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Evolutionary approaches and psychopathology: Life history theory and psychobiological systems for borderline personality disorder

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ABSTRACT

Clinical psychology requires continuous research to encourage integrative explanations for the complexity of mental disorders and their underlying causes. Biological evolutionary approaches have shown particular heuristic power for this endeavor. Life history theory (LHT) is an evolutionary model that incorporates novel and significant theoretical and empirical advances. However, there is a growing need for the incorporation of other successful evolutionary approaches. Thus, the goal of the present paper is to propose potential integrative connections between evolutionary causal modes, behavior systems, and LHT. For this, borderline personality disorder is used as an example of a condition that can be understood as an interaction between stress and attachment psychobiological systems (proximate causes), within the framework of ultimate causes clarified by LHT. To conclude, we will outline several aspects that could enhance the clinical field with implications for assessment and intervention.

Aproximaciones evolutivas y psicopatología: Teoría de historia de vida y sistemas psicobiológicos en desorden de personalidad límite

RESUMEN

La psicología clínica requiere de constantes desarrollos científicos que lleven a una explicación de la complejidad de los trastornos mentales y sus bases causales. Las aproximaciones evolutivas han mostrado ser de particular poder heurístico para esta tarea. Entre ellas, la Teoría de Historia de Vida (THV) incorpora avances teóricos y empíricos novedosos y significativos. No obstante, existe la necesidad de incorporar investigación y aproximaciones evolutivas adicionales de interés. Por lo tanto, en este artículo se propondrá el potencial de integración al ampliar la causalidad evolutiva en conjunción con aproximaciones de sistemas psicobiológicos de conducta. Para esto se utilizará como ejemplo el Trastorno Límite de Personalidad, ampliando su comprensión como una interacción de causas próximas entre los sistemas psicobiológicos de estrés y apego, dentro del marco de causas últimas de THV. Finalmente, se demarcarán aspectos que nutren el campo clínico con implicaciones para la evaluación y los dominios de intervención.

One of the greatest challenges to social and economic well-being is the prevention and treatment of mental health problems that impair the quality of life, development, and productivity of communities (Greenberg et al., 2021; Layard, 2017). Similarly, a major scientific challenge is to reach a holistic understanding of mental health problems that helps to resolve the ontological and causal complexity of mental disorders and the limitations of the current classificatory systems of psychiatry to contribute to necessary advances in the science of prevention and a more effective approach to behavioral problems. Consistent with this, in the last century there has been a growing interest in disciplinary integration that reflects the maturity towards consilience in clinical science through interdisciplinary alliances and the scientific effort to unify the knowledge base in order to better understand and explain the phenomena of interest and minimize causal uncertainty (Figueredo et al., 2006). Undoubtedly, the evolutionary approach to behavior provides potential contributions to the understanding of psychopathology, with exceptional contributions to the elucidation of the etiology, processes, and mechanisms involved in the development and trajectory of behavioral problems. Some authors have considered the evolutionary approach as a meta-model that can be extended to a multilevel and multidimensional analysis with key concepts such as variation, selection, retention, and context, which when focused on the relevant dimensions and levels can provide a solid framework to organize diagnosis and interventions (Hayes et al., 2020c). The interest in individual differences and variations in behavioral traits, the product of histories associated with adverse contexts, constitutes one of the lines of research in which evolutionary perspectives have been advancing (Brüne, 2016; Richardson et al., 2019).

