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The influence of environmental and genetic factors in the manifestation of dissocial disorder

A influência de fatores ambientais e genéticos na manifestação do transtorno dissocial

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Abstract

Introduction: *The etiological theories for Dissocial Personality Disorder (DPD) are multifactorial and integrate biological, social, cultural, and environmental issues. Among them, the relation between the disorder and the polymorphism of the serotonin transporter gene (5-HTT) and the occurrence of anxiety and depression symptoms stands out. In this scope, the influence of the environment in relation to the mutation can be considered bidirectional.* ***Objective:*** *To discuss the influence of environmental and genetic factors on the manifestation of DPD.* ***Methods:*** *The present article is a narrative review, and the articles used on the discussion were found in the databases National Library of Medicine (PubMed), Scientific Electronic Library Online (SciELO), Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS) and Google Acadêmico. As a criterion, only articles published between 2009 and 2021 were included.* ***Results:*** *It was observed a relation between environmental factors and genetic polymorphism – as the one related to the MAOA gene, that plays a role in the degradation of neurotransmitters – and the development of DPD, as well as functional and anatomical changes in the central nervous system, such as reduction of the gray matter in some limbic and paralimbic regions, and others.* ***Conclusion:*** *It is possible to conclude that there is an association between genetic factors, that can influence in the functioning of important structures of the central nervous system, as the cortical region and the limbic system, and environmental factors in the manifestation of Dissocial Personality Disorder.*

Keywords: *Genetics, Personality disorders, Antisocial personality disorder, International classification of diseases, DSM-V*

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Resumo

Introdução*: As teorias etiológicas para o Transtorno de Personalidade Dissocial (TPD) são multifatoriais e integram questões biológicas, socioculturais e ambientais. Entre elas, destaca-se a relação entre o transtorno e os polimorfismos do gene transportador de serotonina (5-HTT) e a ocorrência de sintomas de ansiedade e depressão. Neste âmbito, considera-se que a influência do ambiente possa ser bidirecional em relação à mutação em questão.* ***Objetivo****: Discutir a influência de fatores ambientais e genéticos na manifestação do TPD.* ***Método****: O presente artigo se trata de uma revisão narrativa da literatura, e os artigos utilizados na discussão se encontravam nas bases de dados National Library of Medicine (PubMed), Scientific Electronic Library Online (SciELO), Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS) e Google Acadêmico. Como critério de inclusão, foram inseridos artigos publicados de 2009 a 2021.* ***Resultados****: Foi observada uma relação entre fatores ambientais e polimorfismo genético – como aquele relacionado ao gene MAOA, que atua na degradação de neurotransmissores – e o desenvolvimento de TPD, assim como alterações funcionais e anatômicas a nível de sistema nervoso central, tal qual a diminuição da substância cinzenta em regiões límbicas e paralímbicas, dentre outras.* ***Conclusão****: Conclui-se, portanto, que existe uma associação entre fatores genéticos, que influenciam no funcionamento de estruturas importantes no sistema nervoso central, como é o caso da região cortical e do sistema límbico, e fatores ambientais na manifestação do Transtorno de Personalidade Dissocial.*

Palavras chave: *Genética, Transtornos da personalidade, Transtorno da personalidade antissocial, Classificação internacional de doenças, DSM-V*

Introduction

There is not a unique definition about human personality; it is known that there are varied patterns of bio psychosocial processes that rule the individual's actions in the interactions with their pairs, with the purpose of adaption to the environment. Each human being has their own way to relate to others and to the

world, within varied contexts, through the personality traits[1]. When it comes to personality disorders, the situation is more complex in view of the different psychopathological schools and their theories and precepts, as the phenomenological, biological, sociocultural, existential, behavioral, psychoanalytic, categorical, dimensional, etc.[2]. The integrative vision of these psychopathological schools provides more visibility to the possible alteration of the personality traits and gives an integral notion of personality disorders. The current diagnosis classification of mental disorders, in both dimensional and categorical models, define personality disorders as a constant pattern of inner experiences and behaviors that divert markedly from the cultural expectations. These behavior patterns are substantiated in interpersonal conflicts, difficulties in creating and maintaining intimate relationships, besides stablishing and reaching reasonable existential objectives[3].

When it comes to the possible etiologies of personality disorders, in general, there are several theories that integrate organic, social, cultural, emotional, educational, genetical and environmental causes. There are studies about the relationship between personality and serotonin transporter (5HTT) polymorphisms, the occurrence of anxiety and depressive symptoms[4], and the relation between climacteric and menopausal[5]. These and other theorical and etiological models are not unanimous in their explanation, but there is an influence of various factors that integrate and act in distinct ways in different people.

