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Keywords*Psychology, molecular science, behavioural genetics, psychiatric genetics, neurobiology, evolutionary psychology, mental health, genetic markers, brain–mind connection***ABSTRACT**

The combination of molecular science and psychology has resulted in discoveries on the biological and genetic basis of human behaviour and mental processes. Molecular genetic studies have proven that genetic variations, neurotransmitter systems and brain structure have some role in cognitive functioning and personality traits and predisposition to mental illness. Studies have indicated that behavioural determinants can not be placed on individual genes but rather a blend of many genetic markers and environmental factors is determinants of behaviour. Psychiatric genetics also has revealed that many mental disorders such as depression, schizophrenia, anxiety, etc. intersect genetically and this poses a challenge in the traditional method of diagnosis which promotes dimensional methodologies. The neurobiological reasons are based on the interactive combination of the brain chemistry and the psychological process, and the evolutionary propositions are concerned with the adaptive nature of the human emotions and the interactions. Along with the scientific development, moral and philosophical rhetoric suggests the necessity of the synthesis of genetic determinism and human agency as well as human diversity. The synthesis of the discoveries achieved in the fields of behavioral-genetic and psychiatric and neurobiology is the summary and is an interdisciplinary approach to contribute to the establishment of a bridge between the molecular science and the psychological sphere. This form of integration is at the heart of the development of advances in mental health interventions, the advent of personalized medicine and a deeper understanding of the mind-body interaction.

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INTRODUCTION:

Psychology, always concerned the behaviour to be observed, the mental activity in and the emotional activity in, the deciphering of the biochemical and genetic code of life, was always the object of molecular science. Historically these disciplines have been developing simultaneously as the science of subjective experience and the science of behaviour observation have evolved and cellular science and genetics have evolved. However, recent discoveries in neuroscience, genomics and molecular biology have enabled the two fields to converse yet again thereby forming a new trend of

study that is inter-disciplinary and has its urge on the interaction between the process of biological action and the phenomenon of psychology (Stefánsson, 2007; Pervin, 2009).

This intersection has already led to in-depth knowledge of the biological essence of cognition, emotion and personality. Using the examples of schizophrenia, depression, and bipolar disorder, the research made on the genetic background of psychiatry have demonstrated that the major mental disorders not only share a set of genetic pathways but also, this fact disproves the categorical psychiatric diagnosis (UNC Genetics, 2025; Andreassen, 2023). Going forward, the behavioural genetics theory describes how all human traits are polygenic and multifactorial and how interaction between different genes and environmental stimuli lead to the outcome of psychological traits (Behavioral Genetics, 2004; Kimbrel and Fink, 2020). The evidence indicates that the genetic factors are not acting directly but are mediated by the developmental and social circumstances and, thus, a biopsychosocial model of human behaviour remains topical.

Concurrently, neurobiological research has also exhibited relevance of the brain chemistry and circuitry of neurons in formation of cognitive and behaviour. Neuroimaging and molecular neuroscience have been increasing, which allowed researchers to map neuroactivity of neurotransmitters and brain connections and molecular mechanisms of decision-making, emotion regulation and memory (Biological Perspectives in Psychology, 2024; Longdom, 2023). This statement is a testament to brainmind relation in which the dynamic relation of the molecular process to the psychological processes is present. Even more, evolutionary psychology provides further explanation when combined with the molecular neuroscience against emotional, attachment as well as social behaviour or biologically speaking, as a tool of adaptive survival (Panksepp et al., 2002; Baker, 2007).

Despite the fact that with such developments, some of the potential opportunities of studying the mental health are introduced, there are some ethical and philosophical concerns on the side. This danger of reductionism is revealed owing to irrational overemphasis on biological explanations that would send onward the contribution of social, cultural and environmental process to explaining a behaviour (Miller, 2010). Some other researchers, such as Cotanda (2024), assume that only the interdisciplinary debate can be seen as a remedy since it has the potential to bring together not only science but philosophy and that genetic and

molecular studies are not a deterministic explanation of human diversity.

The paper will thus consider the intersection of molecular science and psychology, each in the context of biological and genetic explanation of human behaviour and of mental processes. The literature has been surpassed into five themes, as follows, molecular genetics of behaviour, psychiatric genetics, neurobiology and the brainmind connection, evolutionary psychology and molecular neuroscience and ethical-philosophical implications. The synthesis of the subsequent areas suggests the relevance of the incorporation of molecular science into the theory of psychology as a means of the evolution of the scholarly and practical study of mental health, treatment, and social policy.