The evolutionary perspective in psychopathology is consistent with current advances in the dimensional recognition of the processes involved in the development of psychopathologies—as opposed to the syndromic view based on the identification of discrete classes of disorders—and it is the basis of several new research programs to provide alternatives to the current restricted category-based classification systems. For example, the Institute of Mental Health's Research Domain Criteria (RDoC) program (Cuthbert & Insel, 2013) reflects an invaluable transition in understanding and approaching psychopathology with a multilevel perspective that seeks to integrate recent advances with explanations that embrace the functional, multicausal, multidirectional, and multidimensional complexity of disorders (McNally et al., 2015). Also, interestingly and consistent with the self-critical process of science, the scope of the medical model to explain behavioral problems has been discussed and reformulated (Szasz, 1960; Syme & Hagen, 2020; Valenstein, 2002). This has facilitated a progressively interdisciplinary work that helps different areas of study and professionals to advance psychotherapies and the understanding of psychopathology approached as a dimensional continuum, with transdiagnostic processes, leading to a clinical management based on procedural criteria, contributing to mitigate the impact of social stigma, the proliferation of a priori medicalization, and optimize assessments on the efficacy of psychotherapies (Hofmann et al., 2016). This self-criticism has facilitated discussion of the importance of scientific criteria beyond the limited discussions around the definition and inclusion or exclusion of disorders in the DSM and

ICD manuals (Hurtado & Trebilcock, 2003; Méndez & Cabanillas, 2012; Maher, 1970; Szasz, 1960), and the difficulty of determining empirically why, how, or what particular components of different interventions lead to mental health benefits (Cuijpers et al., 2018; Primero & Moriana, 2011), benefits for which there is ample evidence and vigorous discussion about the efficacy criteria (Aparicio & Méndez, 2020; Bursal & Pérez, 2017).

In this context, a variety of discussions and conceptual models have emerged over the past few years in psychology, psychotherapy, psychiatry, neuroscience, and other areas, which seek to explicitly incorporate and develop ideas from evolutionary biological theories as a strategy for advancing the understanding of the causal complexity of mental health phenomena in a way that is integrative, multidisciplinary, and inclusive of their individual differences (Abed et al., 2019; Crespi, 2020; Del Giudice, 2016; Durisko et al., 2016; Gilbert, 2019; Gilbert & Kirby, 2019; Han & Chen, 2020; Hayes et al., 2020a; Hayes et al., 2020b; Nesse, 2015; Shackelford & Zeigler-Hill, 2017; Zagaria & Zennaro, 2020). One such model has focused on understanding mental disorders from life history theory (LHT). This approach helps to extend in the evolutionary context the importance of highlighting individual differences (Taji et al., 2020) and involves several advantages of scientific integration related to the use of interdisciplinary language, building complete and accurate explanations involving individual differences, contextual, ontogenetic, and phylogenetic factors for the understanding of psychopathology, as well as leaving behind the deterministic causal explanations of some traditional models (Del Giudice, 2014a).

The complexity of life and the extensive research history in evolutionary biology have resulted in a variety of theoretical and research approaches, LHT being one of them. Similarly, there is also a rich history of attempts to independently integrate various theories with evolutionary origins into the understanding of mental health. A review of recent research in mental health suggests that it is a propitious time to strengthen theoretical integration for this variation of evolutionary stances and research programs focused on mental health. Therefore, the aim of the present article is to highlight the opportunities for integration of three areas of theorizing that have developed relatively independently: LHT, the causal distinction between proximate/ultimate causes, and psychobiological behavioral systems approaches. To this end, we will start with a general description of LHT. Then, we will discuss how the classical distinction in evolutionary biology between proximate and ultimate causes can clarify the progress and scope of LHT using borderline personality disorder (BPD) as an example. BPD is a disorder that is a reference for public health and clinical practice; it involves severe individual and interpersonal disruption, and it could serve as a model for future evolutionary interpretations of other mental health problems. The discussion of causal factors related to BPD will be enriched using the psychobiological behavioral systems approach and their interactions, with emphasis on stress and attachment systems. Finally, some contributions of this discussion to current clinical psychology will be identified.