When analyzing the Dissocial Personality Disorder, as it has been named by the International Classification of Diseases version number 10 (ICD-10), previously known as Sociopathic Personality in the 9 version (ICD-9), both edited by the World Health Organization (WHO), it is possible to notice that there are genetical, psychological and environmental factors involved in the development of the disorder (as an example, sexual abuse during childhood). The antisocial personality disorder is more common in first degree relatives of affected patients than in the general population; this way, the risk of developing it can increase in both adoptive and biologic children when their parents present with the disorder[6].

Objective

In this context, the present article objects to discuss the influence of environmental and genetic factors in the manifestation of Dissocial Personality Disorder, inserted in the current most used international classifications of diseases (ICD-10, ICD-11, and DSM-V) and to compare it to the etiology of the other personality disorders.

Methods

The present study, of qualitative and descriptive nature, is a narrative literature review. This type of review is also called traditional review, which provides the analysis and discussion of the state of art that involves the evidence concerning the influence of genetic and environmental factors in the etiology of dissocial disorder[7]. Although the strength of evidence of this type of study can be considered low, due to the impossibility of reproducing its methodology – and a greater predisposition to selection biases – the choice is due to the fact that the qualitative research does not demand the utilization of statistical instruments and calculations to analyze the data; as well as it demonstrates to be essential to support the discussion and to expose broad perceptions about the issue in a short period of time – in this case, the etiology of dissocial personality disorder[8].

The research was conducted using the following databases: National Library of Medicine (PubMed), Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS) and Google Scholar. At first, the eligibility criterion was articles published between 2009 and 2021. To select the descriptors, the Health Sciences Descriptors platform (DeCS) was used, resulting in the following descriptors, along with the "and" Boolean: "Genetic"; "Shyness"; "International Classification of Diseases"; "Diagnostic and Statistical Manual of Mental Disorders"; "ICD-10"; "ICD-11"; "DSM-V"; "Antisocial Personality Disorder"; "Sociopathic Personality" and "Psychopathology".

The following inclusion criteria were used: a) articles published between 2009 and 2021; b) articles published in English, Portuguese, and Spanish; c) articles that contained in the title and/or abstract the descriptors mentioned above. As exclusion criteria, it was considered: a) articles published before 2009; b) studies that correlate the genetic alterations and the environment factors in other disorders and not in Dissocial Personality Disorder.

To materialize the objective of the study, the articles indexed in the mentioned databases were evaluated on their title and abstracts. This way, it was possible to select only the articles that could contribute to the discussion. In other words, the ones that address the influence of genetic and environmental factors in the manifestation of Dissocial Personality Disorder. After the selection, the articles were read in their entirety and critically analyzed, with the objective to extract the required evidence to write the present article. For didactic purposes, the following topics were selected: (1) Personality disorders classification according to ICD-10 and DSM-V; (2) Personality disor-

ders etiologies; (3) Environmental and genetic factors as etiologies of Dissocial Personality Disorder and (4) Treatment. Finally, it was possible to proceed with the discussion, presented in the body of this article.

Personality disorders classification

Personality disorders classification according to ICD-10 and DSM-V

Firstly, in a history context, it is observed that the diagnostic and symptomatologic nomenclature related to the mental disorders were divergent among authors. Off that, with the objective to trace more coherent and efficient intervention plans and prognosis, the American Psychiatric Association (APA) and the World Health Organization (WHO) proposed the creation of the Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases, respectively, to catalogue and systematize them[3].

The two initial versions of DSM had a psychanalytic character, turning the attention to the cultural influences that affect the individual. DSM-I organized the mental disorders in axes and subdivided the personality disorders in Personality Pattern Disturbance; Personality Traits Disturbance; Sociopathic Personality Disturbance; Reaction Symptoms and Transient Personality Disturbances. In 1968, APA decided to classify the personality disorders, on the publication of DSM-II, exclusively related to psychological traits, subdivided in twelve categories[3].

In 1980, the publication of DSM-III proposes an axial organization, a nosological and semiological diagnostic evaluation, besides a taxonomic reformulation in five axes and a change in the psychanalytic bias to a more clinical and objective model [9,3]. In this new manual, the personality disorders were subdivided in three clusters (A, B and C groups). Yet, APA proposed a new method for diagnosing, through DSM-III-R, where the "comorbidity" term was created to denote the existence of two or more pathological situations[9-10].

