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A genetic-behavioral alternative to the personality disorders: the Livesley dimensional model

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In the personality disorder section of the DSM-V research agenda, the authors stress the need for studies on the relevance of a change from diagnostic categorical models to dimensional ones. These studies should identify the underlying genetic and neurobiologic mechanisms and appropriate representation on the dimensions of clinical criteria as cognitive disturbances, identity conflicts and attachment. Livesley's behavioral-genetic model represents an interesting dimensional paradigm of personality pathology. It was elaborated deductively from the consensus and statistical refinement of data collected by a large number of clinicians from different psychopathological tendencies. The traits are made operative in the «Dimensional Assessment of Personality Pathology-Basic Questionnaire» (DAPP-BQ) tool with 18 dimensions (that became 30) and 4 higher rank factors (adapted to Spanish by Gutiérrez-Zotes et al, 2008). The model has shown an appropriate relationship with important personality paradigms and good predictive power for personality disorders. The authors incorporate methods of variance breakdown for statistical processing of the genetic-environmental mechanism underlying each personality disorder dimension. Homologation of DSM-IV-TR criteria for personality disorders is proposed so that the model's dimensions capture and represent the clinical complexity of the symptoms in a convenient manner for the new location in DSM-V.

Key words:

Dimensions. Personality disorders. Behavioral genetics. Taxonomy.

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Una alternativa genético-conductual a los trastornos de la personalidad:

En la agenda de investigación para el DSM-V, sección de los trastornos de la personalidad, se enfatiza la necesidad de estudios sobre la pertinencia de un cambio de mod-

elo de categorías diagnósticas por uno dimensional. Estos trabajos deberían identificar los mecanismos genéticos y neurobiológicos subyacentes así como la adecuada representación, en las dimensiones, de criterios clínicos como las alteraciones cognitivas, los conflictos de la identidad y del vínculo. El modelo genético-conductual de Livesley se constituye como un interesante paradigma dimensional de la patología de la personalidad. Ha sido elaborado de forma inductiva a partir del consenso y depuración estadística de un gran número de clínicos de diferentes corrientes psicopatológicas. Los rasgos se operativizan en el instrumento «Valoración Dimensional de la Personalidad Patológica-Cuestionario Básico» (DAPP-BQ) con 18 dimensiones (posteriormente 30) y cuatro factores de rango superior (adaptado al español por Gutiérrez-Zotes et al., 2008). El modelo ha demostrado una adecuada relación con importantes paradigmas de personalidad y buena capacidad predictiva con los trastornos de la personalidad. Los autores incorporan métodos de descomposición de la varianza para depurar el mecanismo genético y ambiental que subyace a cada dimensión de la patología de la personalidad. Se propone una homologación de los criterios DSM-IV-TR para los trastornos de la personalidad, en donde las dimensiones del modelo capturan y representan la complejidad clínica de los síntomas de forma conveniente en la nueva ubicación para el DSM-V.

Palabras clave:

Dimensiones. Trastornos de la personalidad. Genética de la conducta. Taxonomía.

INTRODUCTION

The pathway of W. J. Livesley in the study of personality disorder is marked by a double evidence: on the one hand, an endeavor to create a dimensional model that captures all the clinically relevant aspects of the personality (and its disorders) and on the other, he used the strategy of breaking down the variance into each dimension using the questionnaire model into inheritable and environmental ones. He dedicated more than two decades to this work, using, we believe the maxim of our Ramón y Cajal when he stated

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that in science «*facts remain and theories pass away*»¹ as a reference. Adopting the constitution of a new paradigm in the classification of pathological personality meant that Livesley and his collaborators placed their bet on an inductive strategy which, based on the clinically consensually agreed on empirical data, would guide a model that could be tested by the genetics of behavior.