Life history theory

LHT is an approach within evolutionary biology that explains how organisms allocate their resources, energy, and time

throughout their life cycle (Charnov, 1993; Promislow & Harvey, 1990). Because ecological, biological, and psychological resources are limited, there are distinct strategies that have been selected underlying individual differences in allocation for the life activities of development, survival, and reproduction (Geary, 2002; Taji et al., 2020). These strategies that organize individual differences in organisms have been termed life history strategies and involve trade-offs between problems such as: current vs. future reproduction, offspring quality vs. offspring quantity, and “mating” vs. parental effort (Roff, 2002). The pattern of behavioral and biological characteristics of life histories can be placed within what is known as the fast-slow continuum. This continuum describes and integrates the organization of metabolic, hormonal, behavioral, and personality characteristics, and is organized according to the demands of the environment and the survival strategy favored by natural selection (Wolf & McNamara, 2012). Strategies located within the fast end are related to early reproduction, high juvenile mortality, higher number of offspring, and lower parental investment, as well as impulsive and uninhibited behaviors. In contrast, strategies located within the slow continuum are related to late sexual maturation and reproduction, long life span, high parental investment, fewer offspring, lower juvenile mortality, and greater emotional stability (Del Giudice, 2014a).

It has been proposed that life history strategies offer insight into the development of vulnerabilities for psychopathology, including multiple factors such as developmental events, genetics, and epigenetic mechanisms (Del Giudice, 2014b). An interesting proposal from LHT is that individuals who tend to be located at the fast and slow ends of the continuum are more likely to exhibit patterns of behavior that are regarded as mismatched to the context. As will be addressed in the next section, LHT helps to clarify ultimate causes of psychopathological processes by proposing an evolutionary explanation in terms of organized behavioral strategies during ontogeny consistent with a phylogenetic history of adaptive success. LHT proposes that emotional and behavioral development emerges as a result of adaptation to contextual contingencies, which allowed the survival of the individual at a moment in their history (Buss, 2015), dissuading ideas related to causes underlying the symptoms of a disorder. It breaks with the stigmatizing and victimizing role of mental illness typical of the medical model (Gilbert et al., 2000).

The LHT framework has had interesting heuristic power in investigating the relationship between psychopathology and life strategies, as well as risk factors. Some research advances have focused on psychological characteristics that promote psychopathology. For example, fast histories are related to characteristics such as lower empathy, higher impulsivity, neuroticism, aggressiveness, and a tendency to exhibit risk-taking behaviors (Del Giudice, 2016). This compilation of psychological factors has helped to develop novel empirical research. For instance, from factor analysis modeling associated with latent variables underlying a variety of parameters for somatic and reproductive effort a factor K was initially developed. Subsequently a unified dimension called Super K was found by finding positive correlations of K with additional factors of covitality and personality. From these analyses, initial hypotheses that a life history strategy high in K predicts physical and mental health consequences caused by a history of high parental effort and

somatic strain were supported. In addition, statistical independence was identified in the mating effort dimensionality (associated with fast histories) and the low K dimension (associated with slow histories) (Richardson et al., 2017).

Connecting ultimate and proximate evolutionary causes for mental health

The causal complexity of mental health phenomena implies a metatheoretical model that manages to clarify, organize, and include the totality of causal sources for the understanding of psychopathology and the improvement of psychotherapeutic efficacy. A step towards such a model could be achieved by enriching the advances made in LHT by explicitly incorporating the discussion of causal sources from evolutionary theory. Mayr (1961) proposed that a comprehensive and holistic explanation of biological phenomena is enriched by distinguishing two types of causes: 1. Ultimate causes, which refer to the processes of evolutionary history upon which the characteristics of organisms can be explained; and 2. Proximate causes, which refer to the immediate or ontogenetic developmental influence of events on the morphology, physiology, or behaviors of organisms. The need for this distinction has been indicated for multidisciplinary advancement and toward theoretical models encompassing greater causal complexity in biology, psychology, and psychiatry, among other areas (e.g., Tinbergen, 1963; Nesse, 1999; Brüne, 2014). Interestingly, Brüne (2014) and Nesse (1999) propose the need for research informed from evolutionary theory to deepen the study of the proximate and ultimate causes of psychiatric conditions and to achieve improvements in psychotherapy.