In 1994, DSM-IV was published, adding some classification criteria associated with cultural characteristics, age group, gender, prevalence, family pattern and differential diagnosis. In 2000, APA reformulates DSM-IV and publishes DSM-IV-TR, conferring five types of personality disorder (labile, uninhibited, apathetic, paranoid, and aggressive) (DSM-IV-TR)[3-9].

In parallel, ICD-10 brings nine types of personality disorders, based on the clinical presentation characteristics; they are: F.60.0 Paranoid personality; F60.1 Schizoid personality; F60.2 Dissocial personality; F60.3 Personality disorder with emotional instability; F60.4 Histrionic personality; F60.5 Obsessive-compulsive personality; F60.6 Anxious personality; F60.7 Dependent personality; F60.8 Other specific personality disorders and F60.9 Nonspecific personality disorder[11].

While ICD-10 was based on 9 types, DSM-V organizes the personality disorders in 5 domains, using A, B and C criteria, under the denomination of Alternative Model of Personality Disorders – AMPD[12]. In group A were schizotypal, schizoid and paranoid; in group B, narcissist, borderline, antisocial and histrionic; and group C, obsessive-compulsive, dependent and avoidant[11].

On ICD-11, the personality disorders are classified as: 6D11.0 negative affectivity in personality disorder or personality difficulty; 6D11.1 detachment in personality disorder or personality difficulty; 6D11.2 dissociality in personality disorder or personality difficulty; 6D11.3 disinhibition in personality disorder or personality difficulty; 6D11.4 anankastia in personality disorder or personality difficulty and 6D11.5 borderline pattern.

When critically analyzing, it is important to highlight that there is a disagreement on the description of personality disorder in DSM (2013) and CIDs (1992 and 2018), going from a single dimension to more than 20 characteristic descriptions. As consequence, the World Health Organization (WHO) and the American Psychiatric Association (APA) are searching for converging points to circumvent these nosological obstacles[12]. For example, a DSM-V characteristic that ICD has agreed is graduating the disorders. In this direction, ICD-11 classifies the personality disorders according to the severity of the suffering (mild, moderate, and severe), it is, on the way they negatively impact the interpersonal relationships[11].

Although there are similarities, it is important to consider other differences. First, DSM-V brings a separated domain for obsessive-compulsive personality disorder, while ICD-11 inserts it on the field of compulsivity trait. Second, concerning ICD-11 (similar to ICD-11), it presents schizotypal as a variation of schizophrenia, instead of being a type of personality disorder, leading to the exclusion of psychoticism off CID-11. Studies demonstrate that both schizotypal and psychoticism can not be ignored[13]. These divergences reflect on a difficulty on having a universal classification for mental disorders, like dissocial disorder.

Personality disorders etiologies

Initially, it is known that personality disorders can ben explained by the exposure to trauma during childhood and teenage years, like physical, emotional, and sexual abuse, and parental negligence, since familiar model is a determining aspect on the individual's world vision and self-perception. In addition, it is dur-

ing childhood that emotional, cognitive, and behavioral function are developed, ensuring that situations in this phase imply on relevant neuropsychological alterations and interfere on the psychological development of the subject[10,14].

Concerning the personality disorder, researchers analyzed 34 patients with post traumatic symptoms resulting from the war and found a high incidence of personality disorders. The most common were borderline, obsessive-compulsive, avoidant, and paranoid. This way, it is possible to identify a correlation between the traumatic episodes experienced by patients that developed axis-II characteristics[10,14].

On other aspects, it is known that genetic factors interfere with the predisposition to personality disorders, but this does not make them responsible for the disorder itself, as the individual's interaction with the environment is of fundamental importance to this determination or not. This way, it is possible that the subject carries the gene that leads to the disorder, but their interaction with the environment can work against that condition[14].

As mentioned previously, personality disorders were subdivided, according to APA, in three clusters (A, B e C)[10].

Concerning cluster A, the following disorders are framed: paranoid personality disorder, which is influenced by genetic and childhood abuse/aggression experience. This disorder can demonstrate the influence of an environment with constant danger and stressors, as bullying and moral harassment[15]. It also includes schizoid personality disorder (DSM-V), defined by social interaction avoidance, few emotions and mood alterations. The individuals who present with the disorder usually grew up in a hostile environment and hold schizophrenic characteristics or mechanisms[16]. At last, schizotypal personality disorder (DSM-V), identified by social deficit and cognitive distortions, which can be associated with depression, anxiety, and development of schizophrenia[10, 13, 17].