Literature Review:

Molecular genetics has taken on the leading role as a concept of explaining a biological genesis of behaviour, and is suggested as a means by which particular genetic variations can be connected to some complex psychological characteristic. It has also shown that human behaviour and cognition are not controlled by a single gene but are polygenic, i.e., their genetic markers are many, and they interact in a synergistic way with each other (Montag, 2020). These polygenic influences are dispersed over more basic psychological processes like memories, learning and personality formation and imply that the realisation of behaviour is not due to individual genetic loci, but a complex biological system.

Among the most dramatic contributions which have been made to the field of molecular genetics, is the finding of predisposition toward mental disorders. Specifically in discussing the example of schizophrenia and bipolar disorder, Melnychuk (2024) cites the reality that there are certain genetic markers that are inevitably linked to such disorders with the common factor of a cognitive and mood disturbance. This has been extended to genome-wide association studies (GWAS) which have established clusters of genetic variants and have been associated with behaviour-related phenotypes. It adds to the fact that mental and behavioural process is not unitary but may be biologically complex (Bonacina, 2023).

Additionally, there is a chance of a molecularization of psychological models and molecules, and in such a manner a more comprehensive way of understanding human development. Interaction between genes and the environment can also be credited with environmental factors that might trigger genetic

predispositions due to stress or trauma (Kimbrel, and Fink, 2020). In this way, it is not just by means of molecular genetics that the biological background of behaviour is enlightened but also via such methods that the significance of examining contextual effects is fulfilled. It is a method that presents the achievement of integrated solutions, and in this regard, the area of clinical psychology can borrow the prospects of genetics in order to devise certain remedial and prophylactic modalities.

2. Psychiatric Genetics and Mental Health Disorders:

One of such phenomena may be noted as psychiatric genetics which may be of great value by having an exploration of the role which inherited factors play in mental outcomes. During the past 2 decades, increased evidence has been presented to suggest that interacting genetic mechanism is impressive in psychiatric conditions. UNC Genetics (2025) recognizes the true fact that eight significant psychiatric disorders (depression, schizophrenia, bipolar disorder, autism spectrum disorder and attention-deficit hyperactivity disorder) have a common genetic basis. It is a challenge to the classical idea of discrete categories of psychiatric diagnosis, and suggests a dimensional theory of psychopathology instead.

As Andreassen (2023) says, the latest developments in the area of psychiatric genetics have contributed to the understanding of how collective alterations of the calcium channel signaling and synaptic plasticity mechanisms can provide an explanation of vulnerability to various disorders. Such a finding has large-ranging implications in the field of psychiatry since the psychiatric diseases traditionally perceived as a divergence may also be a variant of the same biological weaknesses. This paradigm can change the paradigm of psychiatric classification, which leads to the transition to biologically oriented systems concern, instead of the symptom-oriented system of diagnosis (Thomas and Sharp, 2019).

Another area of research of psychiatric genetics is the impact of the environment and genetic vulnerability. Although the genetic basis is commonly known as the threshold hazard, the environment in terms of presentation of childhood adversity trauma or social loss can also significantly contribute towards the manifestation of such vulnerabilities (Miller, 2010). It is an aspiration of following a biopsychosocial perspective on mental health research. Surprisingly, even psychiatric genetic studies can be employed in therapeutic discovery e.g. the design of pharmacogenomic processes in which individual

treatment can be tailored to the specific genotype of the individual organism. This personalized medicine can potentially be successful as it is linked to tight correspondence between interventions and biological nature of mental disorders.

3. Neurobiology and the Brain-Mind Connection:

The brain itself can be associated with the brain as the place where the genetic and molecular effects are drawn to the cognition and the behaviour. According to the biological approach to psychology, neurobiological functionality is the root of the mental activity and neural systems, neural structures, and neurotransmitters are seen as the physical attribute of thoughts and feelings (Biological Perspectives in Psychology, 2024). Researchers have been able to map these biological processes by new innovations in neuroimaging and molecular neuroscience, which may reify how the fact of reducing it to the molecular scale can be made a prosecution of the psychological state. Some of the important developments are the neurotransmitters such as dopamine, serotonin and glutamate that play a crucial part in the mechanism of mood regulation, motivation and the brain.

Another disorder, which is continuously related to the dysfunction of these systems, is the presence of depression and anxiety disorders. As a case in point, serotonin system imbalance is associated with major depressive disorder, and the imbalance of dopamine is the core pathology of psychotic disorders and addictions (Montak, 2020). On the part of formation, the neuroimaging data presented has depicted that the difference in the intensity of the brain scan of amygdala, the hippocampus, and the prefrontal cortex are directly related to the alterations in the emotional regulations, memory, and judgment (Longdom, 2023).

It is upon this observation that neuropsychiatry develops, by an intellectual fusing of molecular discoveries and theories of the psychology of behaviour. In this interdisciplinary therapy, it is emphasized that brainmind relation is not a one way process: mental states are the result of molecular and cellular brain processes, neurobiological changes are the result of mental experiences, or vice versa, this is called neuroplasticity (Pervin, 2009). As illustration, that cognitive-behavioural therapy can result in a change in the pattern of brain activity has also been proved.