The importance of genetic factors in the etiology of mental disorders is a widely accepted reality. There is an increasingly greater interest in the allelic characteristics of the personality traits and their disorders.² The relevance of the genetic factors in the understanding of psychopathology took an enormous step forward in the year 2003 when Caspi and his group published in the journal *Science*³ the results of a key study on the genetic-environmental vulnerability of mental disease when they related the interaction between a certain genotype and stressful life events in childhood, specifically in child maltreatment, with a predisposition to develop depression in adult life. The evidence of genetically determined biological substrates that influence the development of disadaptive behavior patterns that were precursors to personality disorders⁴ make it necessary to design and structure nosologies of personality domains and their disorders explained in the genetic, environmental and interaction slope.

On the other hand, it is well known that the debate on the dilemma of categorical versus dimension occurring in recent years between personologists and clinicians seems to opt for the substitution of the model of discreet entities with that based on a *continuum*.⁵⁻¹⁰ In this sense, Widiger and Simonsen in the APA 2005 Agenda^{11,12} reflected on the wide acceptance of the dimensional perspective as a model of description of personality disorders and normal personality. They concluded by making an effort to synthesize or integrate the different dimensional proposals that currently existed. They proposed classify most of the traits and behaviors described in the 18 models into one structure with 4 hierarchical levels: 1) Internalization-externalization; 2) The 5 big factors of normal functioning of the personality; 3) Scale of traits; and 4) Behavior symptoms (diagnostic criteria). Thus, they concluded that the personality models make pertinent contributions so that it is the integration of ideas and not choosing a single paradigm that makes it possible to continue to lay the foundations for a new nosological classification.

The contribution of Livesley within this conglomerate of personality models «to integrate» is especially attractive. A little known paradigm in our country, the purpose of this review is to present the novel principals provided by his works, from the genetic-behavioral dimensional model, in the current debate on personality disorders, and their future place within the next DSM-IV-TR revision.

The studies of this author could be divided, roughly, into four stages, that is:

1) Creation stage of a pathological personality model based on a strong clinical-nosological consensus, with use of a statistical and mathematical strategy, or *induction of the principal domains of the personality*; 2) *Epistemological and conceptual* stage or approach to reasons to substitute a categorical model with a dimensional one according to a differentiation between «personality evaluation» and «personality disorder»; 3) *Genetic-behavioral* stage in which the model and its dimensional proposal are tests, using the results found from the genetics of the personality disorders as guidelines; and finally 4) *Definition and placing of personality disorders in the DSM-V* stage, where the proposals to integrate the dimensional model of personality disorders into a new nosological classifications are collected.

DEVELOPMENT STAGES OF THE PATHOLOGICAL PERSONALITY MODEL OF LIVESLEY

Stage I. Induction of the principal domains of personality

Methodological aspects to obtain the pathological personality model

Livesley and his group have proposed a complex process of several stages to identify and define the traits of each diagnosis. Specifically, strictly clinical knowledge of many professionals is considered as a preliminary starting point to elaborate the model. With this, the bias of adopting a single clinical perspective in the constitution of the dimensions as has occurred with other theories is minimized. The procedure is described in detail in several articles.¹³⁻¹⁶ Essentially, it is the following. In first place, the clinical traits and behaviors associated to each DSM-III diagnosis were identified through the analysis of the clinical literature content, the expert's opinion, and the analysis of the content of the interviews with patients suffering personality disorder. After that, 22 questionnaires were elaborated and were sent to a random sample of 2,960 North American psychiatrists, 938 of whom answered, identifying the most prototypical traits of each diagnosis. The coefficients of reliability were high both for traits ($\alpha = 0.81-0.96$) as well as for behaviors ($\alpha = 0.88-0.94$), this indicating a high degree of agreement among the specialists when relating each prototypical traits in each diagnosis¹³. The following step was to organize the most prototypical traits into categories. The least prototypical ones were included in the previous categories or, if necessary, new categories were developed. Finally, the content validity of the trait descriptions of each diagnosis was confirmed by experts' opinion of independent samples of psychiatrists.¹⁴ Then, following the method described by Jackson,¹⁷ self-reported scales were developed with a format of 5-point answers (from strongly disagree to strongly agree). A total of 100 scales were needed: 79 to describe the most prototypical traits and 21 for the least prototypical qualities. The psychometric properties of the scales were evaluated in two phases with independent samples of general pop-