In relation to cluster B, there is antisocial personality disorder and borderline personality disorder. The last one is more frequent in women, mainly those who were victims of sexual abuse and neglect, and has a genetic influence, related to pregnancy and post traumatic events[14]. Concerning the both disorders, a possible etiology is the correlation between the development of these behaviors and the presence of attention-deficit/hyperactivity disorder, once antisocial personality could be an alternative to favor experiences and promote personal control of the environment. Moreover, childhood experiences and family relationship influence on the development of these personality disorders, as violent environment, drug, and alcohol abuse[18-19]. Studies show that antisocial personality disorder has a contribution of a dysfunctional serotonin and monoamine oxidase A (MAO-A) production, which is associated with aggressivity and impulsivity[20]. Genetically, the functional polymorphism on the gene responsible for the metabolized enzyme of MAO-A and other genes demonstrated having influence on this condition[21]. The histrionic personality disorder is related to psychological trauma and sexual abuse during childhood. Furthermore, neuroimage studies identified alterations on the activity of cortical and subcortical prefrontal and parietal regions, thalamus and basal ganglia that can be associated with the disorder[22].

Concerning cluster C, there is dependent personality disorder, influenced by cultural factors and early negative experiences[23], avoidant personality disorder, influenced by marginalization and rejection experiences, and obsessive-compulsive personality, associated with strict and demanding familiar environment[24].

This way, it is notorious that despite the symptomatologic differences between the personality disorders, there is a resemblance concerning their etiology, as it frequently comes from environmental or genetic factors. Just ahead, we will discuss specifically about dissocial/antisocial disorder.

Ambiental and genetic factors as etiologies of dissocial personality disorder

The following table (Table 1) synthetizes the main results found and can help clarifying the etiologies of dissocial personality disorder.

Main related characteristics and tests

Despite not having a consensus on the classification of psychopathy among personality disorders[25-26], we consider, on this article, with didactic purposes, the following terms: "dissocial disorder", "psychopathy", "psychopathology" and "antisocial disorder" as synonyms.

Dissocial personality disorder encompasses a group of adverse personality characteristics, such as superficial charm and intelligence; absence of delirium; absence of psychoneurotic manifestations; lack of reliability; tendency of lying; lack of shame or remorse; antisocial behavior; judgment depletion; pathological egocentrism; affective reactions depletion; loss of insight; reciprocity deficit on interpersonal relationships; fanciful and non-inviting behavior; suicidal threats; impersonal and trivial sex life and failure on following a plan of life[27-28].

Under another point of view, psychopathy can be classified as primary psychopathy (less anxious) and secondary psychopathy (more anxious), which would

turn to be sociopathy, a definition of psychopathy that is related to parental education and environmental factors[29]. This set of factors classify the individual with lack of abilities to stablish real ties, employment bond and a comfortable life. They are also less resistant to criticism and frustration, which makes them more violent[30].

The characterization of this question is included in Hare Psychopathy Checklist – Revised (PCL-R), which classifies the degree of the disease factors[31], being used to forensic investigation and helping on the identification of the disorder subtype[32]. It is possible to analyze that the characteristics of dissocial disorder reverberate in criminal adults, due to the presence of numerous traits of PCL-R, as lack of fear and low empathy[33-34].

Several scales have been made in an attempt to measure the degree and classifications of this disorder, since Kraepelin (1915) made the first use of the word psychopathy to differentiate criminals who were more violent and addicts than the others. Since then, the PCL-R test and the PPI test were created, the last one used to classify psychopathy into: Fearless Dominance (PPI FD) and Self-Centered Impulsivity[35-38]. To analyze whether the answers obtained in the interviews correspond to reality, the MMPI-2-RF is used[39], as

Table 1

Distribution of the main results found according to author, methodology and results