LHT emphasizes the causal importance of the evolutionary history and the adaptive value of people’s life strategies. In terms of the distinction proposed by Mayr, an important advance from LHT is focused on the understanding, clarification, and research related to the ultimate causes of behaviors and mental health problems (research that will be presented later). However, there is comparatively less progress for general explanations regarding proximate causes of behavior. Therefore, we highlight the need to advance in theoretical models and research programs for the understanding of, for example, the mechanisms and behavioral organization underlying the adjustment of psychobiological processes during development according to survival and reproduction. This is true even in cases where such organization may involve strategies with negative impacts on mental health. Behavioral systems approaches are promising to advance in the proximate causes of behavior during development, since they were proposed from an evolutionary context and provide strategies to understand the organization of behavior. These approaches connect the analysis of particular behavioral processes with the ecological and evolutionary analysis of the internal structure of motivational or emotional systems, all framed in an interactive process during the development and life of the individual (Burghardt & Bowers, 2017). The notion of behavioral systems is a conceptual scheme that is based on the proposition that the determinants of behavior are organized into functional systems of identifiable and relatively consistent structures of different functionally interrelated behaviors, an organization that has been shaped by evolutionary, developmental, and learning pressures

(Timberlake, 1994; Bowers, 2018). Examples of different behavioral systems that have been studied are the fear and defense system, the sexual system, the attachment and care system, among others (Bowlby, 1969; Bolles & Fanselow, 1980; George & Solomon; 2008; Domjan & Gutiérrez, 2019). By way of illustration, a simplified diagram of functionally interrelated behaviors for the infant attachment behavior system is presented in Figure 1. Additionally, the description and investigation of relatively independent behavioral systems has clarified that they are in constant interaction, with the possibility of arousing or inhibiting each other (Bowlby, 1969; Baerends, 1976). Conflicting interactions between behavioral systems have led to clarifications of interest for understanding the proximate and ultimate causes of behavioral patterns (Baerends, 1976), as well as more recently leading to novel understandings of psychiatric problems and therapeutic strategies (Liotti, 2017; Cassidy & Mohr, 2001).

Understanding BPD based on ultimate and proximate causes

The conceptual framework of LHT has been used for the causal understanding and therapeutic implications of several mental disorders (Del Giudice, 2014a), and among them BPD has been one on which significant advances have been made. The complexity of BPD as well as its clinical and social relevance make it a convenient reference on which to illustrate evolutionary approaches. BPD is characterized globally by dysregulation in emotional, cognitive, behavioral, and sense of self areas, as well as difficulties in interpersonal effectiveness, intense fear of abandonment, and impulsivity. Moreover, it is one of the disorders with the highest risk associated with suicidal and parasuicidal behavior, low adherence to treatment, and the highest number of referrals between mental health professionals, not to mention the interference in permanence in the education and labor systems due to disabilities (Linehan, 1993). Severe disorders such as BPD involve a network of heterogeneous and multidimensional symptoms, which evolve towards a profound disruption in the quality of life, of the functioning of the person, and his/her social environment. Its complexity and the progress made within LHT