ulation. In the first phase, 3256 subjects responded. Those items that highly correlated with social desirability scale or that had an elevated pattern of asymmetry were eliminated and the items with the greatest correlation with the construct of interest were kept. The alpha coefficient of reliability ranged from 0.98 to 0.64. In the second phase, the internal consistence was replicated with a sample of 110 subjects, those items that were more associated with an irrelevant construct than with their own construct were eliminated. The alpha coefficients for the scales were greater than 0.90 for 22 scales, between 0.80 and 0.89 for 67, from 0.70 to 0.79 for eight, three scales having a reliability below 0.69.¹⁵ To verify the representation of the personality disorders, the questionnaire was administered to a sample of 274 volunteers and 158 patients with primary diagnosis of personality disorder, the mean of the alpha value for each sample being from 0.87 to 0.85, respectively. The data of the samples were analyzed independently by exploratory factor analysis. Fifteen similar factors were obtained in both samples, supporting the dimensional representation of the personality disorders.¹⁶

Design of a new instrument: Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ)

The prototypical characteristics of each behavior or trait are made operative in the *Dimensional Assessment of Personality Pathology-Basic Questionnaire (DAPP-BQ)*.¹⁸ This questionnaire was designed based on the results of 100 scales subjected to an analysis of principal components whose procedure has been described above.¹⁶ The dimensions were: affective lability, callousness, cognitive dysregulation, compulsivity, conduct problems, identity problems, insecure attachment, intimacy avoidance, narcissism, oppositionality, rejection, restricted expression, social avoidance, stimulus seeking, submissiveness. Identity disorders were divided into two groups, resulting in the dimensions of anxiety and identity problems. In addition, two groups of scales were created that did not clearly appear as factors, but that are clinically relevant, these being suspiciousness and self-harm, increasing the total number of dimensions to 18.

The DAPP-BQ is made up of 290 self-reported items and it is a derivation of the longer version or 560-item DAPP-DQ. The structure of the DAPP-BQ has 3 levels of construct: 4 secondary domains formed by 18 basic or primary traits that are subdivided into 69 subtraits. From 2 to 7 subtraits define each primary trait. Domains, traits and subtraits are shown in figure 1.

The four secondary domains are emotional dysregulation, dissocial behavior, inhibitedness and compulsivity,^{6,19} as follows:

I. Emotional Dysregulation is made up of traits such as affective lability, anxiety, negative mood, eccentric perceptions, cognitive dysregulation (tendency to show cognitive

disorganization under stress situations and to experience brief psychotic symptoms), submissiveness and self-destruction.^{19,20} Equally, it implies the tendency to instability and emotional reactivity with interpersonal problems, lack of satisfaction with the self and life experiences. This dimension would be similar to neuroticism, although more extensive, as it includes aspects such as identity and cognitive problems (cognitive disorganization under stress), insecure attachment, oppositionism, suspiciousness and narcissism that would not be represented in neuroticism. In fact, the emotional dysregulation measured by the DAPP-BQ is applicable to the borderline, avoidant, dependence and depressive disorder. It is similar to the Kernberg concept²¹ of borderline organization of the personality that would include several of the Personality Disorders (PD) of the DSM-IV. It is also similar to the description of Linehan²² on this disorder in terms of emotional, interpersonal, behavioral, cognitive and self-dysregulation. In the same way, it is negatively related with the negative temperament scales, eccentric perceptions, self-harm and mistrust of the lack of confidence of the *Schedule for Adaptive and Non-Adaptive Personality (SNAP)*,²⁰ as well as with the *Family Environment Scale (FES)*.^{23,24} Thus, this dimension is adapted to the importance of the affective traits in multiple conditions and studies of the normal personality.

II. Dissocial Behavior implies the negative pole of Responsibility of the NEO in the Big-5 model, that is especially related with the Psychoticism dimension of Eysenck^{25,26} and Impulsive Sensation Seeking of Zuckerman^{27,28} and with the psychopathy content of Hare.²⁹ It is made up of manipulation and disinhibition conducts (SNAP). It is associated with antisocial disorders and secondarily with paranoid and narcissistic ones.