Autor	*Methodology*	*Results and Discussion*
Phillips et al[41]	- Sample: 230 incarcerated women. - Methodology: Use of the MMPI-2-RF and PPI criteria to analyze psychopathic traits	Psychopathy manifested itself equally between genders, without major significant differences. Validation of estimates based on PPI MMPI-2-RF
Rautiainen el al[45]	- Sample: N=370, N=5850 (control) - Methodology: Genotyping analysis of single nucleotide polymorphisms (SNPs) common in both groups	Associations were found with the LINC00951 and LRFN2 genes expressed in the cerebellum, especially in the frontal cortex, of the sample group compared to the control group.
Salvatore et al[46]	- Sample: n = 1379 - Methodology: selection of people with a history of alcohol dependence to analyze the most significant genes in the manifestation of the disorder.	A strong association between single nucleotide polymorphisms and a broad spectrum of antisocial behavior was observed, linked to the ABCB1 gene. This gene is expressed in the brain and is also implicated in substance abuse.
Tiihonen et al[47]	- Sample: n = 9, N = 6 (control) - Methodology: Selection of 6 offenders with TPAS, 3 non-violent addicts and 6 control subjects without antisocial traits or substance abuse disorders for analysis of gene expression	It was observed that the expression levels of RPL109, ZNF132, CDH5 and OPRD1 genes in neurons explained 30-92% of the manifestation of psychopathy, with a stronger relationship of the ZNF132 gene. These genes may be relevant to lack of empathy and emotional insensitivity
Fanning et al[50]	- Sample: N = 47 (26 men and 21 women) - Methodology: Participants randomly received 40 mg of paroxetine hydrochloride or placebo orally using double-blind procedures	Primary psychopathy was found to be related to an aggressive response to provocation. Furthermore, the increase in 5-HT attenuated this reaction, corroborating the theory that links 5-HT dysregulation with dissocial disorder.
Umbach et al[51]	- Methodology: Literature review on studies that used brain imaging to measure structural or functional differences in psychopaths	The author reinforced the idea that prefrontal and amygdala deficiencies help to explain the main features manifested in the disease.
Ermer et al[56]	- Sample: N = 296 - Methodology: Analysis for structural abnormalities using voxel-based morphometry in a sample of incarcerated men	The author associated psychopathy with decreased regional gray matter in paralimbic and limbic areas, including bilateral parahippocampal, amygdala and hippocampal regions, bilateral temporal pole, posterior cingulate cortex, and orbitofrontal cortex.
Yang et al[57]	- Sample: N = 27 - Methodology: Recruitment of 86 participants in 5 temporary work agencies in Los Angeles. - The PCL-R test was applied and 27 individuals with psychopathy were selected.	The findings suggest that the reductions in cortical thickness in the frontal and temporal regions, as well as the reduction in gray matter volume in the dorsolateral prefrontal cortex, provide initial evidence that suggests an association between these deficiencies and increased response perseveration in individuals with psychopathy.

Table 1

Distribution of the main results found according to author, methodology and results

Autor	*Methodology*	*Results and Discussion*
Anderson et al[58]	- Methodology: literature review on recent studies that report neuropsychiatric and neuroimaging, emphasizing the abnormalities found in the processing of emotions and behavior.	Brain differences were observed in the ventromedial/ orbitofrontal region of the prefrontal cortex, anterior region of the frontal pole, in addition to a reduction in the volume of the amygdala. It was also concluded that the anterior and posterior cingulate, paralimbic structures, gray matter, temporal pole and insula form a complex circuit that influences the abnormalities found.
Nummenmaa et al[59]	- Sample: N = 19 (men), N = 19 (control) - Methodology: Individuals selected through PCL-R and individuals in the control group underwent MRI while watching violent movie clips	Low gray matter density was found in the orbitofrontal and anterior insular cortex, in addition to increased responses to violence in the thalamus and in the orbitofrontal, insular and cingulate cortices of the sample group.
Pfabigan[32]	- Sample: N= 30 N= 15 (Control) - Methodology: Analysis according to DSM-IV criteria for degrees of psychopathy. Selection of inmates with different levels of psychopathy and application of the PCR-L test, using questionnaires and tasks to be performed	Low automatic reactivity of empathy was observed, regardless of the degree of the disorder. Furthermore, only patients with high degrees of psychopathy presented results with consistency in the tests, and those with low degrees were responsible for attempts to forge it. It was defined that the analysis must be accompanied by subjective and objective measures, in view of the non-full definition of the disorder
Domes[63]	- Sample: N=90 N= 28 (Control) - Methodology: Use of tests to assess degrees of psychopathy including questionnaires, objective analyzes and statistical analyzes such as t-test, PCR-L, MET and RMET	Expected parameters of lack of empathy, expected dissimulations in the questionnaire tests were identified, as well as the finding of no lack of cognitive skills already studied in the past.
Mello[64]	- Sample: N=284 - Methodology: Use of questionnaires to assess psychopathic traits in the population studied, emotional and empathic assessment tests	A positive relationship between psychopathy and emotional criteria was observed, but a negative relationship associated with empathy according to the tests applied and results statistically analyzed in the population
Bonvincini[30]	- Methodology: Bibliographic analysis of materials including books, articles, journals and published proceedings about treatment for psychopathy in prison systems	It was observed the impossibility of effective treatments against the phenomenon of psychopathy inserted in the prison system, as well as in society due to the lack of a coherent definition of psychopath.

proposed by Sellbom[40] in his study on the validation of the MMPI-2-RF in the Global Psychopathy index, Fearless-Dominance, and Impulsive-Antisociality with male incarcerated inmates. However, his study was limited by the lack of a corresponding female sample, so Phillips[41] published an article that filled this gap and achieved similar results. In it, Phillips also showed that psychopathy manifests itself equally between genders, without major significant differences, for example, the female score being slightly higher in fear and empathy[41].

