquiry should adopt (suspension of beliefs, immediate evidence, intersubjectivity, and pragmatics).

Varela, therefore, proposes concrete aspects of the method through which to achieve integration between neuroscientific and phenomenological data, specifying that the phenomenological component does not coincide with introspective capacities, which are useful for acquiring awareness of conscious experience. According to Varela, the mind cannot be considered separate from the organism: cognition is a phenomenon inseparable from corporeality and, in particular, from sensorimotor components, which are indispensable for actualizing knowledge of the external world. In this context, consciousness emerges as a property arising from the complex system represented by neural activity. The organization of neural matter, through entirely random and unpredictable interactions, gives rise to a process that possesses new characteristics independent of those manifested by the originating matter. In this way, consciousness represents a unitary, complex process not directly identifiable with the elements from which it originates (the neural substrate and the interactions established therein) but bindingly dependent on them.

ISSN: 3035-062X
2025, 2(1)
Preliminary Reports and Negative Results in Life Science and Humanities

Conclusion

The perspectives analyzed thus far offer an example of how it is possible to integrate data from cognitive science with psychopathological findings by attempting to mediate between positions often deemed irreconcilable. It is abundantly clear that these are methodological proposals still requiring concrete refinement. Indeed, in the case of both Darwinian psychiatry and neurophenomenology, the main objections are raised not only concerning the epistemological framework these two fields of study aim to provide, but also regarding the concrete feasibility of such protocols. Psychopathological experiences, in fact, provide abundant data to be interpreted concerning the functioning of cognitive activity in cases of alteration either of functional adaptive mechanisms or of the personal experiences of the conscious individual. The perspectives we have analyzed, however, primarily offer a theoretical contribution, leaving therapeutic practice bereft of applications derived from theoretical hypotheses. A possible continuation of the epistemic efforts to integrate cognitive science and psychopathological experiences could precisely concern the therapeutic aspects often excluded from theoretical debate, yet which assume the role of a testing ground for the formulated theoretical hypotheses.

Conflicts of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ISSN: 3035-062X
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Preliminary Reports and Negative Results in Life Science and Humanities

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