III. Inhibition is linked with Extroversion of the Eysenck Personality Questionnaire-Revised (EPQ-R) and the NEO-PI-R,²⁶ with Openness of the model of Costa and McCrae and Sociability of the *Zuckerman-Kuhlman Personality Questionnaire (ZKPO)*.²⁸ It stresses the schizoid and avoidance disorders on the one hand and histrionic and narcissistic on the other.

IV. Compulsivity is related with Order and meticulousity associated to the responsibility dimension of the NEO.

The four domains of the DAPP-BQ mentioned are similar to the *Four A's* corresponding to Asthenic, Antisocial, Asocial and Anankastic^{30,31} and that underlie the constructs of PD³². Equally, the Livesley model is supported by a recent meta-analysis of 33 studies of O'Connor³³ that suggested the same factors of Neuroticism, Low Agreeableness, Introversion and Responsibility, independently of whether the model is based on the 5-factors Model (FFM), the *Diagnostic and Statistical Manual of Mental Disorders (DSM)*, if the sample was clinical or non-clinical or if the information was obtained through interviews or self-registries.

Domains	Traits	Subtraits	Examples of items
Emotional dysregulation	AFFECTIVE LABILITY	Affective instability, affective over-reactivity, generalized hypersensitivity, labile anger, and irritability	<i>I often feel like I can on emotional roller coaster</i>
	ANXIETY	Tendency to guilt, indecision, rumination, anxiety trait	<i>My mind is like a scratched record: it repeats the same concerns over and over again</i>
	SUBMISSIVENESS	Submissiveness, suggestability, need for advice	<i>In a discussion, I normally end up agreeing with the point of view of the other person</i>
	INSECURE ATTACHMENT	Separation anxiety, baseline security, search for proximity, fear of loss, Intolerance for aloneness	<i>I hate to be separated from someone I love although only for a few days</i>
	SOCIAL AVOIDANCE	Low affiliation, defective social skills, social apprehension, fear of interpersonal harm, desire for improvement of relationships	<i>It is hard for me to look people in the eyes when I speak</i>
	IDENTITY PROBLEMS	Anhedonia, chronic feelings of emptiness, labile self-concept, pessimism.	<i>I feel as if I have a great emptiness inside me</i>
	OPPOSITIONISM	Passivity, oppositionism, lack of organization	<i>I plan so many things in one day that I often cannot finish any of them</i>
	COGNITIVE DYSREGULATION	Depersonalization, schizotypal cognition, brief psychosis due to stress	<i>I feel as if the things around me are unreal</i>
	NARCISSISM	Need for admiration, attention seeking, grandiosity, need for approval	<i>I only am really satisfied when people show their admiration</i>
	SUSPICIOUSNESS	Hypervigilance, suspiciousness	<i>I am always on guard against the actions of others.</i>
Dissocial	CONDUCT PROBLEMS	Interpersonal violence, antisocial juvenile behaviors, addictive behaviors, failure to adapt to social rules	<i>When rules are not to my advantage, I break them</i>
	REJECTION	Rigid cognitive style, critical, interpersonal hostility, dominance.	<i>Once I have decided something, it is difficult to believe that I can be wrong</i>
	CALLOUSNESS	Egocentrism, exploitation, interpersonal irresponsibility, lack of empathy, lack of mercy. Sadism	<i>I do not feel guilty when I hurt someone's feelings</i>
	STIMULUS SEEKING	Sensation seeking, temerity, impulsiveness	<i>I often do things impulsively, even knowing that I will be sorry afterwards</i>
Inhibition	INTIMACY PROBLEMS	Desire for improved relationship, inhibition of sexuality, avoidant attachment	<i>I avoid close personal relationships</i>
	RESTRICTED EXPRESSION	Reluctant self-disclosure, restricted expression of anger, restricted expression of affectiveness, restricted expression of positive feelings, self-sufficiency	<i>It is hard for me to express affection for others</i>
Compulsivity	COMPULSIVITY	Discipline, meticulous, scrupulous	<i>I do work carefully, even knowing that nobody is going to see it</i>
	SELF-HARM	Ideas of self-harm, self-destruction acts	<i>Ending my life often seems to be the only way out</i>

Figure 1

Representation of the Pathological Personality model of Livesley. Secondary domains, traits, subtraits and examples of items.