At last, one of the most important tests to assess personality is Rorschach projective test (1921), which stood out because it does not demand any personality theory and primarily uses perception[42]. It also originated another worldwide used test, the Zulliger test (1948), which aims to understand how personality works, with aspects of dynamic, structure, fantasies, and anxiety[43].

Genetic and neurological influences

It is known that personality disorders have etiological, environmental, and biological components. We still don't know for sure which factor presents to be stronger, but we know that it can change from one person to another, according to some studies[44]. However, these two factors usually work together, as explained by epigenetic, where environmental influences can change the genetic transcription or the way a DNA sequence produces its proteins, beyond causing alterations on hormones or brain structures. In view of

this, studies have demonstrated that proper discipline, with stable and caring families, can act as a protection factor on the development of the disorder because they attenuate the modification of genetic expression, beyond teaching the proper social behavior[44].

A few genes can be associated with the manifestation of antisocial behavior. LINC00951, the gene associated with imprisoned offenders with antisocial personality disorder is specially expressed on the frontal cortex and cerebellum[45]. A recent study also found an association between single nucleotide polymorphisms and a large spectrum of antisocial behavior. The gene linked with antisocial behavior in adults, ABCB1, is also highly expressed on the brain and is associated with substance abuse. The study also suggests the association between sets of genes related to the immunological system and antisocial behavior[46].

Another recent study is of great importance on this discussion. Its results showed that the level of expression of the RPL109, ZNF132, CDH5 and OPRD1 genes on the brain cells could explain 30-92% of psychopathy manifestations, and the expression of RPL109 in astrocytes was significantly associated with the degree of psychopathy. This could contribute to the explanation of emotional callosity and lack of empathy observed in violent psychopath offenders. The strongest relation observed was for ZNF132, associated with malignant and child development disorders. It was also observed that the cerebellum can have an important role in the severe antisocial behavior, suggesting that altered immune response contributes to the pathophysiology of antisocial behavior. At last, they found alterations on the sensibility to insulin, on glucose metabolism, and opioid system dysfunctions, which implies on a direct relation with the psychopathy phenotype[47].

Moreover, there is the MAO-A gene, which is localized on the short arm of the X chromosome and is responsible for degrading neurotransmitters as serotonin, dopamine, and norepinephrine[48]. This fact explains why there is a higher prevalence of antisocial disorder in men, as women can only express the disorder if they are homozygote on both X, while men only need one gene to express it[49].

To explain how the MAO-A gene and serotonin can influence the disease, there is a study held in 2014 which had the objective of determining if 5-HT (serotonin) modulates the relationship between psychotic traits and aggression. The 47 participants made a self-report and received 40mg of Paroxetine or placebo. Then, they evaluated the level of aggression through a competitive game, where the players would get shocks, and the results suggested that only primary psychopathy was related to an aggressive response for provocation. Moreover, the 5-HT increase attenuated this reaction, supporting the theory that aggressive response associated with primary psychopath traits can contribute on the 5-HT deregulation[50].

However, in a 2015 review article, Umbach documented the brain abnormalities in psychopaths, mainly structural and functional reduction on the amygdala and frontal cortex. She reinforced that prefrontal and amygdala deficiencies could explain the main characteristics of the disorder, since these areas are responsible for moral decision-taking, affection processing and executive functioning. Future research on brain imaging is important to provide new perceptions about the etiology of the disorder and could help justice and society to take decisions concerning punishment for these individuals, even during childhood and teenage years, as well as preventing their actions[51].

It is also important to correlate the nuclei according to the intelligence quotient on imaging studies. This can be seen when analyzing the studies with magnetic resonance imaging, where they found a reduction of 30% on the cortex of psychopath adults when compared to the control group[52]. However, this study did not consider the IQ of control group, which was probably higher that the patients and that fact influenced the results. Other studies also found a reduction in the amygdala, temporal pole, prefrontal cortex, and orbitofrontal cortex when compared to the other group[53-56]. It was also reported that the cortical thickness on the orbitofrontal region of psychopaths is inversely related to the perseveration of the response[57].