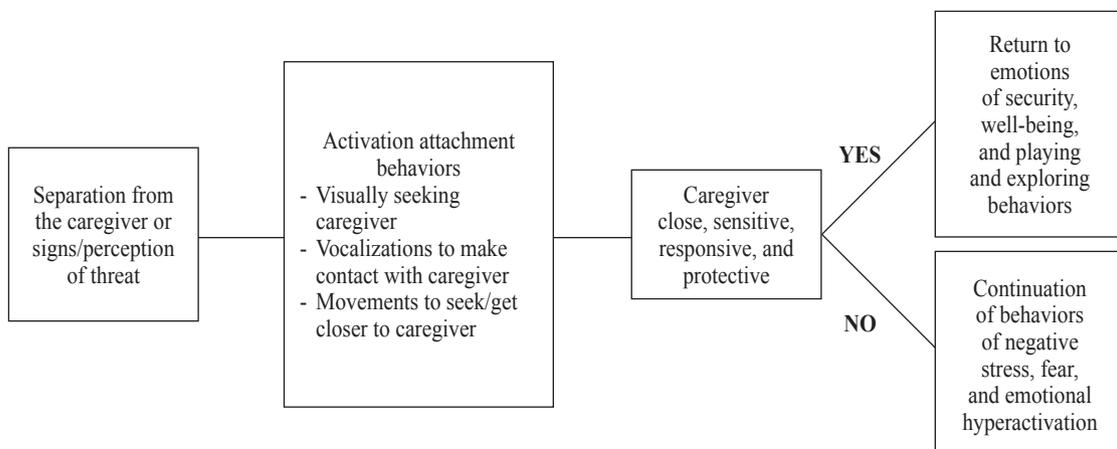
make BPD an example of interest to illustrate how the causal processes of different psychopathologies can be better understood using the evolutionary distinction of proximate and ultimate causes.

Much of the progress on BPD within LHT has been made on understanding its ultimate causes by proposing that its characteristics stem from phylogenetic processes that resulted in fast life strategies to improve the odds of survival in adverse environments (Brüne, 2016; Crowell et al., 2009). Thus, the understanding of the evolutionary causes of the complex psychological and biological interactions underlying BPD has been advanced, as well as the explanation of the origin and functions of individual differences between people with or without the diagnosis. On the other hand, relatively less progress has been made on the proximate causes of BPD in LHT-informed approaches. In particular, emphasis has been placed on the stress response system (Del Giudice, 2014a, 2014b) and the importance of attachment processes for understanding BPD (Figueredo et al., 2006). However, these research and theoretical advances on proximate causes have been created independently without a shared theoretical basis, despite recent acknowledgments of the importance of the attachment system for life history strategies (Szepeswol & Simpson, 2019) and the fact that in evolutionary terms it would be natural for basic survival systems such as stress and attachment to interact (Bowlby, 1969). A consequence of the current limited integration between proximate and ultimate causes is that, thus far, attachment processes do not appear to have been theoretically connected to BPD in the evolutionary context of LHT. In addition, there has been little theoretical and research progress on the potential ways in which proximate causes framed in the stress and attachment systems might interact for BPD, or on the opportunities for multicausal explanation and clinical considerations when considering these inter-process interactions.

LHT and research on ultimate causes of BPD

It is common to find that individuals diagnosed with BPD grew up in unpredictable and hostile environments (Brüne, 2016;

Figure 1. Example of the infant attachment behavior system through a simplified description of the effects of changes in a child's environment for the sequence and interaction of a set of functionally interrelated behaviors. A more in-depth description can be found in Mikulincer and Shaver (2007).



Crowell et al., 2009), suggesting that their psychobiological profiles may have survival value as a fast-life strategy. Additional research has also highlighted parallels between BPD symptoms and fast-extreme strategies. For example, Brüne et al. (2017) found that people diagnosed with BPD reported a tendency to have a greater number of sexual relationships in various hypothetical situations when they had higher subjective depression scores, compared to the control group. This would evidence the tendency of individuals with BPD characteristics to take advantage of material or immaterial resources in the short term, even when the context encouraged the use of slow strategies (Brüne, 2016; Brüne et al., 2017). On the other hand, Otto et al. (2021) reported that, compared with an undiagnosed group, women diagnosed with BPD had scores indicating fast spectrum behaviors, in addition to higher scores on aggressive behaviors, chronic stress, and adversity during childhood.

Proximate causes for BPD: Psychobiological systems and their interaction

Despite the existence and complex interaction of multiple psychobiological systems in understanding BPD, the present article focuses on the stress and attachment systems considering that they are systems that are widely considered for the understanding of BPD, as well as their importance in involving mechanisms upon which individuals internalize contextual cues in the form of life strategies. In research terms, it could be inferred that alterations in these systems could explain, to some degree, the characteristic behaviors of BPD in terms of adaptation strategies rather than psychopathological symptoms.