Up to the present, there are several adaptations of the DAPP-BQ: the German,³⁴ Chinese,³⁵ Dutch^{36,37} and Japanese³⁸ versions, all with good reliability indexes. In the different countries, the analysis of the principal components maintained a similar 4-factor structure as that proposed by Livesley et al.,¹⁹ in the Canadian version.

The DAPP-BQ has been translated, adapted, and validated in our country.³⁹ The Spanish version maintained similar psychometric properties of reliability as the original version of the instrument. Equally, the factorial solutions were replicated in the sample of patients with personality disorder and in subjects of the general population. The validity of the criterion was good as it significantly differentiates the two samples analyzed in 17 of the 18 dimensions, that is, patients and non-patients.

The DAPP-BQ: relationship with other personality models and personality disorders

The Livesley model has been linked since its appearance with other personality paradigms. Congruent relationships have been demonstrated with the 5-Factor Model of Zuckerman (ZKPQ) made by Wang et al.²⁸ The factorial analysis of ZKPQ/DAPP-BQ showed five factors, 4 of which were similar to those found by Jang et al.,⁴⁰ Livesley et al.,¹⁹ and Schroeder et al.,⁴¹ it being concluded that the Zuckerman model would not provide by itself exclusively more relevant information than the model contained in the DAPP-BQ.

On their part, Schroeder et al.,^{41,42} examined the convergence of the normal personality model of the Big-5 of Costa and McCrae with the DAPP-BQ. By means of an analysis of the principal components with both models, 5 factors were obtained and the variables were grouped in the following way: 1) Neuroticism of the NEO-PI with Anxiety, Affective Lability, Submission, Insecure Attachment, Social Avoidance, Identity Problems and Narcissism; 2) NEO-PI Extroversion with Stimulus Seeking of the DAPP-BQ; 3) Extroversion and Openness to Experience with Social Avoidance, Identity Problems, Restricted Expression and Identity Problems of the DAPP-BQ; 4) Agreeableness with callousness, Rejection, Suspiciousness and Conduct Problems; and finally 5) Responsibility with Compulsiveness and Oppositionism.

Given that the Livesley model collected in the DAPP-BQ is a viable alternative dimensional model to the DSM-IV-TR,⁴³ it could be expected that its scores would differentiate between the different forms of disorders on axis II. Thus, Bagge and Trull⁴⁴ hypothesized relationship patterns among the 18 traits of DAPP-BQ and the personality disorders according to the DSM-IV. They tried to corroborate these with healthy subjects, relating the PDQ-4 with the Livesley questionnaire. The results of their studies concluded that: 1) the traits of the DAPP-BQ are relevant for the personality disorders according to the DSM-IV; 2) the regression analysis provides preliminary data that suggests that the Livesley

model would be useful to differentiate personality disorders individually; 3) while the traits with the highest grade reflect larger dimensions of the personality disorder that characterize PD groups (for example, inhibition), the lower order traits help to distinguish PD. In a similar study with the sample of 81 patients with personality disorder, Pukrop et al.³⁴ related the four secondary domains of the DAPP-BQ with dimensional scores of the SCID-II (number of criteria fulfilled). The Emotional Dysregulation domain significantly related with paranoid, schizotypal, borderline, dependent, avoidant, depressive, negativistic and narcissism criteria. The PD criteria that had the greatest correlation with the dissocial behavior domain were antisocial, paranoid, schizotypal, narcissism, borderline and negativeness. The third domain, Inhibition, was related with narcissism, schizoid, histrionic, avoidant, negativistic and depressive criteria. Finally, the compulsivity domain obtained significant correlations with compulsive, depressive and histrionic PD criteria.