Anderson and Kiehl analyzed the neurological, cognitive, and developmental reports on articles that emphasize the abnormalities found on emotional processing and behavior on psychopathy. They noticed similarities in the reports on brain changes in the ventromedial/orbitofrontal region of the prefrontal cortex, along with the anterior region of frontal pole. Moreover, they also concluded that the amygdala volume reduction, along with the mentioned regions, are frequently found in psychopaths. Other regions, as the anterior and posterior cingulate, paralimbic structures, grey matter reduction, temporal pole and insula form a complex circuit that influence the behavioral abnormalities observed[58].

At last, a 2021 article found that aggressive psychopaths have low density of grey matter in the orbitofrontal and anterior cortex of the insula. They also observed an increase in violent response in the thalamus, orbitofrontal, insular, and cingulate cortex, inferring that brain characteristics in the psychopath spectrum are different than in health individuals[59].

Environmental influences

About 80% of psychopathy cases are diagnosed during childhood in a period that goes from 8-12 years, and boys have precocious development when compared to girls[60]. However, the disorder development can be changed according to the experiences of each individual[60].

Therefore, the environment can determine the expression of dissocial disorder when a comparation between the two extremes is made. For example, the prison reality, on the recurring threat to integrity and future happiness stablish an aggravating overview when compared to the external world, with possibilities in every surrounding moment. This way, prisoners with higher or lower degree of dissocial personality disorder present lower affective empathy traits when compared to free individuals in the control group[32]. Empathy is one of the traits evaluated by PCL-R and can be defined as the ability to experience other people's feelings without actually feeling them[61]. It can be used as the core of psychopathy or antisocial personality disorder. This human ability can be classified as cognitive, according to the mentioned definition, or affective[62], which was observed to be lacking in imprisoned individuals, in a higher degree, when compared to the control group.

The act of observing an image that demonstrates adverse feelings compared to what is natural in individuals who do not have antisocial personality disorder can cause repulse or sadness, transcribed as resonance, showed in a study as SCR, an autonomous factor explained by skin conduction traits[32]. In this study, videos that induced discomfort were showed to the control group (15 individuals) and to prisoners (14 with a higher degree of the disease and 16 with a lower degree). These videos showed an acoustic treatment for mental disorder patients and could produce pain in the individuals who were watching. This way, the facial expression in the components of the video had a role of propelling the test, and the expected affective empathy reaction, through resonance, could be related to them[32].

In front of a pleasant temperature, air fluidity and comfortable ambiance, in a scale from 0-7, the prisoners' expressions were classified according to the autonomous response system. In this context, the influence of the prison system is presented by a break from everyday life, since based on the mentioned scale, only men prisoners with a higher level of psychopathy showed similarities with those who do not have any disorder (control group). However, prisoners with a lower level of psychopathy exaggerated on the attempt to demonstrate lack of affective empathy, showing a potential difference from control group[32].

This fact demonstrates that the presence of individuals with antisocial personality disorder in the prisons can increase their degree of perception, allowing them to comprehend body language and facial expressions and to acquire the ability to distort their own body and facial expression mechanism[32], ensuring a better understanding of the victims and a better control of their abilities as social predators, reflecting on alterations on the SCR test, it is, giving them the ability to influence an indirect reading about themselves, made possible by the prison environment[32].

Moreover, beyond the SCR tests, another research demonstrated that the lie scale is also associated with empathy expression because it shows a high level of dissimulation when analyzing individuals with different levels of the disorder in a forensic environment. It also shows a difference on the behavior when analyzing the educational level of the individuals, since those with higher level of education could get past their own body stimuli limitations, irrespective of their disorder level. This demonstrates that both prison environment and better opportunities in the past influence on the expression of the discussed question[63].

Beyond that, self-comprehension acts as an effect of the environment where the psychopath personality is identified, because it demonstrates the reaction of the individual's disorder traits in controlled situations, as they are responsible for their own diagnosis. In view of that, another study utilized the IRI method, which consists of an autonomic report with 26 items and 4 areas: empathic consideration, perspective-taking, personal distress, and fantasy[64].

This test, out of the prison context, has showed lower levels of empathic consideration, personal distress, and fantasy. However, concerning perspective-taking, the results were different, highlighting an audacity trait, which covers the most preponderant aspects of psychopathy, as social dominancy, lack of fear and resiliency [64]. From that, it is possible to infer that the antisocial personality manifestation in non-prisoners does not express a higher comprehension and reading of others, but a higher self-evaluation possibility, due to the differences between SCR and IRI. One of them is held as an analysis of the individual by others, and the other one allows a self-report of the individual in a different environment[64].

This way, it is possible to notice the influence of the environment in the ability of the individual to have a self-identification of their personality, which is different from the expected, while in a controlled environment, the self-identification becomes a weapon to exchange and guarantee acknowledgement that can reflect on the resurgence of a latent condition, and the possibility to overcome it in the future.