The awareness of the existence of these reflections leads to awareness of the fact of the brain-mind

relationship, which is a complex, reciprocal notion that transcends reductionism models. Besides a discussion of neurobiology, biological and psychological inseparability of their investigation of human thought and behaviour are discussed. It may be by applying the view of molecular and genetic discovery to how the brain functions, that it may gain a clearer understanding of the foundations of adaptive and maladaptive processing of the mind.

4. Evolutionary Psychology and Molecular Neuroscience:

This is the third perspective of the explanation of human behaviour provided by evolutionary psychology that provides a downstream product of evolutionary adaptation through natural selection. There is now an opportunity with the introduction of molecular neuroscience of identifying the origin of these adaptive behaviours to some biological processes with a clearer understanding of the evolutionary roots of cognition, emotion and interaction with others. Concerning central emotions, Panksepp et al. (2002) elaborate that central emotions such as fear, attachment and play are species-conserved, adaptive to environmental issues, and are central emotions. These findings indicate that, there are some prior patterns of behaviours, these behaviours are in-built, but driven by the forces of evolution during the evolution process. Molecular genetics also lends credence to this view in part by appreciating the presence of hereditary forces that shape social and emotional behaviour. One of them would be that of genetic polymorphisms of oxytocin/vasopressin pathways and attachment behaviour, pair bonding and social trust (Baker, 2007). This kind of molecular evidence is an indication that, not only can forces of evolution make an individual behave at the population level, but also make an individual difference in social relations and dynamics. The cross species (comparative) and the human molecular data are pointing to the generality and specificity of adaptive behaviours and the molecular processes are making possible the result of the evolutionally profitable consequences of cooperation, mating preferences and emotional quality. Surprisingly, molecular neuroscience is also enlightening as well as concerns issues of maladaptive expression of evolutionary consistent tendencies in contemporary circumstances. Maybe, the characteristics that served the purpose at a certain point of time in the form of heightened threat sensitivity or high extent of in-group prejudices were the ones that triggered the anxiety disorders, defense against discrimination and social maladjustment in the modern context (Panksepp et al., 2002; Bonacina, 2023). By the evolutionary theory and the molecular evidence, the researchers

will perhaps be better situated to learn more about the biological foundations of normative and pathological behaviours and make the inference of biologically informed and context-sensitive interventions. It is also through this trend of synthesizing that the value of synthesizing a synthesis of both evolutionary psychology and molecular neuroscience is brought to bear as a tool of providing a complete picture of human behaviour.

5. Ethical and Philosophical Implications:

The increasing curiosity of using genetics in the explanation of behaviour poses some serious ethical and philosophical questions. The danger to such under-reliance to biological determinism is excessively far in the direction of simplifying human contact, so far as one can point to the process by which it is done such a service to the human mind, as the work of the branch of molecular and psychiatric genetics. When genetic problems are treated merely as cause to diminish psychological characteristics Stefánsson (2007) cautions that it can be constructed deterministically and misused against the society such as stigmatization or genetic discrimination. The requirement then is a moral construct to establish that knowledge vouching by molecular psychology is utilized in a responsible way and not exploitation of an individual autonomy and individuality.

Interdisciplinarity also points at the importance of integrating philosophically. The idea of philosophy, psychology, and genetic convergence being simplified is what Cotanda (2024) advocated as important and essential because it will assist in thinking critically of the research implication of molecular research. The identification of genetic risk factors in mental diseases, rather, can be invoked as the defence mechanism, the production of the issue of whether free will, individual responsibility, and normal versus pathological behaviour can be argued. In the same spirit, Miller (2010) also critiques the protective interest of neuroscience in which a presentation of biological accounts is to be accompanied by privilege to other psychosocial and cultural accounts that can be added to mental health.

The clinical practice and sociocultural can also be regarded as far as ethical discourse is concerned. Likewise, with genetic (e.g. identifying genetic signs of mood disorder vulnerability or schizophrenia-like) studies in the psychiatric context, early diagnosis and tailored treatment can be discovered. Nevertheless, be attentive to this tendency because it could be used against them, infringe their privacy, or mistreat them at work, and during their insurance (Kimbrel and Fink, 2020).

Also, the overall attitude to the genetic studies cannot be overestimated: it can be misinterpreted and assume deaths or needless hysteria on the subject of the heritability.

On balance, it can be observed that the ethical and philosophical criticism must be implemented with the view to ensuring that the possession of the molecular knowledge does not hinder but rather collaborates with the psychological one in the ethical and philosophical reflection. The combination of the biological explanations, experience, and the cultural and social stimulates provokes the responsible research and practice. The researchers and practitioners will be in a position to utilize the potential of the genetic studies, preserve the complexity, dignity and diversity of humans with the help of the ethical considerations in the field of molecular psychology (Stefánsson, 2007; Cotanda, 2024).