Stage II. Epistemological and conceptual stage

For Livesley et al.,⁴⁵ the assumption of a model based on normal personality dimensions implies the need to distinguish the concept of personality from personality disorder. Thus, normal personality is managed by traits, that are not directly observable, that are relatively stable and long-lasting, on a continuum and the grade in which an individual has a trait is indicative of the likelihood that this person will carry out conducts governed by the trait. Equally, it is considered that the traits form both the normal personality as well as the personality disorder, each DSM diagnosis being described with a number of trait dimensions, and a taxonomy of trait terms that describes the PD content should be developed. However, on the contrary to that which is generally believed, an extreme position on a dimension does not necessarily indicate a disorder.

Livesley et al.,^{6,46} consider that in addition to being an extreme variation of the personality, PD must also be associated with failure to attend to universal life tasks such as identity, attachment, intimacy or affiliation. Thus, PD is seen as: 1) failure to establish stable and integrated representations of the self and of others; 2) interpersonal dysfunction, as indicated by the failure to develop the capacity for intimacy, adaptively function as an attachment figure and/or establish the capacity for affiliative relationships; and 3) failure to function adaptively in the social group, such as those that involve difficulties to develop the capacity for prosocial conducts and/or cooperative relationships. Obviously, time criteria such as difficulties that begin in adolescence or at the beginning of adult life are maintained.

Due to the limitations of the DSM-IV-TR classifications of the personality disorders,⁶ Livesley⁴⁷ proposes that the PD be considered a single diagnostic entity defined by a severe pathology of the self and by chronic interpersonal

difficulties, and that they should be classified on axis I as any one of the other mental disorders. Another axis would serve to register the individual differences in the clinically significant personality characteristics and would be important to understand the form in which the axis I disorders are expressed. This axis could help to describe the different PD characteristics or clinically important aspects of the personality in patients without PD. The new taxonomy proposed would imply considering the dispositions of the personality in the understanding and treatment of other disorders. Thus, a classification is proposed based on two components: 1) a systematic definition of PD and the associated diagnostic items and 2) a system to clinically describe important differences of personality.⁴⁵ The diagnostic process based on this two-component structure would mean evaluating the differences of personality at the times when the PD criteria are fulfilled or, in any case, when the personality contributes to the clinical picture of any other mental disorder. Finally, Livesley⁶ proposes that the diagnosis of personality disorder should be included together with other axis I mental disorders and that axis II remains to codify pathological personality traits. This classification favors the distinction between personality disorder diagnosis and evaluation of personality in the clinically relevant dimensions.

Stage III. Genetic-behavioral methodology in the analysis of personality disorders

For Livesley,⁶ a paradigm of the personality should be based on two assumptions: 1) be consistent with the knowledge derived from neurosciences, that is, take the disciplines related with theory of the personality, cognitive sciences, genetics of behavior and evolutive psychopathology into account; and 2) be based on the phenotypic structure of the personality disorder. Thus, even if the classification is consistent with biological thinking, the diagnostic concepts proposed should be based on the phenotypic structure of PD since these are the clinical phenotypes that should be explained and treated. In spite of the large number of models existing, it has become clear over the years of debate that phenotype studies alone do not solve the configuration of the personality disorder, since phenotypes are extremely variable. Thus, confidence in some of the structures should be increased with the evidence that the phenotypic configuration reflects an underlying genetic architecture. In fact, Jang et al.⁴⁸ presented results to indicate the conceptual difficulties but also the psychometric commitment in the definition of the personality phenotypes. Thus, a model that has been especially used in recent years, that is, the psychobiological one of Cloninger,^{49,50} is criticized for being too deductive as the facts demonstrate that the bases of homologation of behavioral systems (dimensions) with genetic bases of the model are incorrect^{51,52}. This would bias the distinction between temperament/inherited and character/learned that was the base of the model.

Precisely, the significant inconsistency in the findings of molecular and genetic psychiatric of behavior evaluated with questionnaires which, are apparently convergent measurements can be explained, according to Livesley, by three reasons: 1) the psychometric properties of the measurements influence the results. Thus, the comparison between Dopamine-Novelty seeking and Serotonin-Neuroticism is given as an example. The results obtained from the comparison with the first binomial are more inconsistent since they have already been measured in many studies, using the Tri-dimensional Personality Questionnaire (TPQ) questionnaire that has worst psychometric properties than the NEO as an evaluation instrument; 2) the inconsistency may be due to confusion in the environmental and genetic influence on the phenotypes. Thus, it is proposed that it is surprising that the study of the genotype with measurements such as Temperament and Character Inventory (TCI) or NEO confound the part of environmental influence and genes; 3) the variable results obtained with molecular genetics challenge the validity of the underlying constructs in the personality models and how these are made operational in the measurement scales. That is, in the TCI, there are significant allelic associations with character traits learned as Cooperation or Self-direction and the 5-HTTLPR gene.