Treatment

Because aggressivity is commonly expressed in crimes against society, prison system accounts a large proportion of the treatment and controlling of action mechanisms, acting as an environmental factor, as mentioned.

In this gap, the grievance control of antisocial personality disorder finds a hurdle in the non-imputability of the individuals who have the disorder, aggravating the resurgence of the factors presented by them, who turned to perform actions judged unacceptable for society[30]. This occurs in a way the individual who presents the disorder does not comprehend their fault and the laws, so the control maintenance becomes difficult, since when it is not comprehended, the punishment loses its meaning[30].

This way, even punishment measures work as an attempt to improve the antisocial traits, some tests, as previously discussed, demonstrate that punishing through value learning turns to be a way to increase the deviations from ethical conduct, acting as a daily analysis school. According to the history of "Pedrinho Matador", the exposed factors are assured in virtue of this real-life character, as he killed more than 100 people, 47 of them in prison and one of them in his household. His actions began when he was 14, along with his desire to commit illicit and homicidal acts, which continued when he was incarcerated, as he used to say that taking from other caused him a well-being[30].

Furthermore, it is important to highlight the biological and psychosocial treatment, which embraces the personal history of the individual, as well as the environment factors, since personality is shaped during childhood and teenage years[6]. This way, Jeffrey E. Young, Janet Klosko and Marjorie Weishaar proposed a therapy based on schemes, because the pervious method was not efficient when treating personality disorders. This therapy reunited elements of cognitive behavioral therapy, Gestalt, etc.[6].

This therapeutic mechanism finds its functionality in the accomplishment of self-reflexive processes on the part of the individuals who are receiving treatment, through an exercise of comprehension of their surroundings. This way, simple reflexive ways and expanded reflections are used, as well as thinking impulse on the freedom of choice concerning the individual. This way, it is possible to observe that these strategies for compensation act as the basis to comprehend the individual, encouraging them to deal with inferiority emotions, beyond not disturbing other people who live in the same reality[6]. Likewise, even though therapy can have a considerable success, it can not be stablished as ideal or excellent in its results, since an approach that takes into consideration a greater comprehension of the pathological characteristics and the social environment actions is needed(6).

At last, it is possible to comprehend the treatment as incipient, since as presented, the mechanism that could have a positive effect results in the opposite, in other words, it does not alleviate the bad habits and practices that characterize this disorder, beyond the fact that there is no direct and precise classification on which factors should be suppressed to end the antisocial traits[30], which explains the environment influence, but the minimal possibility of an effective solution of the questions generated by this factor, active in the daily-life social environment.

Conclusion

It is important to reinforce that, as this article is a narrative review, it has limitations as: subjectivity, having in mind its qualitative nature; language limitation, as it was limited to English, Portuguese and Spanish articles, and the lack of conclusive studies that could prove all these factors involved in the disorder and its treatment.

In this article, it was possible to notice that personality disorders have similar etiologies. Dissocial personality disorder has strong characteristics as: superficial charm and intelligence; tendency of lying; lack of shame or remorse; antisocial behavior; judgment depletion; pathological egocentrism; affective reactions depletion; loss of insight; reciprocity deficit on interpersonal relationships; impersonal and trivial sex life and failure on following a plan of life and many other that can range from one individual to another. It is also possible to notice the importance of the tests to characterize and assess the disorder level, as it can be divided in primary and secondary psychopathology.

In addition, we conclude that various genes can influence on the etiology of dissocial disorder, as: MAOA, LINC00951, ABCB1, RPL109, ZNF132, CDH5 and OPRD1. These genes can manifest in the production of hormones (serotonin), metabolism and brain system dysfunctions, etc. In the biological scope, it was also reinforced the existence of brain abnormalities, mainly in the amygdala, temporal pole, prefrontal cortex, orbitofrontal cortex, anterior and posterior cingulate, paralimbic structures, grey matter, insula, and thalamus.

At last, we emphasize the importance of the environment for personality modulation and for the etiology of the disorder. We mentioned that the environment and education can also perform a role of protection factors in the development of the disorder, as they could mitigate the genetical expression modification, beyond teaching the proper social behavior. Similarly,

when comparing imprisoned individuals with those in freedom, it was demonstrated that external factors can allow a greater possibility of self-evaluation.

This way, to accomplish better results in future treatments, it is important to have a complete life change, taking into consideration an environmental, hormonal, social, cultural, and religious change. Furthermore, we judge necessary the suggestion of new research that can confirm the arguments presented in the body of this article and clarify the questions above-mentioned.

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