Stress response system. This is defined as a psychobiological system and an adaptive mechanism whose function is to collect information essential for the survival of the species, such as potential dangers and opportunities in the environment. For this purpose, neurobiological subsystems such as the sympathetic, parasympathetic nervous system, and the hypothalamic-pituitary-adrenal (HPA) axis are involved (Ellis et al., 2006; Ellis & Del Giudice, 2014). These subsystems activate and adjust in an allostatic manner in coordination with environmental challenges and the organism's resources (McEwen & Stellar, 1993). Stress system activation will depend on the intensity and duration of environmental cues (Ellis & Del Giudice, 2014), such that it can be highly responsive or poorly responsive, causing individuals to exhibit different response patterns that allow them to adapt to their environments (Ellis et al., 2017). These patterns can be framed globally in terms of fast-slow continuum strategies, which promote survival and reproduction, although they can sometimes have collateral health costs (Ellis & Del Giudice, 2017).

Specifically, the HPA axis, one of the subsystems of the stress system, is responsible for the distribution of energetic, homeostatic, and physiological resources, and in turn, for the regulation of life strategies through changes in defensive behaviors, risk-taking, reproductive status and fertility, mating and care, memory, learning, and the development of emotional systems (Del Giudice et al., 2011; Nesse et al., 2016; Crespi et al., 2013). In environments of constant exposure to danger, uncertainty, or little control, the HPA axis remains in hyperactivation and is highly responsive to threats, allowing the organization of fast strategies and adaptation

of individuals (Ellis et al., 2017a; Ellis et al., 2017b). In contrast, in contexts of low threat and relatively high predictability, moderate activation of the axis tends to be present, which is related to slow life strategies that enable survival through traits such as social openness, sensitivity to social feedback, greater inhibitory control, and delay of gratification (Ellis et al., 2017a).

With respect to BPD, a high responsivity to stress promotes fast strategies in unpredictable contexts, as threat vigilance is increased and sensitivity to social feedback is decreased; this is related to the characteristics of emotional dysregulation which, in turn, are related to other symptoms such as impulsivity and risk-taking behaviors (Brüne, 2016). A correlation has been found between adverse environments (e. g., trauma histories) and alterations of the HPA axis in individuals with BPD (Fernando et al., 2012). In this sense, the modification or alteration of the stress system has been proposed as one of the key mechanisms, at the biological level, to explain how individuals internalize fast strategy behaviors according to the contextual signals received, as is the case of BPD. As suggested by Boyce & Ellis (2005), high stress activation patterns constitute one of the integrative pathways through which environmental and psychosocial factors may be reflected in manifestations of psychopathology.

Attachment behavioral system. This is proposed as an innate psychobiological system that motivates the proximity of the offspring to its attachment figures, which increases the probability of survival by keeping it close to its primary source of security, and encourages exploration of the environment, and feelings of protection and security (Bowlby, 1969). This system has become an evolutionary advantage for offspring that do not fend for themselves, such as human infants, by preparing them for the demands and availabilities of the environment (Szepeswol & Simpson, 2019). This occurs from the integration of information from experiences with caregivers into internal working models, which are mental representations that guide individual perceptions, emotions, thoughts, beliefs, and expectations about future relationships and the environment in general (Bowlby, 1969; 1982). Internal working models, then, will impact personality and the adjustment of different processes and behaviors across the lifespan, such as life history characteristics (Mikulincer & Shaver, 2007). Thus, the quality of parental care serves as a channel through which children receive information about risks and opportunities in the environment, and it has been proposed as one of the most proximate mechanisms through which life history strategies develop (Ellis et al., 2006). The attachment system is key to the internalization of contextual cues through information received in the interaction with attachment figures in the form of beliefs and cognitive schemas that mediate the development of life strategies.

