

The crisis of psychiatry – insights and prospects from evolutionary theory

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Darwin's emphasis on natural selection has had a transformative influence on how biological and medical sciences are conceptualized and conducted. However, the relevance of his ideas for the understanding of psychiatric conditions is still under-appreciated. Modern understanding of disease has required appreciation of the dialectical give and take between environmental influences, life history theory imperatives, human behavioral ecology, and characteristics of adaptive processes at all levels of the individual. This has enabled a better comprehension of metabolic disturbances, cancers, auto-immune disease, inherited anemias, and vulnerability to infectious disease (1). Here we propose that a contemporary and scientifically satisfying understanding of psychiatric conditions requires adopting a similar logic of inquiry, by taking into consideration the influence of environmental contingencies and natural selection in sculpting not just brain based mechanisms and processes germane to clinical neurosciences, but also diverse characteristics of behavior.

One approach to understand psychiatric disorders in an evolutionary perspective builds upon Nobel laureate Nikolaas Tinbergen's ideas, suggesting that, for a full understanding of any given phenotypic trait, one needs to detect the development and nature of its mechanisms, construed as the "proximate causes", and, in addition, its evolutionary (or phylogenetic) history and adaptive value (2). Studying the proximate mechanisms is standard in psychiatry and the clinical neurosciences, but the questions pertaining to the phylogeny of traits have largely been ignored.

Admittedly, placing dysfunctional cognitive, emotional and behavioral processes in the context of possible adaptation is not straightforward at first sight. The clinical directive requires that "disorder" represent the appropriate focus. However, a "disorder" – by definition – is counter-intuitive in the context of adaptation. By *adaptation* we mean a genetically-mediated structural or behavioral trait, which when possessed, increased survival and reproductive success in the environment in which the trait evolved. Were psychiatry's focus be placed on "traits" (i.e., cognitive processes, emotions, and behaviors), problems which are clinically relevant could more satisfactorily be understood as distorted expression of mechanisms that in earlier environments provided answers to problems of adaptive significance, but which currently interfere in light of prevailing environmental contingencies (3).

Important to the understanding of a particular phenotype is the evolutionary concept of variation. Without variation, no evolution by natural selection could take place. Mainstream psychiatry has largely ignored the fact that variation is the rule, not the exception, and this creates conceptual tensions. Psychiatry conceptualizes "disorder" as a statistical deviation from a normative statistical mean, yet handles it as a category. In other words, both "normalcy" as well as "disorder" with regard to psychological or behavioral functioning are burdened with the connotation of low variation.

Phenotypic variation is the result of a complex interplay of genotype and environment, including epigenetic mechanisms that are decisively shaped by experience over the individual lifespan. These issues translate to providing a clinician with a rationale for explaining why, how, and when adaptive behavior is compromised and constrained; that is, when social, cultural, or ecological conditions and circumstances pose hindrances or risks which interfere with achievement of best solutions to socio-biological problems, and which may require a modification of a strategy of coping, selection of an alternative strategy, and/or the setting of more realistic biological goals. This integrative view of psychopathology, we believe, can have profound effects on how psychiatry conceptualizes disorders, which shall be illustrated briefly in three examples.

GENETICS

One presumption of how to explain the nature and causes of psychiatric conditions pertains to the idea that individuals carry variations of genes that make them vulnerable to develop a disorder, commonly referred to as the "diathesis-stress-model". Evolutionarily informed research into the genetics of psychiatric disorders now demonstrates that while such alleles can predispose to developing a psychiatric condition under adverse environmental conditions such as childhood maltreatment, they can also protect, and in fact can allow enhanced coping upon encountering favorable environmental conditions during early stages of development. For example, the "short" allele of the serotonin transporter coding gene is associated with greater risk for depression if linked with early childhood adversities, yet the same version of the

gene is associated with *reduced* risk for depression if carriers grow up in emotionally secure conditions (5). This suggests that selection favored plasticity or “open programs” (4) that render individuals more susceptible to environmental contingencies – for better *and* worse (6).

Similarly, psychiatrists guided by evolutionary theory have recognized that antagonistic pleiotropy may play a role in psychiatric disorders – genes that convey fitness advantages in one domain, while having potentially maladaptive value in another domain, a concept that was originally put forth with regard to senescence (7,8). Nowadays, examples for antagonistic pleiotropy can be pinned down to even single genes such as the catecholamine-O-methyltransferase coding gene, of which one particular allele is associated with poorer working memory performance but superior empathy (9).

Taken together, these insights offer an answer to the question of why natural selection designed bodies that are – under specific circumstances – vulnerable to disease (10). In addition, speaking of genetic “vulnerability” in one-sided ways that are common in psychiatry seems to be incomplete if not simplistic, and requires reformulation considering complex gene-environment interactions, and trade-offs between different functional aspects.