DISCUSSION:

The convergence of psychology and molecular science necessitates the importance of the multidimensional conceptualization of cognition of human behaviour and mental mechanisms. Recent research indicates that behaviour is not predetermined by genetics, as well as even by the environment, but dynamically by the interaction of biological precocities between the environment and the genetics (Kimbrel and Fink, 2020; Pervin, 2009). Molecular genomics and neurobiological studies have revealed an enormous amount of genes and genetic variation associated with personality traits, cognitive functioning and predisposition to psychiatric diseases proving the multidimensional and multifaceted nature of behaviour (Montak, 2020; Melnychuk, 2024). As an example, shared genetic mechanisms have been identified in giant psychiatric (depression, schizophrenia, bipolar and the like) disorders to demonstrate that predisposition to mental disease was not confined to particular types of diagnostic issues but rather interratered or co-occurred.

However, despite the genetic tendencies based on healthy biological grounds, the situational and environmental conditions are shown to mediate behaviour. It has been demonstrated that early life experiences (e.g. early childhood adversity, social stressors, educational opportunities) can amplify or mitigate the genetic risks, showing this through the environment and genetic interaction (Miller, 2010). This is a perception that is in line with the biopsychosocial model of human behaviour, which integrates biological, psychological, and social parameters and provides a more holistic perspective on human behaviour (Thomas and Sharp, 2019). As the example, we might single out cognitive-

behavioural interventions, which, in turn, can also result in some form of reorganization of neural affairs, thus convincingly showing that psychosocial experiences can indeed influence the work of molecular and neurobiological processes, a phenomenon called neuroplasticity (Longdom, 2023; Biological Perspectives in Psychology, 2024).

The fact that the integration process between psychology and molecular science has implications also affects mental health. The concept of precision medicine can be supported by molecular and psychiatric genetics to indicate patients with a higher risk of psychiatric disorders and build preventive or therapeutic lines of treatment that shall be observed as an aftermath of the described discovery (Bonacina, 2023). Consistent with this, neurobiological understanding of the circuits and neurotransmitter systems provide better proposals in pharmacology and cognitive therapy as it provides precise solutions.

Evolutionary and comparative studies have also been used to complement this model and provides a perspective of the behaviours in relation to the adaptive mechanisms and talks about the normative and maladaptive patterns of behaviour within the modern settings (Panksepp et al., 2002; Baker, 2007). Reduced consumption of molecular knowledge is however required. Extreme use of genetic determinism can lead to reductionist accounts lacking the social, cultural and experience features of behaviour (Stefánsson, 2007; Cotanda, 2024). Ethical reasons are the most urgent to be considered, especially in the situation with the sensitive genetic information.

Wide-ranging research areas such as privacy, possible genetic discrimination, and misunderstanding of biological risk factors require powerful ethical considerations to be navigated through the studies and clinical use (Kimbrel and Fink, 2020). To sum up, research on synthesis of molecular science and psychology is a potent area that can be used in explaining human behaviour. With a combination of genetic, neurobiological, psychological and social interventions, researchers and clinicians can gain a micro knowledge of cognition, emotion and mental health. A multidisciplinary approach like this will not only accelerate the knowledge base of science but also allow more fitting and constructive interventions that are ethical and personalized regarding the complexity and diversity of individuals.

CONCLUSION:

The combination of psychology and molecular science has reshaped the way we currently see human behavior and the mechanisms of the mind by connecting biological, genetic, and environmental factors. Molecular genetics, neurobiology, and evolutionary psychology studies have shown that behavior is not the product of an individual gene or individual process but rather the consequence of multiplexed interactions between genes and their environment, as well as neurochemical processes. Psychiatric genetics has revealed common genetic pathways of the major mental disorders that challenge the traditional diagnostic typologies and have advanced dimensional and patient-centered treatment. Neurobiological and neuroimaging findings have further illuminated the relations between brain and mind, demonstrating that molecular and neural working demonstrate the support of cognition, emotion, and personality and promote the concept of neuroplasticity- how experience changes the brain. Evolutionary and comparative approaches also help in putting human actions into perspective as an evolutionary product, that is, an adaptive one. But with the development of scientific integration, ethics has become critical to avoid reductionism, safeguard privacy, and human dignity. In general, molecular science and psychology come together to advance a holistic, inter-disciplinary paradigm, which takes into consideration both the biological and psychosocial aspects of mental health. This synthesis does not only improve clinical and therapeutic activities but also deepens our philosophical vision of human nature in terms of the complexity of unity of mind and brain and environment.

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