For the case of people diagnosed with BPD, it is common to find histories of asynchronous interactions with their caregivers in childhood characteristic of insecure attachment (Buchheim & Diamond, 2018; Steele et al., 2020; Peng et al., 2020). In this sense, some authors such as Szepeswol and Simpson (2019) proposed to consider attachment types in terms of slow and fast life strategies. Particularly, in secure attachment relationships the caregiver is sensitive and consistent, so the infant anticipates that the world is safe, that he/she will find resources to meet his/her needs, and that the people around him/her are trustworthy. Secure attachment

would thus relate to slow strategies that increase adaptation in safe and predictable environments. In contrast, in insecure attachment relationships caregiving can be hostile, intermittent, and difficult to predict because social signaling may be sparse, inconsistent, threatening, or ambiguous, making the social environment difficult and unpredictable. In BPD it is common to find that social relationships are unstable and disorganized (Linehan, 1993). Individuals present short-term manipulative and resource-exploitative behaviors (Ebert et al., 2013), as a result of biased perceptions and low expectations of trust, availability, and consistency regarding others (Chisholm, 1996; Fonagy et al., 2000), and moreover, a hypersensitivity to emotional stimuli indicating potential rejection, abandonment, and hostility, which may also be related to high-risk self-injurious behaviors that may have the function of increasing the likelihood of care from an attachment figure (Brüne, 2016). These characteristics of insecure attachment coincide with fast strategies as forms of coping. Finally, relationships have been found between BPD and other behaviors characteristic of fast strategies related to the attainment of short-term resources, such as expecting a lower level of parental care from hypothetical partners and indulging in early activities at younger ages compared to people without the condition (Brüne et al., 2017). Such responses to hostile environments could involve survival advantages, such as goal attainment in the short term in individuals whose attachment system signals that the environment is difficult and hostile (Szepeswol & Simpson, 2019).

Interactions between stress and attachment systems. In addition to the understanding of particular psychobiological systems, conflicting interactions between psychobiological or motivational systems could be key aspects for the understanding of developmental processes and risk for psychopathological behaviors (Liotti, 2017; Cassidy & Mohr, 2001). Informing this general framework with LHT and the stress and attachment systems, BPD could be understood as an adaptive behavioral pattern resulting from the organization of the attachment system in conjunction with the stress system in the face of scarce caregiving resources typical of adverse environments (Brüne, 2016; Brüne et al., 2010; Brüne et al., 2017). Thus, starting from a low capacity for emotional regulation as a result of adaptation to difficult contexts, asynchronous experiences with caregivers imply a hyperactivation and high responsivity of the stress system (Brüne, 2016), making even more frequent the difficulties in self-regulation and trust that are characteristic of BPD. These characteristics may explain other symptoms such as difficulty in interpersonal effectiveness, impulsivity, and risk-taking behaviors, all framed in a fast life strategy (Brüne, 2016). One way in which these psychobiological systems interactions are organized is the adaptive calibration model (Brüne, 2016), where the stress system is a general mechanism that organizes other psychological and developmental mechanisms to regulate strategies that can be located on the fast-slow continuum. Some empirical findings that could support this interaction are that the presence of a caregiver may influence along with other factors on cortisol reactivity due to their presence and availability (Hostinar et al., 2014). In addition, attachment styles are shaped by levels of early psychosocial stress and co-regulation provided by the social environment that demarcates the most effective response to stress (Ellis & Del Giudice, 2014). These discussions have very interesting heuristic potential for necessary future research that will need to clarify both the mechanisms of interaction of

psychobiological systems and the potential clinical opportunities to consider these interactions, as well as the processes underlying the functioning and interaction of other behavioral systems.