According to Livesley, that is why the key to approach the problem of phenotypes is the introduction of biological-genetic criteria in the development of the models.

Genetic and environmental influence in the personality dimensions of DAPP-BQ

The analyses of genetic correlation factors between the principal traits that form the 4 domains show that the phenotypic structure is very consistent with the genetic one.¹⁹ According to Livesley, this suggests that a few general genetic factors or dimensions influence multiple traits in order to produce clusters of traits with a differentiated genetic etiology⁴⁷.

Using studies of monozygotic and dizygotic twins, the magnitude of the genetic influence of the personality dimensions of the DAPP-DQ questionnaire was described in detail.⁵³ The ACE model⁵³⁻⁵⁷ was used in order to estimate inheritability. This evaluates the effect of the additive genetic factors (A), non-additive genetic factors that can be attributed to dominance (D), shared environment (C) and non-shared environment (E). Correlations of the monozygotic twins were significantly greater than those of dizygotic twins. The variance explained by the additive genetic effect in the first 18 traits had a mean value of 47% and the non-shared environmental effect a mean value of 53%. In the secondary domains, the estimated range for inheritability went from 38% to 53% and the non-shared environmental effects accounted for 47% to 62%.⁵³

Based on these results, the authors conclude that personality disorder has an important inherited component

and that genetic factors also influence all the levels of the hierarchy of the personality traits. Thus, etiology models of personality disorders should incorporate both genetic and environmental factors into the explanations on the development of PD as occurs in the dimensions described by the DAPP-DQ.

In the year 1998, an important article published in *Archives of General Psychiatry*, Livesley et al.,¹⁹ using the ACE model again, attempted to verify which of the gene/environmental ratio models best explains the behaviors of each dimension. Thus, out of all the models, the AE model (that specifies additive genetic components plus non-shared environmental one) was the one that best explained the traits of Submissiveness, Identity problems, Affective lability, Restricted expression, Callousness, Intimacy problems, Rejection, Conduct problems, Suspiciousness, Social avoidance, Narcissism and Insecure attachment. However, the CE model (that specifies shared and non-shared environment components) gives a more adjusted explanation of the traits of Cognitive Dysregulation, Stimulus seeking, Compulsivity, oppositionism and Anxiety. The results show the variance attributable to non-additive genetics that underlies many traits, with the implication that this has for the etiology, investigation in molecular genetics of PDs and their classification.

Consequently, Livesley^{2,48} proposes a genetically informed classification, showing that all the traits are inheritable since the primary structure of traits reflects genetic influence. Even if the genetic and environmental influence is similar in magnitude, the high consistency between the genetic structure and phenotypic structure suggests that the environmental effect does not change the structure of the covariation of traits. The possibility that PD is subject to pleiotropic effects (a single genetic entity influences different phenotypes) offers an alternative pathway to the definition of secondary domains. A domain can be defined as a combination of primary traits influenced by the same general genetic dimension. Thus, the objective should be to develop a classification with minimal genetic intercorrelations between secondary domains, providing a new criterion to resolve the situation of the primary traits in the hierarchical structure.

Following this premise, and based on the genetic results that appeared in his studies with twins, Livesley⁵⁸ proposed increasing the number of primary traits from 18 to 30. The multivariate genetic analyses show that some traits are made up of several genetic dimensions.² For example, stimulus seeking is divided into two primary traits: sensation seeking and impulsiveness. On its part, intimacy problems should be represented by three primary traits: avoidant attachment, need for attachment and inhibited sexuality. Affective lability is influenced by two genetic dimensions: emotional reactivity and emotional intensity. Callousness includes three genetic components: lack of empathy, exploitation and sadism. Narcissism is influenced by two ge-

netic factors: need for approval and grandiosity. Two genetic factors also make up Restricted expression: self-contention and inhibited emotional expression. Social avoidance is influenced by two genetic factors: low affiliation and social apprehension. Finally, the genetic component was specific for each subtrait of self-harm: self-harm ideas and self-harm acts. The factorial structure of these new traits was similar to the previous one.