EXPRESSIONS OF EMOTIONS

Contemporary psychiatry has minimized the functional significance of non-verbally expressed emotions (11). This is an unfortunate development, because it makes psychiatry a “science” relying largely on subjective self-report and clinician-generated rating scales. What is overlooked is that the biology of social interaction is based on facial expressions, gesture and body language, complemented by verbal language. However, it has repeatedly been shown that not only can psychiatric patients reliably be distinguished from non-clinical individuals on the basis of their non-verbal behavior. In addition, the study of non-verbal behavior can be more informative in terms of response to treatment and relapse compared to standard psychopathological scores (12). Changing patterns of behavior, e.g., a reduction in frequency of defensive body positions, can be linked to clinical improvement, even before the patient (or clinician) becomes subjectively aware of it. Conversely, an increase of “displacement activities” related to motivational conflict can alert clinicians to monitor for clinical deterioration, because such patterns may be indicative of impending suicidal behavior. These examples of behavioral analyses based on ethological methodology explicitly assume that behaviors found in clinical conditions are not qualitatively distinct from behaviors in healthy individuals but different by degree, i.e. intensity, frequency or contextual inappropriateness (13).

PSYCHOTHERAPY

Environmental conditions include the behavioral ecology in which human cognition, emotions, and behavior developed, and the adaptive nature of psychological mechanisms that evolved to solve recurring biosocial problems such as eliciting from and providing care to others of a relevant group, forming cooperative alliances, finding a mate, and attaining an acceptable rank in the social hierarchy. An inability to achieve relevant biosocial goals is at the core of many psychiatric conditions. For example, depression-like behaviors have been likened to a de-escalating strategy to avoid ongoing conflict (14). In many if not all psychiatric disorders, alternative psychological mechanisms play a prominent role in shaping the actual manifestations or phenotype, which often include defenses against perceived threat, such as in social anxiety (disorder), obsessive-compulsive rituals, or paranoid ideation (15).

Accordingly, therapy ought to help patients understand the bio-ecological bases inherent and communicated through their symptoms and provide motivations for giving up unprofitable behavioral strategies or defenses. For example, a recently developed method termed “compassion focused therapy” (CFT) draws upon attachment theory (the first evolutionarily-grounded theory of psychopathology and therapy) and other sources (16,17). CFT aims to provide patients with healing environments which promote feelings of warmth, understanding, and kindness toward themselves and others in light of and despite burdens imposed by evolutionarily based motivations and emotions.

An evolutionarily informed psychiatry also proposes that psychotherapy needs to be individually tailored as regards sex, age, and environmental differences, which shape psychosocial goals, needs, and behavior (18). Moreover, insights from gene-environment interaction in phenotypic development open the promising perspective that behavioral plasticity can be used constructively in the therapeutic process to reduce and avoid suffering and emotional pain by encouraging patients to use their potential for change and enlightening them about the evolutionary significance of behaviors and symptoms.

CONCLUSIONS

The search for a coherent and comprehensive scientific understanding of psychiatric disorders has long been ignored by “mainstream” psychiatry. Even “biological” psychiatry has long failed to take into account those aspects of human experience and behavior that have been formed during the ancestral past of *Homo sapiens*. Instead, theory and practice of psychiatry has developed in response to human health problems tied to a comparatively recent segment of human history. Political, economic, ecological, scientific, and cultural contingencies prevailing in modern Anglo-European societies had the effect of directing inquiry to population health problems towards an emphasis on mental phenomena.

Here it is proposed that a Darwinian approach may advance the endeavor to formulate optimal ways of conceptualizing and explaining psychopathology. It necessitates rigorous analyses of how environments have and continue to shape and constrain adaptive behavior, producing different varieties of signs, symptoms, and responses. The latter represent the data on which contemporary clinical sciences have built their disciplines in conformance to a process that has been repeated throughout ancestral and recorded human history (19).

Building upon life-history theory, behavioral ecology, ethology (not to be confused with ethnology), developmental psychology, and evolutionary genetics, ideas germane to evolutionary theory enable formulation of testable predictions about the causation, unfolding (“natural history”) and significance of psychiatric disorders. For example, it has recently been shown that maternal-neonate separation has tremendous effects on the autonomic activity and sleep quality of newborns compared to mother-neonate co-sleeping (20), which in turn may have profound impact on one’s ability to cope with stress (21) and interpersonal orientation in terms of attachment (22). This is exactly the way gene-environment interaction should be studied in light of evolutionary constraints on human behavior.

Likewise, in view of current controversies about how to conceptualize and categorize psychiatric disorders (23), which is currently occurring as the DSM-5 and ICD-11 are taking shape, it is likely that psychiatric nosology will need a reshuffling of categories. We suggest that it is worth considering a reclassification of disorders according to the evolutionary significance of behavior that is expressed in malfunctioning ways, given conditions germane to modern environments compared to ancestral ones. Several conceptualizations have been published in the recent past, including the “harmful dysfunction analysis” (24) and an “evolutionary taxonomy of treatable conditions” (25), but none of them satisfactorily addresses the problem of reductionism (26). Accordingly, historical aspects of psychiatric nosology and findings from neuroscience have been proven difficult to reconcile, and similar obstacles will arise for any attempt to develop a psychopathological system based on insights from evolutionary theory (27). In any event, if such a prospect shall be successful at all, it would need to involve analyses by researchers with expertise in evolutionary social sciences.

It seems that the old claim by one of the founding fathers of the “new synthesis”, Theodosius Dobzhansky, “nothing in biology makes sense, except in the light of evolution”, is obviously true for psychiatric neuroscience, if not medicine and the life sciences in general. It is time not just to rethink but to implement such an integrative approach in research, clinical practice and medical education.

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