Some contributions of LHT and behavioral systems to clinical psychology

Contributions from LHT and behavioral systems have shown promise in terms of advances for preventive models in mental health and explanatory models of etiology and intervention in psychopathology. Estimates of risk and protection for clinical psychology are as necessary as understanding the processes and mechanisms involved in the origin, course, development, and intervention of behavioral problems. We believe that contributions from LHT and behavioral systems contribute to understanding the variation expressed in different behavioral phenotypes, both psychopathological ones presented in relation to adverse environments that affect processes concerning the overall well-being of individuals, and healthy behavioral variation related to sufficiently predictable safety conditions in social, community, and physical ecology. The evolutionary contributions of LHT and behavioral systems result in an emphasis of a clinical approach based on community integration for recovery from a functional context analysis (Richardson et al., 2019), as well as in the preventive value of microsystems, represented in early social support. The effects of this support are best understood by considering the sensitivity of psychobiological systems in which social interactions shape physiology by linking distinct behavioral systems such as stress and attachment, which are early organizers of other biological and behavioral systems and processes. It is not surprising then, that the most effective current interventions targeting people with impaired regulatory processes and adverse history benefit from treatments aimed at optimizing interactions for the promotion of emotion regulation skills (Fehrenbach et al., 2022), as well as the repairing of effective interpersonal relationship skills. A consequence of this orientation is a better calibration of stress response system responses, as polyvagal theory and interventions aimed at restoring complex trauma-specific physiological responses, such as those based on somatic experience tend to propose (Graziano & Derefinko, 2013).

In line with the above, the five domains for intervention and change proposed by Richardson et al. (2019) can be considered: 1. Predictability and environmental safety, interventional approaches aimed at restoring bonds, social integration (attachment and care systems), and the processing of emotional experience (stress and fear system) (Cusack et al., 2016). 2. Management of beliefs and schemas that relate to unpredictability or future expectations (Ellis et al., 2012). 3. Increases in Super-K (e.g., somatic, parental, and community integrative effort). 4. Decrease in mating competence, tendency toward development of slow life strategies (e.g., mating effort, risk-taking, and aggression). 5. Belief that healthier and more cooperative behaviors in the future can strengthen mate value, status, and access to resources.

On the other hand, the clinician can draw on the prediction derived from what is known as the differential K factor and mating skills, providing a dimensional approach that underlies a variety of life history parameters that make individuals more likely to have indicators of general health, developmental stability, and mental

and physical functioning (Richardson et al., 2017). An important advance from this approach is the understanding of mental disorders as manifestations of global dimensions of survival and reproductive strategy, in which resources are allocated in the short term for survival, rather than being seen as a set of isolated symptoms, which in turn is consistent with more general psychobiological proposals and useful for the clinic.

General conclusion

In general, the evolutionary approach based on LHT and behavioral systems is deeply linked to a processual view of behavior and is oriented to self-critical progress in psychometric, longitudinal, experimental, and predictive research programs. A strength and opportunity of these proposals is their consistency with multicausal, multidirectional, and multidimensional perspectives, situated within bioecological views of behavior and human development (Richardson et al., 2019). These, in turn, are oriented to the identification of the evolutionary and psychobiological variables that underlie the individual differences common to mental health problems (e. g., Belsky et al., 1991). Additionally, as indicated by Baptista et al. (2021), the possibility is created of developing specific prevention and intervention programs for different moments of development based on the knowledge of the developmental trajectories of disorders such as BPD. All these theoretical and research advances suggest that developmental metatheoretical approaches will continue to have enormous heuristic potential for understanding psychopathology and improving psychotherapeutic efficacy. Nevertheless, there is an enormous variety of evolutionary as well as psychological and psychiatric approaches that will gradually have to be included within increasingly integrative models. We propose a further step in this process of integration and metatheoretical consilience by describing the potential for complementing the understanding of disorders such as BPD through developing the explicit connection of several recent and relatively independent research advances: LHT, distinctions between proximate and ultimate causes, and theoretical and applied advances in psychobiological systems of behavior.

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Conflict of interest

There is no conflict of interest for any of the authors.

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