Stage IV. Definition and placement of personality disorders in the DSM-V

As a previous step to the initiation of the dimensional model in the DSM, Livesley made a work on integration and proposed combining the categorial and dimensional diagnoses. As an illustrative example of it, he related the first 30 traits of the DAPP-BQ with the diagnostic criteria of the DSM-IV-TR. In this way, 68 of the 79 diagnostic criteria of the 10 personality disorders can be assigned to a primary trait of the DAPP-BQ. If we use the Borderline Personality Disorder as an example, we find that each DSM-IV-TR criterion has its correspondence in the Livesley model. Thus, and using the first two criteria as examples, frantic efforts to avoid real or imagined abandonment is included in the primary trait of insecure attachment and intense and inappropriate anger criteria are explained by the primary trait of Emotional Reactivity.⁵⁸

As was already mentioned above in point II, it has been proposed to include PD in axis I and specifically, a combination of the 5 general criteria to diagnose Personality Disorder is suggested for the DSM-V: «A. Persistent inability to accomplish one or more of the following basic tasks of adult life: 1) establish coherent and adaptive working models of the self and of others (for example, he/she is capable of formulating a clear and consistent sense of his/her objectives and values in life; he/she perceives other persons as coherent entities); 2) Establishment of intimate relationships and activities (e.g. a longer term relationship that involves mutual emotional support), 3) Establishing occupational activities and relationships (e.g., employment that provides a stable source of income). B. Be under 18 years of age. C. Inability to accomplish life tasks is not due to a direct physiological effect of a substance (e.g. an abuse, a medication) or a general medical condition (e.g. head trauma). D. Specify the characteristics of PD by recording the traits considered as highly characteristics or highly uncharacteristic. E. Specify the grade of correspondence of PD with the personality prototypes, recording the number of prototypic traits present (considered as highly characteristic or highly uncharacteristic). If more than a critical number of characteristics of a personality prototype are present, record the prototype as a subtype of PD.»⁵⁹ In accordance with this system, Axis I of the DSM-V would include a single general diagnosis of Personality Disorder and Axis II would be modified to record the pathological traits by a 4-point scale that describes in what grade each trait is characteris-

tic of the person in general. Axis II would also collect the combinations of traits that give rise to the configurations that would exemplify prototypic cases of PD (Criteria E).

In summary, the dimensional evaluation of the pathology personality proposed by the W.J. Livesley team represents a dimensional model of 20 years evolution based on the clinical phenomenology, empiric-inductive method and on the genetics of behavior. A reflection of this is that the DAPP-BQ is an instrument designed from a large consensus of the dysfunctional pathological traits of the personality and from the analysis of content of opinions in an important population of clinicians. Given its adequate formulation, the dimensions of the DAPP-BQ capture a large amount of the variance of the PDs of the DSM, going from 29% to 63% with a median of 44% values superior to those found with the NEO PI-R and TCI. The design strategy of the DAPP-BQ overcomes the deficiencies of models such as the TCI and FFM which, having been developed in the normal population, do not capture the domains of the PDs. Thus, these models would not be adequate to cover certain personality traits that are frequent in the clinical practice such as cognitive-perceptive distortion or identity. The content of the items is sufficiently sensitive to pathological extremes of the dimensions and has been consistently related with the dimensional models of Eysenck, Costa and McCrae and Zuckerman.

As a mainstay of his model, Livesley has contributed to the development of the field of genetics of personality by the application of mathematical models of breakdown of the information contained in the DAPP-BQ dimensions. The studies on genetics of behavior have found a 45% mean inheritability for the 18 dimensions of the DAPP-BQ. Finally, the Spanish version of this instrument shows adequate psychometric properties that assure its adequate use in our setting.

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